REFUSE DISPOSAL PERMIT APPLICATION
PHASE III REPORT

HAWKINS POINT LANDFILL

3801 Fort Armistead Road
Baltimore, Maryland

July 28, 2022

Prepared for:

HAWKINS MANAGEMENT LLC
2519 Wilkens Avenue
Baltimore, Maryland 21223

Submitted to:

SOLID WASTE PROGRAM
Maryland Department of the Environment
1800 Washington Boulevard, Suite 605
Baltimore, MD 21230-1719

Attn: Mr. Ed Dexter and Andrew Grenzer

Prepared by:

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GTA Project No. 200476

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GEOTECHNICAL AND
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A Practicing GBA Member Firm

July 28, 2022

Solid Waste Program
Maryland Department of the Environment
1800 Washington Boulevard, Suite 605
Baltimore, MD 21230-1719

Attn: Mr. Ed Dexter and Mr. Andrew Grenzer

Re: Refuse Disposal Permit Application – Phase III Report
Hawkins Point Landfill
3801 Fort Armistead Road
Baltimore, Maryland
(Existing Permit: No. 2019-WIF-0527A)

Dear Mr. Dexter:

Geo-Technology Associates, Inc. has prepared this Phase III Report for a Refuse Disposal Permit for the remaining capacity of the above-referenced landfill ("Site"). This Phase III Report has been prepared as part of an application for a refuse disposal permit for the existing Hawkins Point Landfill at 3801 Fort Armistead Road in the Curtis Bay area of Baltimore, Maryland (existing Refuse Disposal Permit No. 2019-WIF-0527A).

This report transmits GTA's findings. Should you have any questions regarding this report, or should you require additional information, please contact our office at (410) 792-9446.

Sincerely,
GEO-TECHNOLOGY ASSOCIATES, INC.

Kristen Daly
Associate

Kristen Daly for
Paul H. Hayden, P.G., L.R.S., R.S.M.
Vice President

KBD/ PHH
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REFUSE DISPOSAL PERMIT PHASE III REPORT

HAWKINS POINT LANDFILL
BALTIMORE, MARYLAND
JULY 28, 2022

1.0 INTRODUCTION

1.1 Overview and Purpose

At the request of Hawkins Management LLC, Geo-Technology Associates, Inc. (GTA) has prepared this Phase III Report as part of an application for a refuse disposal permit for the existing Hawkins Point Landfill (HPL) at 3801 Fort Armistead Road in the Curtis Bay area of Baltimore, Maryland (the "Site", *Figure 1 – Site Location Map*). The Site was a landfill previously used to support the operations of the now-closed Cristal USA, Inc. manufacturing plant. The landfill previously accepted industrial waste and has remaining capacity to accept additional waste. The landfill recently began operating under the existing permit until a new permit is issued per a written agreement between the applicant and prior owner.

The Site is currently permitted through the Maryland Department of the Environment's (MDE) Solid Waste Program (SWP) permit no. 2019-WIF-0527A issued to the prior owner, Hawkins Point LLC, and originally operated by Cristal USA, Inc. The Site recently changed ownership and operation under the current permit has been transferred to the current owner, Hawkins Management LLC. This report represents the permit application for Hawkins Management LLC to accept waste for the remaining capacity of the landfill.

1.2 Limitations

This report was prepared by GTA for Hawkins Management LLC, under the terms and conditions of GTA's contract(s) with Hawkins Management LLC. This report was prepared by GTA for the sole and exclusive use of Hawkins Management LLC. GTA acknowledges that this document is being submitted to the MDE and will be part of the public record, and that MDE is expected to use this report as part of its review process. However, use of this report by any third party is at their sole risk. GTA is not responsible for any claims, damages, or liabilities associated with third-party use.

1.3 Statement of Professional Qualifications

This report was prepared by GTA on behalf of Hawkins Management LLC. As required by COMAR 26.04.07.07(B), this report was prepared by an individual who "*shall possess at least a bachelor's degree from an accredited college or university in the field of geology or a related field of earth science*", Ms. Kristen Daly, and reviewed by a geotechnical engineer who "*shall possess at least a bachelor's degree in civil or environmental engineering from an accredited college or university with the major course of study in geotechnical engineering or related earth sciences, and shall be registered in Maryland as a professional engineer*", Mr. Benjamin Myers, PE.

1.4 Report Organization

This Phase III Report addresses items outlined in three regulatory and guidance documents: (i) State of Maryland COMAR 26.04.07.19; (ii) Federal statute Code of Federal Regulations (CFR) Title 40 – Protection of the Environment, Part 258 – Solid Waste Disposal Facility Criteria, Subparts 10 through 15; and (iii) existing solid waste Permit No. 2015-WIF-0527A. The design of the landfill exceeds the requirements of COMAR 26.04.07.19 and has been sited and constructed under the more stringent regulation for a Subtitle D Landfill under 40 Code of Federal Regulations (CFR) 258.10-15 and COMAR 26.04.07.07. A summary of the compliance of the HPL with 40 CFR 258 are outlined in *Sections 3.0* and *4.0*, and with MDE's solid waste regulations in *Section 5.0*.

2.0 BACKGROUND

2.1 Site Description

The Site consists of approximately 30 acres located southeast of Fort Armistead Road in Baltimore, Maryland. The majority of the Site is a landfill that occupies approximately 23 acres of the parcel, with an access road around the perimeter of the landfill and several small outbuildings including a main operations office in the northern portion of the property near an entrance gate. A stormwater retention pond is located at the southwestern corner of the property between the landfill and the perimeter access road. The property is accessed by a gated entry that extends south from Fort Armistead Road. The Site is bounded to the northwest and southwest by

CSX railroad tracks, followed by Fort Armistead Road and a 65-acre landfill owned by Constellation Energy, respectively; to the southeast by the Anne Arundel County-Baltimore City boundary, followed by industrial land operated by the Maryland Port Authority; and, to the northeast by industrial land formerly part of the Cristal USA, Inc. facility followed by the Patapsco River. A *Site Location Map* for the subject property is presented as *Figure 1*.

2.2 Site History and Operations

The Site was historically associated with the adjacent Cristal USA, Inc. facility that comprised approximately 148 acres and included a chemical manufacturing facility that produced titanium oxide since approximately 1954. Operations of the Cristal USA, Inc. manufacturing plant ceased in 2011. The landfill was approved to accept waste from the manufacturing process that included gypsum-sulfate process waste, dredged material from the wastewater treatment lagoons associated with the manufacturing plant, brick and refractory brick, soil excavated from the plant property for construction/maintenance purposes, rubble, ore residues, sand, lime, and road asphalt. Third party waste was acceptable in the event that it fit into one of the permitted categories of non-hazardous industrial waste and was properly characterized prior to acceptance. When manufacturing operations ceased, the landfill was used to stage clay excavated from the neighboring 65-acre landfill which began in 2009. The landfill has been inactive since that time aside from the operations and maintenance, groundwater monitoring, and reporting required by the permit.

The MDE received the Refuse Disposal Permit Application and Phase I Report for the Site on January 12, 2022 for a change in the permittee from Hawkins Point LLC to Hawkins Management LLC. MDE distributed the Permit Application and Phase I Report to interested agencies in accordance with COMAR 26.04.07.20B and requested any comments be submitted within 20 days. Following the agency comment period, a public comment period of 30 days was held that included a public meeting on March 1, 2022.

3.0 STATE OF MARYLAND STATUTE

The design of the landfill exceeds the requirements of COMAR 26.04.07.19 and has been sited and constructed under the more stringent regulation for a Subtitle D Landfill under 40 CFR 258 similar to a municipal solid waste landfill. COMAR 26.04.07.08 outlines 21 items for discussion as part of the Phase III permitting process, which are described below.

3.1 Property Boundary

A map which designates the property boundaries, the actual area to be used for filling, and all existing and proposed structures.

Figures included in the appendix of this report show all pertinent features including the property boundary, landfill footprint, and existing site conditions including structures. No new structures are proposed at this time, and existing features and infrastructure are planned for continued use.

3.2 Infrastructure – Utilities and Maintenance

A description of any vehicle weighing facilities, any telephones or other communications equipment, any maintenance and equipment storage facilities, any employee safety and sanitary facilities, and any water supply and sewerage systems. Any proposed on-site water supply and sewerage systems shall be approved by the Approving Authority.

The entire disposal footprint of the landfill has been constructed, covering approximately 23 acres of the 30-acre site and includes a bottom liner and leachate collection system.

- Personnel are based out of a field office/office trailer located near the gated entrance to the facility that controls access to the facility and provides space for administrative operations such as record storage, employee break area, and visitor reception.
- The leachate pump system includes two control houses on the perimeter of the landfill, inside the perimeter road.
- A truck wash, consisting of a concrete lined basin, approximately 50 feet in length by 30 feet in width and 5 feet in depth is situated on the north side of the landfill parking lot near the landfill office trailer. The basin is in line with, and part of, the perimeter swale. The basin is connected to the perimeter swale along the west property line by an 18-inch pipe under the main entrance road to the landfill. City water supply is available at the basin.
- A stormwater basin (that discharges to the stormwater swale) is located in the southwest corner of the Site.
- A groundwater monitoring well system is installed around the landfill.
- Telecommunications service is provided to the office trailer.
- Water from the Baltimore City Department of Public Works is provided to the administration area of the site by a four-inch service line which enters the Site from

Fort Armistead Road along the landfill entrance driveway. The water is available to the office trailer and the truck wash. No public sewer is available at the landfill. Domestic wastewater from the trailer is collected in an aboveground septic tank (approximately 10,000 gallons) on the west side of the trailer, which is periodically pumped and disposed of at a permitted facility.

- Electrical power is provided by overhead wires originating from the adjacent inactive plant. An electrical box is situated approximately 80 feet from a locked gate on the southeast corner of the Site. Three-phase, 480-volt service is available. Power is distributed around the perimeter road on poles spaced every 200 feet. Lines for the primary leachate collection pump house, the supplemental pump house, the groundwater collection well, the office trailer and maintenance shed are serviced by underground wire from boxes on the poles. Overhead street lamps are placed on each pole.

3.3 Infrastructure – Roadways

The location and type of all existing or proposed on-site roads.

Two roadways are developed on the Site, and no further roadway development or modification is proposed at this time.

- A gravel perimeter road travels around the entire landfill footprint and provides access to leachate pump houses, groundwater monitoring well locations, drainage swales on either side of the road, and the stormwater basin.
- A gated, paved entrance road approximately 25-ft wide leads to the office trailer parking lot and perimeter road from Fort Armistead Road. The entrance road is mainly used by site personnel and trucks hauling waste loads to the active disposal face.

3.4 Type of Waste and Service Area Profile

A description of the types of solid waste which will be accepted, the types of solid waste which may not be accepted, and the area and population which will be served by the facility.

Refer to *Section 4.9* for types of wastes accepted. The landfill is intended to service third-party customers for disposal of acceptable wastes with MDE approval. The service area is not restricted to any particular county or city, but rather is focused on a specific waste stream for sites in the surrounding area.

3.5 Waste Volumes and Facility Lifetime

The anticipated quantities of solid waste which will be accepted, and the calculations used to determine the useful life of the facility.

The landfill is estimated to have a capacity of approximately 3 million cubic yards, of which

approximately 2 million is estimated to be available following removal of the stockpiled clay. Based on capacity and operations producing waste during the design of the landfill, the HPL was anticipated to have a disposal lifespan of approximately 9.4 years.

The closure of the former Tronox facility and cessation of previous waste stream reduced the amount of fill being placed in the landfill for a period of time, and waste stream volume is now variable. The most recent projection of remaining landfill capacity was submitted to MDE on March 1, 2021, with the remaining capacity calculated to be 939,021 cy as of January 30, 2021. The letter states that because the waste stream into the landfill is variable and inconsistent, a revised projection of lifetime in years is not able to be made at this time.

3.6 Data Collection and Projections

Proposed methods of collecting and reporting data on the quantities and types of solid waste received and for revising facility life expectancy projections.

The remaining capacity of the landfill is calculated through review of the current topography and computations of the volume occupied by solid waste placed in the landfill. The volume of solid waste received will be estimated based on periodic aerial surveys of the landfill disposal areas to obtain updated topography. Remaining capacity is computed by determining the difference between the existing topography and the elevations shown on the approved Final Grading Plan prepared by Oosterbaan Associates, Inc. and Haley & Aldrich, Inc.

Operations and the source of waste has been in flux recently due to a change in ownership and waste stream, and calculations will be more accurate after one to two years of the new management of the landfill. Since the filling rate is variable at the HPL, an estimate of the time when the landfill will reach final grades has not been updated.

A Solid Waste Tonnage and Annual Operations report will be submitted annually to MDE for each year the landfill is in use, no later than 60 days following the date specified in the permit. The reports will include:

- The quantity of waste that was landfilled at the facility during each of the preceding 12 months;
- An estimate of the total quantity of soil material that was used in the landfill during each of the previous 12 months;
- An estimate of the percentage of total landfill capacity that was used for placement of solid waste and the percentage that was used for soil cover materials; and
- An estimate of the projected date at which the landfill will reach its maximum disposal capacity and the assumptions upon which this determination was made.

3.7 Cover Material

The volume and type of available cover material, the calculated volume of earth needed for daily, intermediate, and final cover, the location of earth stockpiles, and provisions for saving topsoil for use as final cover.

As part of the construction of the adjacent Lot 15 Landfill, approximately 1,000,000 cubic yards of clay was stockpiled on the HPL on top of the Phase I cell waste and unfilled Phase II cell. Currently, that clay and sandy clay material is being removed as overburden to expose the available landfill capacity, and is being used as cover. The stockpiled clay is also being removed for off-site uses, or reserved for future closure-capping material.

The final cover of the HPL requires a two-foot-thick layer of capping material. Given that the footprint of the landfill is 23 acres, the amount of material needed for the final cap is equivalent to 2 feet times 23 acres, or approximately 75,000 cubic yards.

Daily and intermediate cover soil is estimated as a percentage of disposal capacity. Based on the type of landfill and waste accepted, daily and intermediate cover is estimated at about 10% of the total 3,000,000-cubic-yard disposal volume, or approximately 300,000 cubic yards.

3.8 Site Security

Proposed means of controlling unauthorized access to the site.

Please refer to *Section 4.6*.

3.9 Site Operating Procedures

Proposed operating procedures including: (a) Hours and days of operation; (b) Number and types of equipment to be used; (c) Number of employees and their duties; (d) Provisions for fire prevention and control; (e) Means of preventing public health hazards and nuisances from blowing paper, odors, rodents, vermin, noise, and dust; and (f) Proposed method of daily operation including wet weather operation.

3.9.1 Operating Hours

Normal operating hours are 7:00 am to 4:00 pm, Monday through Friday. The landfill will be closed on the noted holidays - New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas.

3.9.2 Equipment

The main operations requiring equipment onsite are placement of material, compaction, and cover. Heavy equipment typically used for grading or earth-moving is generally

utilized for deposition and movement of the waste or cover soil. The heavy equipment is also used for some of the heavier-duty maintenance tasks such as roadway maintenance and removal and loading of the clay overburden.

Lighter equipment is also utilized to support the heavy equipment and day-to-day maintenance requirements of the facility. Examples of support equipment include fueling trucks, water trucks, employee transport vehicles, landscaping equipment, groundwater and leachate pumps, and machinery associated with the leachate collection system.

Equipment will be routinely serviced according to the manufacturer's recommendations. In the event that essential equipment becomes inoperable, the Landfill Foreman will procure appropriate replacement equipment from local equipment rental companies within 24 hours.

3.9.3 Employees

The landfill shall be under the supervision of a responsible individual who is present at the landfill at all times during the active operation of the Site. The landfill operational staff will consist of a Landfill Foreman and one equipment operator. The Landfill Foreman is responsible for managing other landfill personnel, inspecting incoming waste and accepting/rejecting loads, referring back to plans and design documents as needed to maintain operations or effect improvements, and ensure that landfill standard operating procedures are being followed.

Adequate personnel and equipment shall be maintained at all times to ensure proper operation and prompt attention to correct problems associated with the construction and maintenance of the landfill. Standing agreements with alternate labor and equipment vendors will be maintained as contingency for both operating components. All employees shall be provided with appropriate safety equipment. First-aid supplies shall be stocked in the on-site office trailer and other operating vehicles, as appropriate.

3.9.4 Fire Prevention and Control

Most of the material accepted at the facility is not flammable, limiting the likelihood of fire associated with the waste pile. Fire extinguishers are provided in various locations onsite. Operators will also be trained in procedures to follow in the event that a fire is observed. Smoking will be prohibited on site except in designated areas. An Emergency Contingency Plan (*Appendix C*) prepared by Geosyntec in 2019 provides procedures to address fires on the Site.

3.9.5 Public Health Hazard Control

- Vectors: As described in *Section 4.3*, vectors such as insects and rodents are typically not associated with the type of waste accepted at the HPL, and have not

been an issue during operations to date.

- Dust: When dust is produced by vehicular traffic, especially on unpaved haul roads, the road surfaces are sprayed with water from a dedicated water truck which has adequately suppressed airborne dust. When dust is produced during unloading of waste, the material and area are sprayed with water. There is an existing water connection near the site entrance to supply water for dust control, equipment washing (i.e. truck washing), and other types of landfill operation activities. This practice will be continued. Dust from cover soils will also be reduced by the establishing vegetation on final and intermediate slopes of the landfill as soon as practicable.
- Litter: The types of waste accepted do not typically become litter due to their weight, moisture content, or other physical characteristics. Site personnel shall periodically inspect the Site and remove litter as applicable.
- Noise: The main source of noise onsite is heavy equipment operating. Mufflers are provided on equipment and the potential for noise nuisances off-site is small due to land use of surrounding properties (industrial). Noise control measures for the Site will be implemented in accordance with COMAR 26.02.03. On-site noise control for employees will be governed by the Occupational Safety and Health Administration (OSHA) Standards.

3.9.6 Standard Operating Procedure

Daily operating procedures are discussed in detail in Section 4.C of the O&M Manual. There are four options, as described below:

- Preference 1: Access fill area by dump trucks, spread waste/fill with bulldozer in thin layers, no more than one foot in thickness, to allow drying and compaction. Work, turn, and agitate waste material/fill to promote drying during favorable weather conditions. Compact waste/fill by repeated tracking with bulldozer and rolling to attain density sufficient to ensure stability of embankment slopes. The specification for compaction will be determined by future testing and slope stability analyses. As soon as possible, grade the waste with a uniform surface which will not pocket water but shed runoff away from the waste which is in the process of drying.
- Preference 2: Place waste/fill from elevated position, such as perimeter road, in random thicknesses. Method only available until landfill surface reaches level of perimeter road. Drying not possible within mass of waste and wet material. If deposited near the perimeter of landfill, wet material may interfere with eventual slope construction and use of Preference 2 will be restricted to non-critical areas which will not influence slope stability.
- Preference 3: Provide dump truck access to the interior of landfill over elevated all-weather access roads constructed of dry waste. Spread waste/fill in thin lifts by bulldozer, proceed as in 1 above.
- Preference 4: In conjunction with 3, if waste/fill is too wet to be accessed by bulldozer, distribute and work waste with long reach backhoe perched on timber or

steel mats to promote drying until bulldozer can gain access. Then proceed as in 1 above.

3.10 Cell Construction and Utilization

The location and depth of solid waste cells and the sequence of filling.

The landfill consists of Cells 1 and 2, both of which have been constructed. As-built plans show that the cells were excavated to approximately 11 feet amsl in the northwest corner of the landfill and gently slope down to approximately 8 feet amsl in the southwest corner (*Figure 6*). A bottom liner was constructed across the entire base of the landfill footprint consisting of a 12-inch-thick compacted clay layer that conforms to the required maximum hydraulic permeability of 1 x 10^{-7} cm/sec. Overlying the 2-foot-thick clay liner is an 18-inch-thick leachate collection system, which is described further in *Section 5.13*. The pipe network in the 30-acre parcel consists of 6-inch HDPE coated perforated metal pipes surrounded by 18 inches of washed pea gravel wrapped in needle punched geo-fabric designed for drainage applications.

3.11 Facility Screening

Natural or artificial screening to be used.

The adjoining properties are industrial use, and existing vegetation and the industrial nature of surrounding property uses provides adequate screening of landfilling operations. Currently, the southern and eastern perimeter of the Site is predominately forested with mature trees. According to the 2019 Geosyntec Phase III report, the following vegetation was added in 2011 as additional screening along Fort Armistead and Fort Smallwood Roads:

- 5 Leyland Cypress (Cupressocyparis Leylandii) - 5-6'Ht.
- 6 Holly (Ilex 'Nellie Stevens') - 5-6' Ht.
- 5 Arborvitae (Thuga x Green Giant) - 5-6' Ht.
- 20 Dart's Duke (Viburnum rhytidophylloides) - 4-5' Ht.
- 2 White Pine (Pinus Strobus) - 6-7' Ht.
- 5 Viburnum rhytidophylloides - 4-5' Ht.

3.12 Property Drainage

Methods of controlling on-site drainage, drainage leaving the site, and drainage onto the site from adjoining areas. Erosion and sediment control provisions shall be approved by the appropriate approving agency and satisfy the requirements of Environment Article, Title 4, Subtitle 1, and COMAR 26.09.01.

Please refer to *Section 4.7*. As required by COMAR 26.04.07.08.B(12), the stormwater and erosion and sediment (E&S) control designs were submitted, reviewed, and approved by the

appropriate local agencies. There are no changes to the currently permitted stormwater management system.

During the construction of Phase I, seepage was encountered on the south and east faces of the cut slope which required collection and conveyance to the permitted surface discharge point. Approximately 400 feet of 6-inch perforated pipe was installed in trenches excavated at approximate elevation 35 MSL along the south and east slopes and directed to the vicinity of the leachate collection tunnel. The trenches were backfilled with washed pea gravel and capped with compacted clay to isolate the system from waste materials. The pipes pass under the perimeter road and outer drainage swale to a collection well at the southeast corner of the site. The well pumps the perched groundwater to the outer swale which drains to the primary storm water management pond, Pond No. 3. During the construction of Phase II, perched groundwater seepage was encountered along the east slope and approximately 150 feet of perforated pipe was installed to extend the pipe placed during Phase I.

3.13 Leachate Management

Proposed methods and engineering specifications for the collection, management, and disposal of leachate generated at the facility. The calculations used to determine the anticipated quantities of leachate which will be generated shall be included.

A leachate collection system drains leachate and rainwater into a network of pipes and a sump. An 18-inch-thick leachate collection system consisting of coarse sand with a network of 4-inch or 6-inch diameter perforated pipes surrounded by coarse aggregate encased in a filter fabric was installed to collect leachate generated and to prevent migration of pollutants outside the limits of the landfill. The liner floor was graded at approximately 0.25% slope to facilitate leachate conveyance to the sump and collection pipes. The pipe network drains to the leachate sump within the landfill and then gets pumped to a sump which consists of a manhole that removes leachate by gravity to the middle settling basin on-site.

Leachate is currently pumped to a settling basin on the adjacent former Cristal USA, Inc. property that is scheduled to be abandoned, but is planned to be redirected to discharge to the Patapsco River by way of an easement on the adjacently southeastern property, through a treatment system if needed based on leachate sampling results and discharge requirements. Because this permit application is for the transfer of an existing permitted and constructed landfill, no additional leachate management system design or calculations were performed. Please refer to the leachate management system design and calculations found in Section 13 and Appendix D of the 1992 Oosterbaan Phase III permit application, which is copied in *Appendix D,* and *Figure 7*.

- Leachate Collection Basin and Tunnel: The primary sump consists of a 10-foot high by 7.5-foot wide by 21.5-foot long (exterior dimensions) reinforced concrete basin at the southeast corner of the floor of landfill with top of floor slab at El. 6.0 MSL. A 6-inch leachate pipe from landfill enters with invert El. 8.0 MSL. The tunnel consists of an 8.5-foot high by 7.5-foot wide by 109-foot-long reinforced concrete structure

rising from the sump up to the leachate equipment house. A supplemental reinforced concrete leachate collection sump box with a square footprint measuring 5 feet by 5 feet and 5 feet high, riser pipes and pump house were installed midway along the east slope of the waste limit during the preparation of the depressed area between Phase I and Phase II to receive waste solids.

- Leachate Equipment House: 11.5-feet high by 10-feet wide by 16-feet long masonry block building with concrete slab roof and concrete slab floor with turn-down perimeter footing. Located at top of leachate tunnel. Top of slab floor el. 54.0 MSL. Standard metal entry door on north wall and removable metal plate over small access door at base of east wall to facilitate removal of pump and discharge hose.

- Leachate Pump System: The primary pump system consists of 2 Grundfos 16S07-8 15 gpm pumps (or equal), 109+ feet of 1-1/4-inch flexible hose for each pump, twin 18-inch HDPE pipes for guideways to raise and lower pumps, two winches to raise and lower pumps, quick disconnects for hoses, power disconnect for pumps, floats on the wall of the basin to automatically monitor leachate height and progressively switch pumps on and off, pump power supply and control electrical boxes, automatic high water alarm, an in-line Brooks flow meter, piping and valves. A new, near identical supplemental pump system has been installed midway along the east slope of the landfill limit.

- Leachate Equipment House Safety Appurtenances: The leachate equipment house contains a rescue basket, fire extinguisher a fresh air recirculation fan for the tunnel/riser and lighting for the house and tunnel/riser.

- Leachate Storage Tank/Pond: The leachate solids settling tank at the 30-acre parcel consists of an 8.5-foot high by 10-foot wide by 16-foot long (outside dimensions) precast concrete tank with three internal chambers installed below grade in the landfill on the north side of the leachate equipment house. The tank serves to aerate the leachate flow to cause and retain precipitates from oxidation and to capture suspended solids in the leachate discharge stream. Each chamber can be accessed by one of three manholes in the top slab of the tank.

- Leachate Conveyance Pipe: Consists of 1000 feet of 6-inch HDPE pipe draining (by gravity) the Leachate Sedimentation Tank to the treatment box (the 002 mixing box between the Upper Settling Basin and Lower Settling Basin at the plant). Clean-outs are located every 100 feet (approx.). The as-built drawings indicate the location and invert elevations of the pipe.

- Internal Seepage Control: Due to the relatively low permeability of the waste, the placement of waste in approximate horizontal layers, and the high moisture content, not all leachate will migrate vertically to the leachate collection system. It is possible that some leachate may daylight at seams or zones in the waste surface, especially as the landfill rises higher. Ordinarily, this occurrence will not be an issue because the

amount of moisture reaching the surface of the waste will be so small that evaporation will cause the seepage to go unnoticed. In the event that such seepage becomes pronounced and persistent, it should be captured and conveyed to the leachate collection system.

Currently, leachate is discharged via a shared outfall (Outfall 002). That outfall is planned to be abandoned and a new discharge route is being designed as part of the application process for NPDES permit MD0066206. Currently, the proposed easement would extend from the southern point of the site across the neighboring Maryland Port Authority property to discharge into either an existing stormwater pond, or directly to the Patapsco River. Sampling of leachate indicated elevated levels of iron, which MDE may require treatment for prior to discharge; groundwater monitoring data for wells surrounding the Hawkins Point Landfill have demonstrated that total iron concentrations can range up to 36 mg/L. However, background concentration data for other groundwater monitoring wells in the region have indicated total iron concentrations ranging above 100 mg/L.
A resolution to the iron content and discharge limit negotiation with MDE is pending. The design of any leachate treatment system will be dependent on MDE's requirements. One appropriate technology under consideration would be filtration (such as bag or cartridge filters) for removal of total suspended solids (and subsequently, iron). A short-duration pilot test may allow for a more complete evaluation of filtration as a viable removal technology, as well as provide design data (such as filtration change out schedules).

There are also ongoing discussions with the Port regarding the final location of the outfall line and location of the outfall. One option under discussion is for the outfall to discharge into a large existing storm water retention basin on the Port's property near where their property line meets the Patapsco River. It is easily visible on an aerial. This configuration would provide settling treatment for iron and other solids which would mitigate aesthetic issues for the river and shoreline. If the outfall is discharged to the pond, iron limits would likely not be applicable in the permit, especially if there is a TSS limit.

3.14 Contingency/Emergency Plans

<u>A contingency plan for preventing or abating the pollution of the waters of this State. At a minimum, the contingency plan shall address the following items: (a) Emergency provisions of potable water to users whose supply may be affected by the landfill; (b) A spill containment and prevention plan for any leachate collected or stored at the site; and (c) Emergency telephone numbers and contact persons for fires, medical emergencies, spills of hazardous materials, or other emergency situation.</u>

These items are addressed in the following three subsections as well as the O&M Manual (Appendix C) that was submitted with the original 1992 Oosterbaan Phase III permit application.

- Potable Water: As discussed in the Phase II report, the Patapsco Aquifer is not used as a source of drinking water and is overlain by approximately 100 ft of low

permeability clay. No drinking water wells were identified within 0.5 miles of the Site; municipal water is supplied to all surrounding properties and the Site. Contaminant leak from the liner system and through the native clay layer is unlikely, and based on public water service throughout the area, there is no risk of leachate impact to the potable water supply.

- Leachate/Spills: The landfill is designed to contain all leachate that is generated by the waste. However, leachate is collected and conveyed via a pump system located on-site, and therefore it is possible that leachate spills may occur. (Refer to *Section 5.13* for details regarding leachate system construction.) In the event of a release of leachate, the Landfill Foreman will be called immediately and measures taken by a spill response team to contain the spilled leachate. Following the response, measures will be taken to prevent the release from recurring and repair damaged or defective features or equipment.
- Emergency Contacts: Emergency telephone numbers and contact persons for fires, medical emergencies, spills of hazardous materials, or other emergency situations are listed in the office trailer. In addition, mobile phones are used to facilitate communication among landfill personnel and to link the landfill working face with the office. Mobile phones allow immediate response to any emergency and improves control over operations. The following telephone numbers should be called in the event of an emergency:

Agency	Address	Phone Number
Baltimore City Fire Department	Fire Station No. 57 4427 Pennington Road Baltimore City, MD 21226	(410) 396-1257
Baltimore Washington Medical Center	301 Hospital Drive Glen Burnie, MD 21061	(410) 787-4000
Baltimore Police Department	10 Cherry Hill Road Baltimore, MD 21225	(410) 396-2499

3.15 Landfill Gas

Proposed methods for controlling landfill gas.

Please refer to *Section 4.4* of this report.

3.16 Final Stabilization Procedures

Proposed methods for covering and stabilizing completed areas.

Per the O&M plan, the standard procedures for final stabilization can generally be classified into one of three categories:

- Inactive areas: Seed and mulch within 7 days in accordance with the approved sediment and erosion control drawings, Drawing No. SE-8.

- Completed slopes: As perimeter slopes attain design berm level, grade to final configuration as soon as possible and seed and mulch within 7 days.
- Waterways - swales: Periodically inspect for siltation, erosion, and loss of vegetation. Remove sediment and re-stabilize with seed and mulch or sod, as necessary.

The criteria for vegetation of these surfaces follows the *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control*. Areas will be capped once waste deposition has been completed, then prepared for cultivation of permanent vegetation. Stabilization activities will be performed by either site personnel or private contractor.

To prepare cover surfaces, soil will be loosened to a depth of at least three inches or aerated prior to seeding. Soil property testing will be performed to determine the need for fertilizer and/or pH adjustment with agricultural lime as needed. Steep slopes may require additional preparation, such as roughing the surface to provide traction for seeding strategies such as casting, hydro-seeding, or drill seeding. Vegetation selected to seed varies by season, as outlined on Tables B.1 and B.2 of the *2011 Maryland Standards and Specifications for Erosion and Sediment Control*.

Following seeding, erosion will be minimized through one of several options such as mulch application, tackifier, or placement of straw. Established vegetation will prevent significant erosional features such as surface channels and/or culverts, accelerated siltation in sediment basins, or the presence of erosion gullies. Areas with significant erosion will be repaired and then revegetated by over-seeding and applying fertilizer using half of the original rates. Fertilizer will be applied to permanent vegetated surfaces yearly, or as needed. If mowing is carried out, the stand will be mowed no closer than 3 inches from the ground surface.

3.17 Groundwater Monitoring

A system for routinely monitoring the quality of the waters of this State around and beneath the site, including the location and types of monitoring stations, and the methods of construction of monitoring wells. Wells shall be installed by a State licensed well driller in accordance with COMAR 26.04.04.

A series of five groundwater monitoring wells were installed during the Phase I construction. Groundwater samples from monitoring wells M-1 through M-5 installed at the HPL have been sampled on a semi-annual basis since January 1993. Groundwater levels in the wells are measured monthly and samples are obtained and analyzed for a specified set of parameters semi-annually. The details of the well locations, construction details, sampling and analytical testing requirements are contained in a Groundwater Monitoring Plan, dated April 27, 1992 and revised October 2001, which is maintained by the Environmental Division. No additional wells are anticipated. The monitoring well locations are sufficiently removed from landfill operations that the chance for disturbance or damage is remote. Please refer to the approved Environmental Monitoring Plan for further detail in *Appendix E*.

3.18 Burning of Waste

A statement that "Burning of solid waste is not allowed, except as permitted by the Department of the Environment."

Burning of solid waste is not allowed, except as permitted by the Department of the Environment.

3.19 Timeline of Implementation

A schedule for implementing construction and implementation of the Operation and Maintenance Manuals and engineering specifications once the refuse disposal permit has been issued.

The HPL is an existing landfill with the liner and leachate collection system already constructed. No expansion of the existing landfill cells is proposed at this time. Therefore, a schedule for construction is not applicable. An O&M manual was prepared in 2009 by TM Engineering, Inc. that is already implemented at the Site.

3.20 Closure and Post-Closure Plan

A landfill closure and post-closure plan to be followed over a period of not less than 5 years after application of final cover.

A Closure and Post-Closure Plan for the landfill has been developed (Geosyntec, 2019; *Appendix F*). The Closure/Post-Closure Plan includes the following:

- Requirements for closure and post-closure care;
- Methods and procedures to be followed to close the landfill;
- Descriptions of the closure system features and their design;
- Cost estimates for closing the landfill;
- A plan for providing maintenance throughout the post-closure period; and
- Methods for determining whether the appropriate amount of post-closure care has been provided and for evaluating whether it is appropriate for regulatory post-closure care to end.

The final disposition of the landfill, following the termination of waste deposition, will be a capped and permanently stabilized slope. The closure cap included in the Geosyntec plan has been updated to meet current requirements, as shown in *Figure 8*. The updated final cap design will consist of 24-inches of cover soil immediately over the waste, overlain by 40-mil HDPE liner and geocomposite drainage layer, followed by 18” of vegetative support soil and 6” topsoil, for a total of 24” of soil over the geocomposite layer. The capping and vegetative stabilization will follow the slopes specified in the currently approved final grading plans and cross-sections provided in the 1992 Oosterbaan Drawings in *Appendix G*. An updated closure cap design is included as *Figure 8*.

3.21 Operator Contact

The name, address, and telephone number of the person or agency responsible for the maintenance and operation of the site. Changes to this information shall be submitted to the Approving Authority once effected.

Joe Bittner
Director of Operations
Hawkins Management LLC
2519 Wilkens Avenue, Baltimore, MD 21223
Cell: 443-945-5165
jbittner@hawkinsmgt.com

4.0 REFERENCES

Geosyntec Consultants (2011), "*Evaluation of Waste Stability over Stock Pile, Millennium Inorganic Chemicals, Inc. 30-acre Parcel Landfill, Baltimore City, Maryland*", prepared for Millenium Inorganic Chemicals, Baltimore City, Maryland, 4 March 2011.

Geosyntec Consultants (2019), "*Phase III Report, Hawkins Point Plant Industrial Waste Landfill, 3901 Fort Armistead Road, Baltimore City, Maryland*", prepared for Hawkins Point LLC, Baltimore City, Maryland, October 2019.

Howard, K.A., Aaron, J.M., Brabb, E.E., Brock, M.R., Gower, H.D, Hunt, S.J., Milton, D.J, Muelberger, W.R., Nakata, J.K., Plafker, G., Prowell, D.C., Wallace, R.E., and Witkind, I.J. (1978) "*Preliminary Map of Young Faults in the United States as a Guide to Possible Fault Activity*" United States Geological Survey.

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Oosterbaan Associates, P.C., (1992) "*Phase III Report for Industrial Waste Disposal Facility, HPP Landfill.*" Prepared for SCM Chemicals, Inc., Baltimore, Maryland.

Oosterbaan Associates, P.C. (1992) "*HPP Industrial Waste Landfill, Phase III – Landfill Design* Drawings." Prepared for SCM Chemicals, Inc., Baltimore, Maryland.

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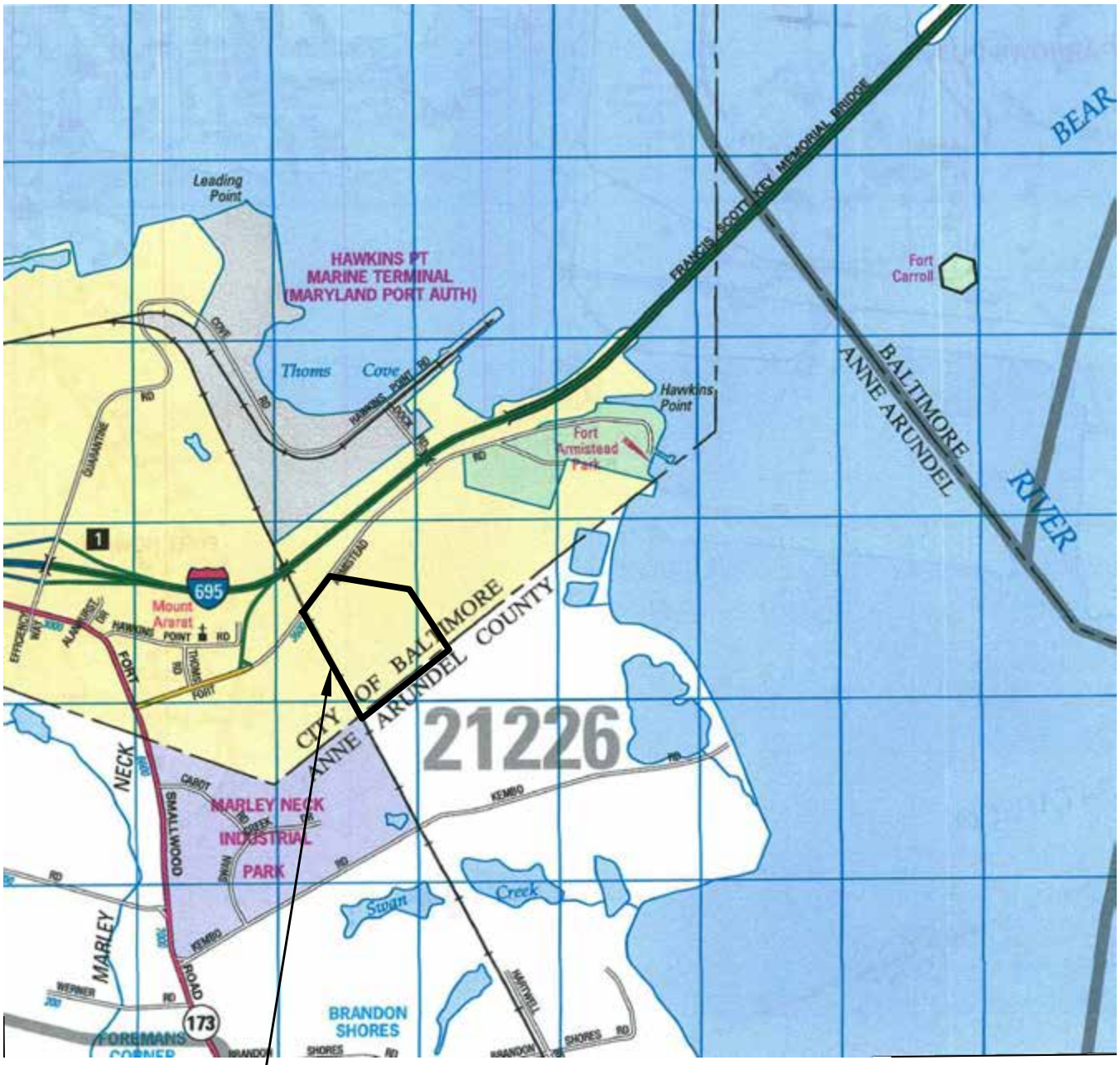
TM Engineering, Inc. (2010) *"HPP Landfill – 30 Acre Site, Clay Stockpile Relocation."* Prepared for Millenium Inorganic Chemicals, Inc.

TM Engineering, Inc. (2019) *"Tronox HPP Landfill – Groundwater Monitoring Plan."* Prepared for Tronox Pigments, USA. Revised.

United States Environmental Protection Agency (1991b) Solid Waste Disposal Facility Criteria; Final Rule, Federal Register, 40 CFR Part 258.

******* END OF REPORT *******

FIGURES



Approximate Site Boundary

0 1,000 2,000

Approximate Scale
1 inch = 2,000 feet

NORTH

Notes

1. Map Copyright © ADC The Map People, (800) 829-6277
2. Permitted Use Number 21006238

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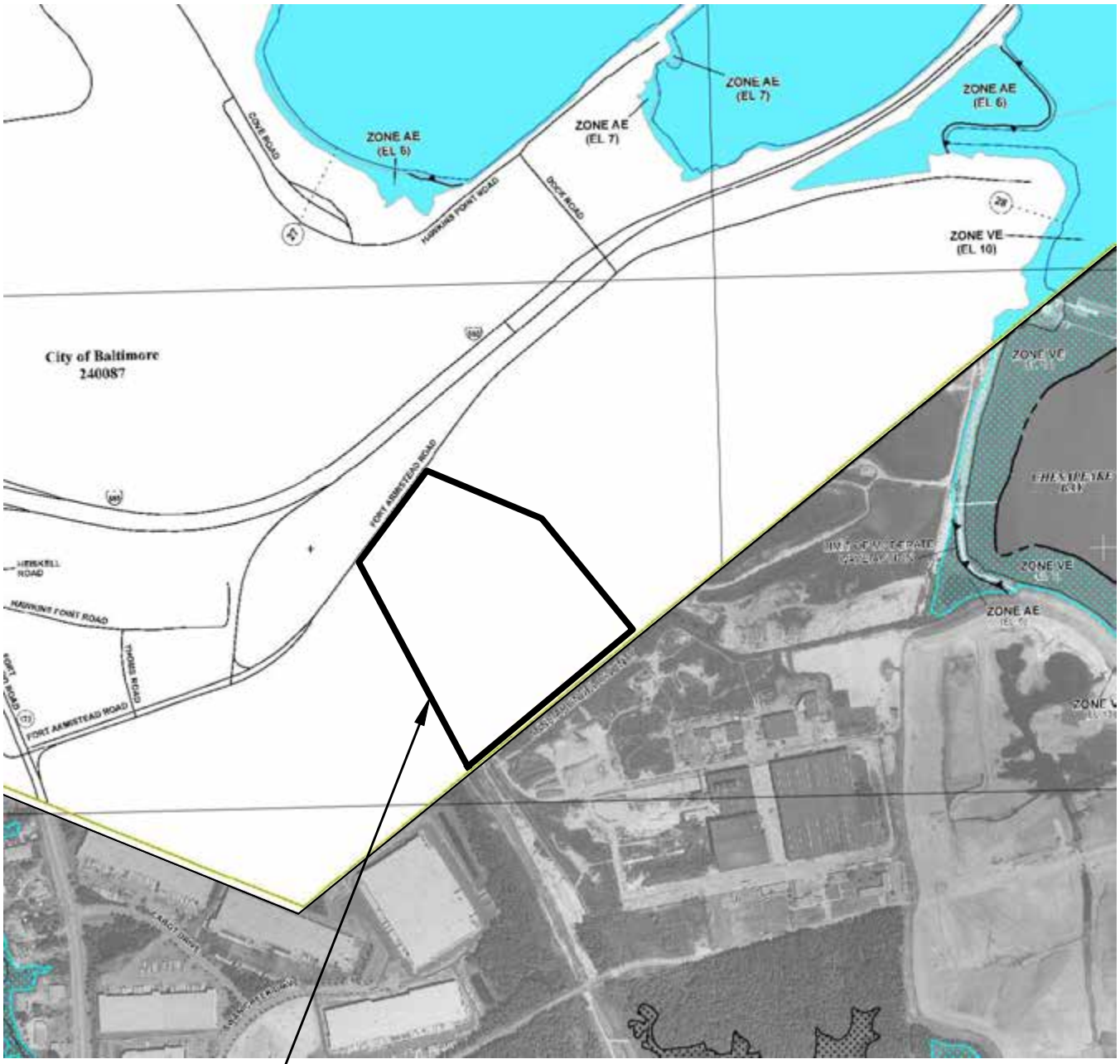
HAWKINS POINT LANDFILL
BALTIMORE CITY, MARYLAND

SITE LOCATION MAP

PROJECT: 200476	DATE: DECEMBER 2021	SCALE: 1" = 2000'	DESIGN BY: BRS	REVIEW BY: KBD	FIGURE: 1



Approximate Site Boundary

0 500 1,000

Approximate Scale
1 inch = 1,000 feet

NORTH

Notes

1. Base map image obtained from FEMA National Flood Insurance Program
2. Map #s: Baltimore-2400870036G, Anne Arundel County- 24003C0058F

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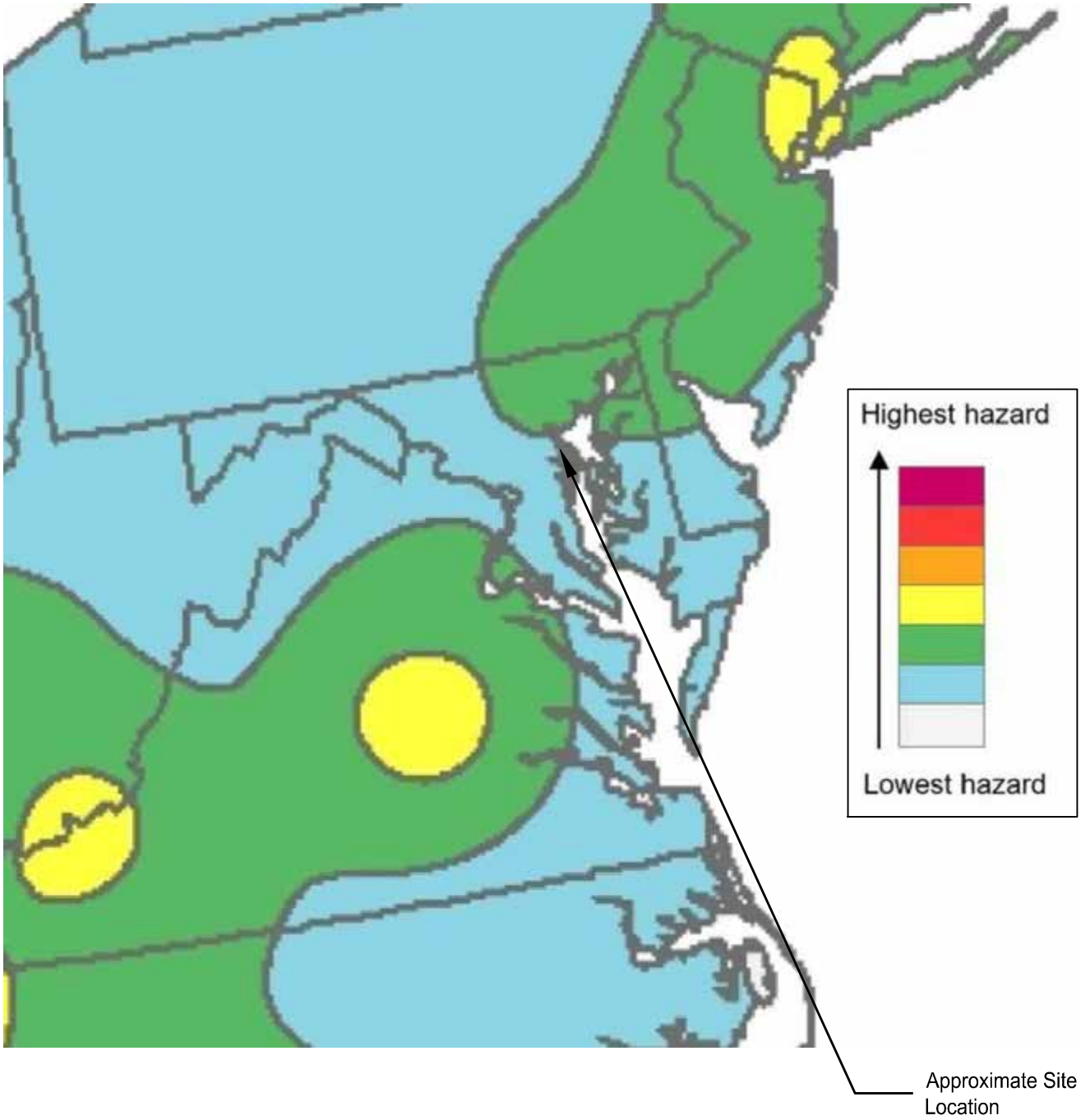
FEMA FLOODPLAIN MAPS

PROJECT: 31200476	DATE: October 2021	SCALE: 1" = 1,000'	DESIGN BY: BRS	REVIEW BY: KBD	FIGURE: 2



Notes

1. Base map image obtained from USGS, *2018 United States (Lower 48) Seismic Hazard Long-term Model* Map

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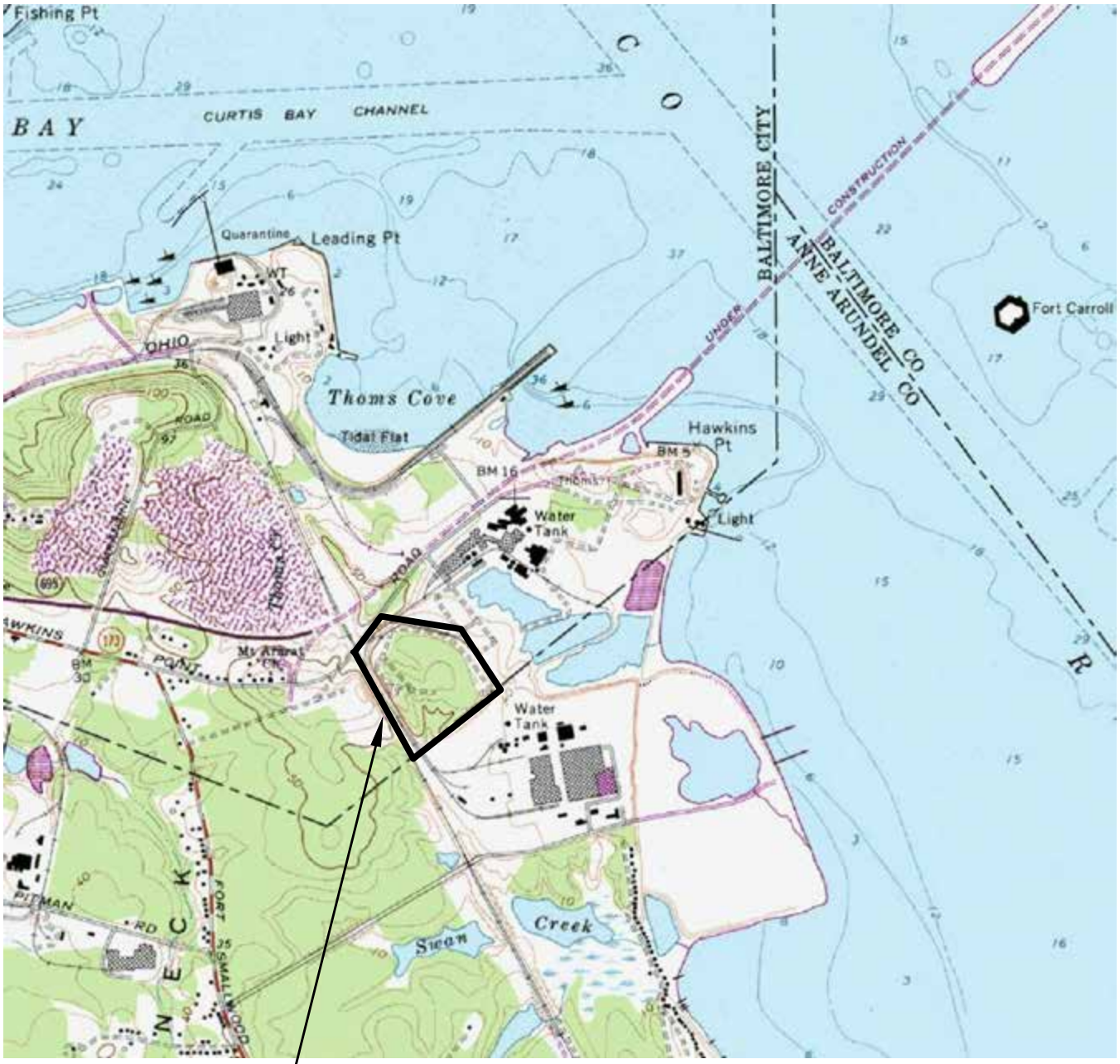
SEISMIC HAZARD MAP

PROJECT: 31200476	DATE: December 2021	SCALE: Not To Scale	DESIGN BY: BRS	REVIEW BY: KBD	FIGURE: 3



Approximate Site Boundary

0 1,000 2,000

Approximate Scale
1 inch = 2,000 feet

NORTH

Notes

1. Based on the USGS Curtis Bay, MD 7.5 Minute Quadrangle Map.
2. Copyright 2013 MyTopo, Inc.

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HAWKINS POINT LANDFILL
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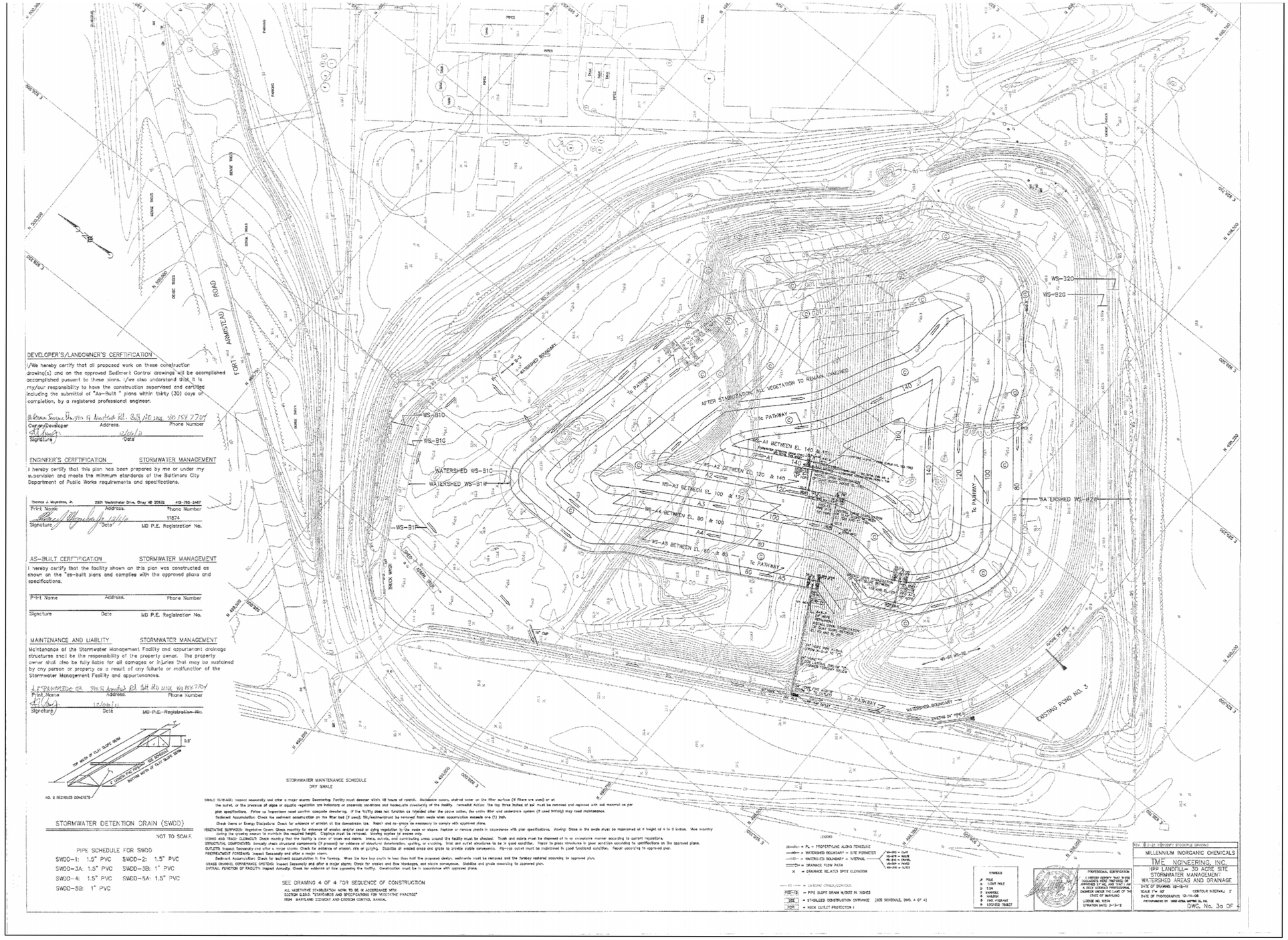
VICINITY TOPOGRAPHIC MAP

PROJECT: 200476	DATE: DECEMBER 2021	SCALE: 1" = 2000'	DESIGN BY: BRS	REVIEW BY: KBD	FIGURE: 4



1. Base map obtained from *HPP Landfill - 30 Acre Site Stormwater Management Watershed Areas and Drainage* by TME Engineering, Inc. dated 02/18/2011

0 40 80
Approximate Scale
1 inch = 80 feet

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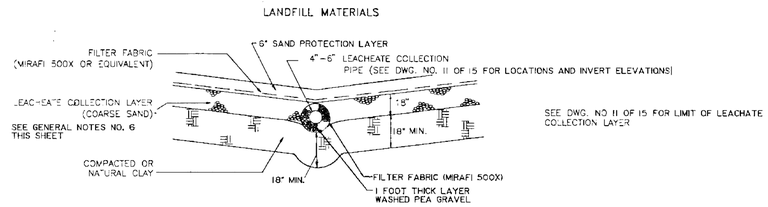
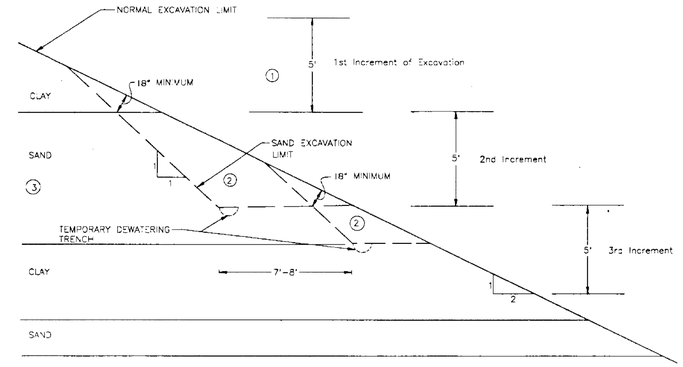
STORMWATER MANAGEMENT DESIGN PLAN

PROJECT: 200476	DATE: December 2021	SCALE: 1" = 80'	DESIGN BY: BRS	REVIEW BY: KBD	FIGURE: 5



DETAIL 'A' - TYPICAL LINER/LEACHEATE COLLECTION LAYERS

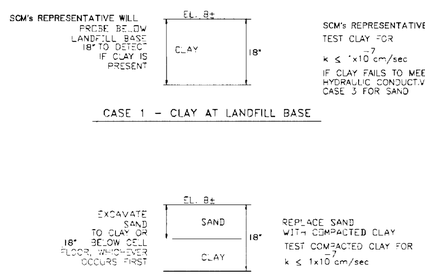


NOTES FOR DETAIL C: NORMAL SLOPE CONSTRUCTION

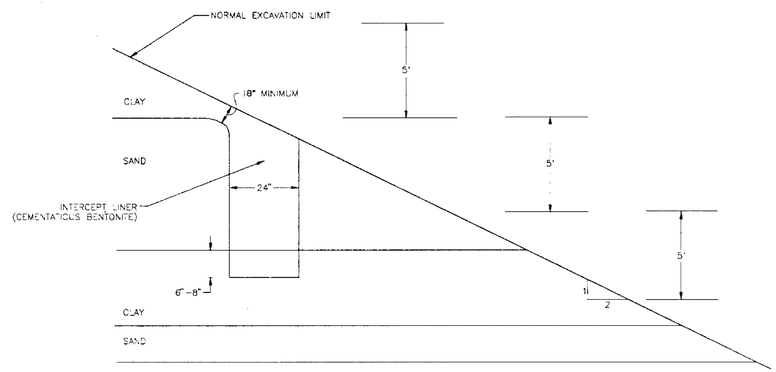
1. EXCAVATION TO PROCEED IN FIVE (5) FOOT INCREMENTS. SLOPES WILL BE OBSERVED AND TESTED BY SCM'S REPRESENTATIVE AT EACH INCREMENT TO DEMONSTRATE CONTINUOUS CLAY, AT LEAST 18 INCHES THICK.
2. EXCAVATE SAND LAYERS/LENSES TO THE APPROXIMATE LIMITS SHOWN. REPLACE SAND WITH COMPACTED CLAY MEETING CLAY LINER SPECIFICATIONS.
3. TEMPORARY DEWATERING TRENCHES LEADING TO TEMPORARY SUMP AND PUMP WILL REMAIN IN OPERATION WHILE COMPACTED CLAY IS BEING PLACED.
4. IF INITIAL EXCAVATION ON SLOPE UNCOVERS A ZONE OF SEEPAGE OF A NOTICEABLE VOLUME ON A POTENTIALLY PERSISTENT BASIS, THE CONTRACTOR WILL BE DIRECTED TO IMPLEMENT DETAIL 'D'.

DETAIL C: NORMAL SLOPE CONSTRUCTION

NOT TO SCALE



DETAIL B: LANDFILL BASE PREPARATION



DETAIL D: CONTINGENT SLOPE CONSTRUCTION

NOT TO SCALE

NOTES FOR DETAIL D: CONTINGENT SLOPE CONSTRUCTION

1. EXCAVATE INTERCEPT LINER TWO (2) FEET IN WIDTH THROUGH SAND LAYER TO CLAY.
2. BACKFILL INTERCEPT LINER WITH CEMENTATIOUS BENTONITE WITH HYDRAULIC CONDUCTIVITY OF 1x10⁻⁶ cm/sec OR LESS. CEMENTATIOUS BENTONITES TO CONSIST OF SLURRY MIXTURE AT A RATIO OF 2 LBS. OF PORTLAND CEMENT TYPE II WITH 1 LB. OF BENTONITE WITH 1 GAL. OF WATER.
3. ALLOW CEMENTATIOUS BENTONITE TO CURE UNTIL INITIAL SET.
4. CONTINUE NEXT INCREMENT OF GENERAL EXCAVATION.

GENERAL NOTES

1. EXCAVATION FOR LANDFILL AT FINAL CUT SLOPES WILL PROCEED IN VERTICAL INCREMENTS NOT EXCEEDING FIVE (5) FEET.
2. FINAL CUT SLOPES WILL BE OBSERVED AND TESTED AT EACH INCREMENT BY A QUALIFIED FIELD TECHNICIAN UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL GEOTECHNICAL ENGINEER TO DEMONSTRATE CONTINUOUS CLAY, AT LEAST 18 INCHES THICK MEASURED PERPENDICULAR TO THE SLOPE FACE AS SHOWN IN DETAILS "C" AND "D" ON THIS DRAWING SHEET.
3. CLAY TESTS WILL CONSIST OF IN-PLACE DENSITY TESTS, MOISTURE CONTENT, LIQUID AND PLASTIC LIMITS (LL AND PL), MECHANICAL ANALYSES TO DETERMINE THE PERCENT PASSING U.S. NO. 200 SIEVE AND FIELD OR LABORATORY HYDRAULIC CONDUCTIVITY TESTS PERFORMED ON FIELD SAMPLES OF COMPACTED CLAY.
4. ACCEPTABLE TESTS WILL BE AS FOLLOWS.
   A. IN-PLACE DENSITY: γ ≥ 95% ASTM D-698
   B. PLASTIC INDEX, (PI = LL-PL) > 7
   C. PERCENT PASSING NO. 200 SIEVE > 40%
   D. HYDRAULIC CONDUCTIVITY, k ≤ 1x10⁻⁷ cm/sec
5. FREQUENCY OF TESTS* (BY OTHERS)
   A. IN-PLACE DENSITY: 10 PER ACRE
   B. PLASTIC INDEX: 10 PER ACRE
   C. PERCENT PASSING NO. 200 SIEVE: 10 PER ACRE
   D. HYDRAULIC CONDUCTIVITY: 1 OR MORE PER ACRE
   E. CLAY THICKNESS PROBES: 10 PER ACRE
   * IN-PLACE DENSITY, P.I., AND PERCENTAGE PASSING NO. 200 SIEVE WILL BE USED AS INDICATOR TESTS AFTER CORRELATION WITH HYDRAULIC CONDUCTIVITY TESTS.
6. SAND USED FOR LEACHATE COLLECTION LAYER SHALL BE CLEAN SILICA SAND WITH LESS THAN 5% OF THE MATERIAL PASSING THE U.S. NO. 200 SIEVE AND WITH A HYDRAULIC CONDUCTIVITY, k ≥ 5x10⁻⁴ cm/sec.
7. IN CIRCUMSTANCE WHERE SEEPAGE OF NOTICEABLE VOLUME ON A POTENTIALLY PERSISTANCE BASIS IS ENCOUNTERED IN SURFICIAL SAND, AN EXCAVATION TWO (2) FEET IN WIDTH, WILL BE CONSTRUCTED ON THE STORMWATER CONVEYANCE CHANNEL SIDE OF THE ACCESS ROAD. THE EXCAVATION WILL PROCEED VERTICALLY TO CLAY AND BE FILLED WITH SAND MEETING THE REQUIREMENTS OF THE LEACHATE COLLECTION LAYER SAND IN GENERAL NOTE NO.6 ABOVE. THE EXCAVATION WILL BE GRADED TO DRAIN BY GRAVITY TO A DOWN-GRADIENT LOCATION IN THE STORMWATER CONVEYANCE CHANNEL AND/OR A STORMWATER MANAGEMENT BASIN.

NOTE
SEE INDEX
ON 7533

Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists
FORMERLY
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4909 Cordell Avenue FAX: 301-907-9101
Bethesda, MD 20814 Tel: 301-907-9100

BALTIMORE COUNTY, MARYLAND

BCO-EMCALS, INC.
3901 FORT ARMISTEAD ROAD, BALTIMORE, MARYLAND 21226 (301) 355-3600

HPP LANDFILL
CLAY LINER DETAILS, SECTIONS & SPECIFICATIONS

DESIGNED TM	DATE 2-14-92	JOB NO: 65358-28	
DRAWN AR	DATE 2-14-92		
APPD TM	SCALE	DRAWING NO:	
APPD	AS SHOWN	10 OF 15	

7543

1. Base plans obtained from Oosterbaan Associates P.C. Phase II Permit Application

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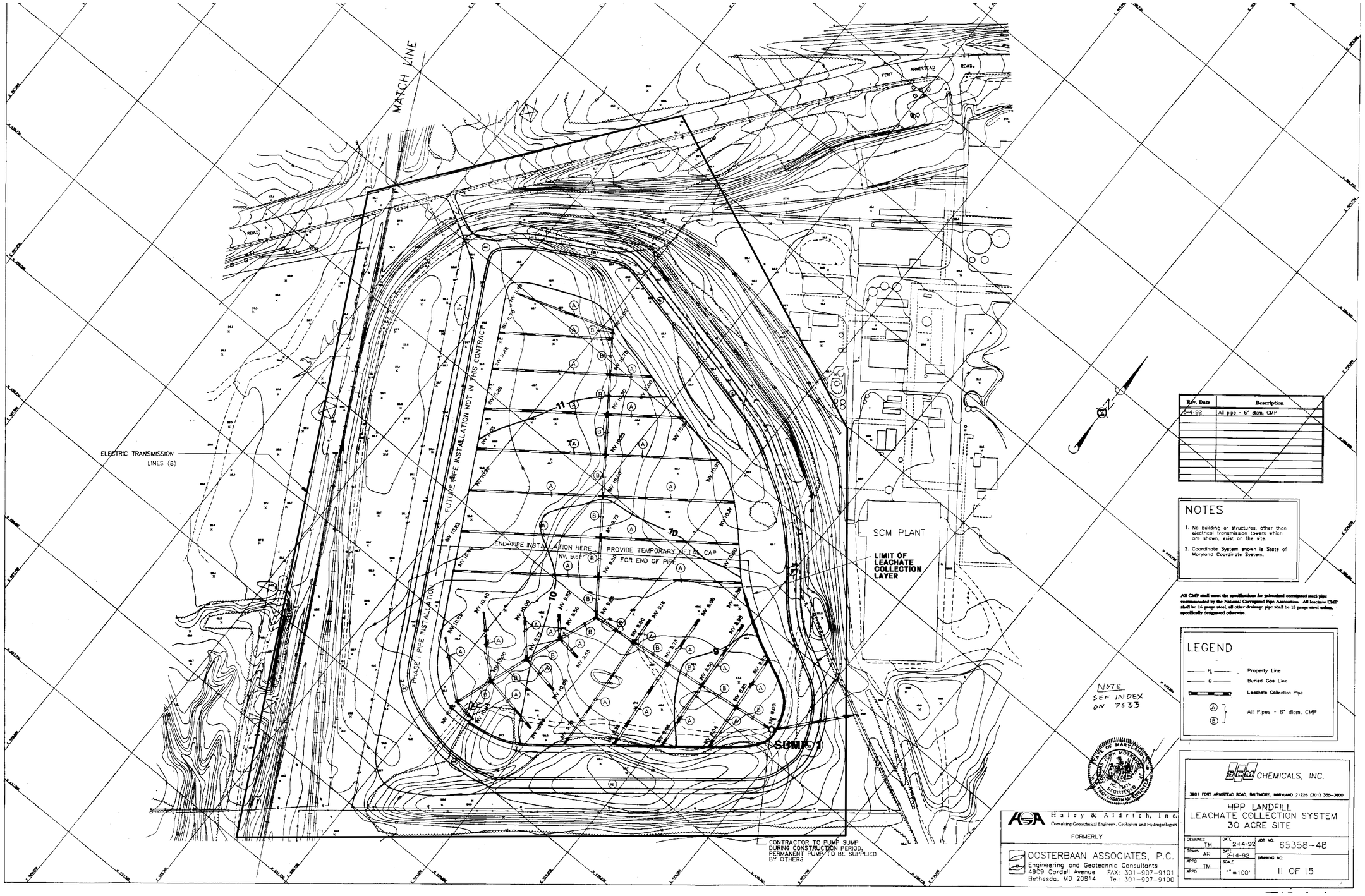
HAWKINS POINT LANDFILL

BALTIMORE COUNTY, MARYLAND

LINER SCHEMATIC

PROJECT: 200476	DATE: December 2021	NOT TO SCALE	DESIGN BY: BRS	REVIEW BY: KBD	FIGURE: 6



1. Base map obtained from Oosterbaan Associates P.C. Phase II Permit Application

0 50 100
Approximate Scale
1 inch = 100 feet

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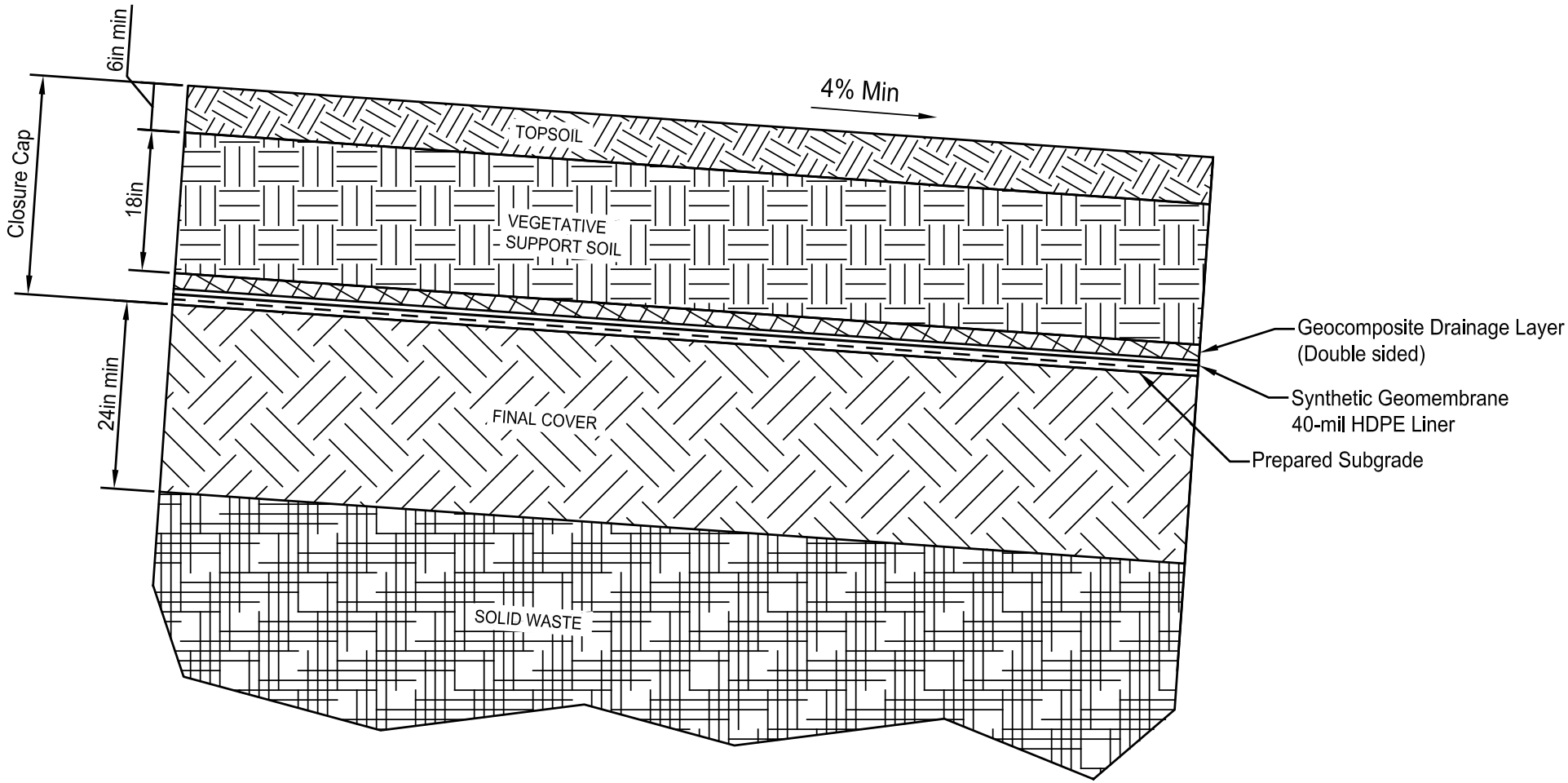
HAWKINS POINT LANDFILL

BALTIMORE COUNTY, MARYLAND

LEACHATE SYSTEM LAYOUT

PROJECT: 200476	DATE: December 2021	NOT TO SCALE	DESIGN BY: BRS	REVIEW BY: KBD	FIGURE: 7



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HAWKINS POINT LANDFILL
BALTIMORE COUNTY, MARYLAND

CLOSURE CAP DESIGN

PROJECT: 200476	DATE: JULY 2022		DESIGN BY: NMT	REVIEW BY: KBD	FIGURE: 8

APPENDIX A
O&M Plan

OPERATION AND MAINTENANCE MANUAL

FOR THE

MILLENNIUM INORGANIC CHEMICALS, INC.
HPP LANDFILL
BALTIMORE, MARYLAND

NOVEMBER, 2004
Revised January, 2009

Prepared For:

MILLENNIUM INORGANIC CHEMICALS, INC.
3901 FORT ARMISTEAD ROAD
BALTIMORE, MARYLAND 21226

Prepared By:

TM ENGINEERING, INC.
2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832

Revised By:

Geosyntec Consultants
10220 Old Columbia Road, Suite A
Columbia, Maryland 21046

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MAINTENANCE ITEMS (Previously submitted for 30-acre parcel and not yet available for 65-acre parcel)

Administration Trailer
Storage Shed
Security Fence
Safety Showers
Electrical
Portable Pumps for Stormwater/Contact Water Evacuation
Leachate Collection/Conveyance System
Recorders for Leachate Flow
Flow Meter for Leachate
Float Controls for Leachate Pumps

INTRODUCTION

This Operations Manual applies to an industrial solid waste landfill known as HPP Landfill situated adjacent to the Millennium Inorganic Chemicals, Inc. (MIC) Hawkins Point Plant (HPP) in Baltimore, Maryland. The facility is permitted to receive non-hazardous waste from MIC and other industrial facilities, and is operated under a refuse disposal permit, 2005-WIF-0527, issued by the State of Maryland Department of the Environment (MDE) to MIC. This Operations Manual documents facility items and procedures to follow to operate the landfill in accordance with MIC standard operating procedures and safety requirements, the requirements of MDE and City of Baltimore permits, and the intent of the engineering design of the landfill. This manual should be used in conjunction with other MDE approved guidance documents kept at the HPP Landfill office trailer and maintained by the MIC Environmental Department.

The format of this manual is an outline of the facility components and operational items associated with these components to provide a quick reference.

BACKGROUND AND HISTORY OF HPP LANDFILL

General

MIC also operated another nearby landfill known as the Millennium Inorganic Chemicals Quarantine Road Landfill. When this landfill was reaching capacity in the late 1980's, planning for a replacement landfill commenced and the site adjacent to the HPP was selected and purchased. As shown in Figure 1, the site is comprised of two parcels, a thirty (30) acre portion contiguous with the western boundary of the MIC Hawkins Point Plant and a 65-acre portion on the west side of the 30-acre parcel separated by the CSX railroad. The design of the HPP Landfill for both parcels was approved and permitted by MDE in 1991. The 30-acre parcel was constructed first. Construction of the Phase I (southern half of the 30-acre parcel) commenced in 1991 and was completed in September, 1992. Construction of Phase II (northern half of the 30-acre parcel) was completed in 1999. Development of the 65-acre site is expected to start in 2009.

Description of the 30-Acre Parcel

Phase I consisted of excavating existing predominantly clay soil from average elevation 45 MSL down to elevation 9 MSL at which level the natural clay floor was compacted, tested and approved as a liner to prevent leachate from migrating outside the limits of the landfill. Also, a leachate collection system (comprised of a network of 6-inch perforated HDPE coated metal pipe surrounded by 18-inches of washed pea gravel, all encased in filter fabric) was installed in accordance with the design drawings approved by MDE. The purpose of the pipe network is to prevent leachate from accumulating above the landfill floor more than one foot in height. The pipe network drains to a primary concrete sump box at the southeast corner of the landfill floor. The sump box is accessed by a concrete riser tunnel, built contiguous with the sump box, which

extends up the side slope of the landfill to the level of the perimeter access road at approximate elevation 50 MSL. Since construction, the sump box and riser tunnel have been buried by waste so that only the equipment room at the top of the tunnel is visible.

During Phase I construction, a storm water basin designed for the collection of runoff, waste sediment, and contact water (water which has come into contact with, but not percolated through, the waste) from the 30-acre parcel was constructed in the middle of the site (on the north side of Phase I) between Phase I and eventual Phase II. The floor of the basin consisted of clay, but the clay was not prepared and approved as landfill floor because the basin was used to evacuate storm water from the excavation from the very onset of construction. The lower basin was drained by dedicated fixed pumps which conveyed flow to a drainage channel located along the perimeter access road along the western border of the site. The channel, in turn, drains to a primary sediment/storm water management basin constructed at the southwest corner of the property which discharges off-site at a point regulated by NPDES Permit No.01DP2954.

Additional facilities installed at the 30-acre parcel during Phase I construction included a perimeter road around the landfill footprint, a drainage swale around the outside of the perimeter road, seepage control of water from localized surficial sand layers, lighting, electrical power, water supply, sanitary waste water system, office trailer, paved entrance drive and parking at the office trailer, storage shed, truck wash basin, safety stations, and a groundwater monitoring well system. Two entrances to the landfill were provided with the main entrance from Fort Armistead Road near the CSX railroad crossing and a rear entrance from the HPP facility near the southeast corner of the property.

As waste placement in Phase I of the HPP Landfill approached interim capacity, planning and detailed design for Phase II in the northern half of the 30-acre parcel was begun in 1998. Construction of Phase II was completed in 1999 and, similar to Phase I, consisted of excavation of existing soil from average elevation 50 MSL down to elevation 9 MSL at which level the natural clay floor was compacted, tested, and approved as a liner. The pipe network for the leachate collection system was extended into the Phase II area and connected to Phase I by a trunkline pipe which crosses the storm water basin.

As part of the normal sequence and progression of the landfill operation, the depressed area between Phases I and II which contained the stormwater collection basin needed to be prepared to receive waste solids as the fill level in Phase II approached the level of the perimeter road. This work was completed in 2007 and consisted of installing a compacted clay liner and the final portion of the leachate collection system. As part of the work, a supplemental leachate collection sump, riser pipes and pump house were constructed on the east slope of the landfill limit.

Description of the 65-Acre Parcel

As shown in Figure 1, the 65-acre parcel will be divided into five cells. Cell 1 will be excavated down to approximate elevation 8 MSL at which level, the natural clay floor will be compacted and tested to ensure that it complies with the requirements for a prepared subbase. A minimum of 60-mil HDPE geomembrane and a leachate collection system will be installed over the prepared subbase to collect the leachate generated and to prevent migration of pollutants outside the limits of the landfill. Construction of subsequent cells will be scheduled such that there is available airspace at all times during the operation of the 65-acre parcel. In general, as waste placement continues and the surface of the landfill in any given cell reaches levels higher than the surrounding ground surface, the next cell will be constructed in accordance with the permit design and drawings approved by the MDE.

The subgrade floors will be graded at a minimum 2% slope to facilitate leachate conveyance to the collection pipes. The leachate collection system comprising a network of 8-inch perforated HDPE pipes surrounded by coarse aggregate, all encased in filter fabric, will be installed in accordance with the Cell 1 construction drawings submitted to MDE for its review and approval. The leachate collection system will be designed to maintain the leachate depth over the bottom liner to no more than one foot. The pipe network will drain to a leachate sump. The leachate sump will be accessed by an HDPE riser pipe, which extends up the side slope of the landfill to the level of the perimeter access road at approximate elevation 50 MSL.

During Cell 1 construction, a storm water sump will be constructed to collect runoff from the Cell 1 footprint. Water accumulated in this sump will be drained by a portable pump and conveyed to a temporary sediment/storm water management basin that will be constructed at the northwest corner of the 65-acre parcel. Water from the basin will be discharged off-site through a NPDES regulated point.

Additional facilities that will be constructed at the 65-acre parcel will include a perimeter road around the landfill footprint, a drainage swale around the outside of the perimeter road, seepage control (as needed), electrical power, water supply, sanitary waste water system, office trailer, paved entrance drive and parking at the office trailer, and truck wash basin.

It is expected that excess soils from the excavation of the 65-acre parcel will be disposed of at the 30-acre facility, for example to fill the valley created between Phases I and II.

WASTE STREAM

The HPP landfill was initially approved to receive non-hazardous waste generated at MIC only consisting of solids from the neutralization of acid, the sulfate process, the chloride process and miscellaneous solids from plant maintenance projects such as bricks and soil. A few years later, the sulfate process was discontinued and waste solids are no longer generated from this process. In May 2007, the landfill was authorized to receive gypsum waste solids from a source other than HPP, consistent with a permit amendment allowing acceptance of third-party non-hazardous waste subject to MDE approval. Any additional third-party waste will be compatible with the design of the landfill, and will be received via truck and/or railway. One such source of waste is coal combustion byproducts (CCB) generated from Baltimore area fossil fuel power plants. The 65-acre parcel will be exclusively dedicated for the CCB waste and will be developed with an upgraded bottom liner system. No other waste will be disposed at this parcel.

The total waste quantity has been approximately 50,000 tons per year from the ongoing MIC operations at the 30-acre parcel. It is estimated that 400,000 tons per year of CCBs will be placed at the 65-acre parcel.

LANDFILL OPERATIONS

I. PERMITS

A. Landfill Permit : Maryland Department of the Environment - Permit No. 2005-WIF-0527.
B. Erosion and Sediment Control Permit: City of Baltimore - Permit No.66P - 5/19/92 and No.324 - April 23, 1999.
C. Storm Water Discharge Off-Site: NPDES Permit issued by Maryland Department of the Environment - Permit No. 01DP2954.

The corresponding permits will need to be modified to incorporate disposal of CCB at the site.

II. LANDFILL DRAWINGS

The following drawings present the construction and improvements performed at the 30-acre parcel:

A. Approved Permit Design Drawings - Submitted as Phase III of the MDE permit process (not to be confused with Phase I, II, III etc. of the landfill construction sequence).
B. Construction Drawings - Phase I.
C. As-Built Drawings - Phase I.
D. Construction Drawings - Phase II.
E. As-Built Drawings - Phase II.
F. Leachate Pipe Repair - Design and As-Built Drawings.
G. Improvements to Leachate Conveyance System - Design and As-Built Drawings.

The Cell 1 Construction Drawings (65-acre parcel) present the proposed construction and improvements to be performed at the 65-acre parcel including the cell layout for the entire facility.

III. PERMITTED WASTE

In accordance with the current permit, the following waste streams are permitted to be disposed at the site:

30-Acre Parcel:

1. Specific waste streams:
   - Primary gypsum-sulfate process;
   - Secondary gypsum-sulfate process;
   - Lagoon dredging/chloride process solids-chloride process;
   - Neutralized batch mud-sulfate process;
   - Miscellaneous calciner brick, excavated soil from plant construction and maintenance, etc.;
   - Dewatered dredged solids and solids from the chloride process settling basins;
   - Refractory brick and brick solids from the calciner kilns, batch attack vessels, and chlorinators;
   - Settled solids from the settling basins on the landfill;
   - Batch attack mud;
   - Batch attack vessels refractory brick and brick solids;
   - Chlorinator refractory brick and brick solids;
   - Excavated soil, clay and rubble;
   - Residual magnesium hydroxide, sodium hydroxide;
   - Unreacted ore residues from the batch attack process;
   - Chlorinator bed material;
   - Lime grit; Process refractory;
   - Titanium dioxide/sand mill wastes;
   - Sandblast material;
   - Silica wastes; and
   - Road asphalt from the plant.

2. Third party waste that is compatible to the waste stream generated by the Hawkins Point Plant may be acceptable at this landfill. This waste stream shall be non-hazardous industrial waste or waste excluded from RCRA Subtitle C regulation under 40 CFR 261.4(b)(7).

3. Additional waste materials can be accepted upon written approved by MDE.

The above described wastes (except approved third party CCB waste) will be confined exclusively to the 30-acre parcel.

65-Acre Parcel:

Pursuant to modification of the permit the site will receive CCB from the Brandon Shores, H.A. Wagner and C.P. Crane fossil fuel power plants for disposal at the 65-acre parcel. No other waste will be disposed at this parcel.

IV. PLACEMENT OF WASTE AND NATURAL SOIL STOCKPILE

A. Conveyance of Waste and Natural Soil Fill

Millennium waste is brought to the landfill (30-acre parcel) from the waste solids processing area (formerly the PWAN-SWAN area) in the northeast portion of HPP by dump trucks under contract. The distance is approximately 3/4 of a mile. For this material, two routes are available, one using Fort Armistead Road to the main gate of the landfill and one through the plant to the rear gate.

Trucks delivering waste from off-site sources use the Fort Armistead Road main gate. Since the landfill is surrounded by an internal perimeter access road (approximately 4,000 feet in length), sufficient capacity is available on-site to stage incoming trucks in a queue, if necessary, without any impact on Fort Armistead Road. When used, Fort Armistead Road must be kept clear of waste materials. The landfill is situated immediately adjacent to I-695 with easy access for trucks which travel entirely within the industrial zone of south/southwest Baltimore.

Natural soil (fill) excavated during the development of the 65-acre parcel may be trucked to the 30-acre parcel over Fort Armistead Road utilizing the main access gate of each parcel. The natural soil fill may be placed on the 30-acre parcel in a stockpile consisting exclusively of this fill.

CCBs will be brought to the landfill from the Brandon Shores, H. A. Wagner, and C.P. Crane Power Plants by dump trucks (or other suitable means of transportation) under contract. A separate main gate for the 65-acre parcel will also be located on Fort Armistead Road. Trucks carrying CCBs will enter the site using this main gate. The perimeter access road on the 65-acre parcel will provide sufficient on-site staging area for the incoming trucks without any impact on Fort Armistead Road.

B. Records of Waste Quantity and Type

Every truck carrying waste is documented upon entry into the landfill with respect to waste type and weight. Waste type is visually verified upon entry. All documentation is maintained in the administration trailer at each landfill parcel. Trucks carrying CCBs will not be allowed on the 30-acre parcel. Trucks carrying non-CCBs waste will not be allowed on the 65-acre parcel.

C. Method of Placement

30-Acre Parcel:

1. Preference 1: Access fill area by dump trucks, spread waste/fill with bulldozer in thin layers, no more than one foot in thickness, to allow drying and compaction. Work, turn, and agitate waste material/fill to promote drying during favorable weather conditions. Compact waste/fill by repeated tracking with bulldozer and rolling to attain density sufficient to ensure stability of embankment slopes. The specification for compaction will be determined by future testing and slope stability analyses. As soon as possible, grade the waste with a uniform surface which will not pocket water but shed runoff away from the waste which is in the process of drying.
2. Preference 2: Place waste/fill from elevated position, such as perimeter road, in random thicknesses. Method only available until landfill surface reaches level of perimeter road. Drying not possible within mass of waste and wet material. If deposited near the perimeter of landfill, wet material may interfere with eventual slope construction and use of Preference 2 will be restricted to non-critical areas which will not influence slope stability.
3. Preference 3: Provide dump truck access to the interior of landfill over elevated all-weather access roads constructed of dry waste. Spread waste/fill in thin lifts by bulldozer, proceed as in 1 above.
4. Preference 4: In conjunction with 3, if waste/fill is too wet to be accessed by bulldozer, distribute and work waste with long reach backhoe perched on timber or steel mats to promote drying until bulldozer can gain access. Then proceed as in 1 above.

65-Acre Parcel:

1. Preference 1: Access fill area by dump trucks, spread CCB with bulldozer in 2-ft thick layers (maximum), to allow proper compaction. Compact CCB by repeated tracking with vibratory smooth drum compactor. Grade CCB to promote runoff away from the active area.
2. Preference 2: Provide dump truck access to the interior of landfill over elevated all-weather access roads constructed of stabilized CCB. Spread CCB in 2-ft. thick max. lifts by bulldozer and proceed as in 1 above.

D. Sequence of Placement

1. Place waste in areas of priority to accomplish the following general goals:

30-Acre Parcel:

a. Raise landfill surface in Phase II area to level above perimeter road.
b. Fill-in depression between Phase I and Phase II which contained the former lower storm water management pond with material excavated from the 65-acre parcel to level above perimeter road.

c. Focus on filling specific areas to attain final slope configuration and vegetative stabilization around perimeter of landfill.
d. In conjunction with c, fill and grade berms/swales and install storm water management system at milestone elevations in accordance with permit design and drawings approved by MDE/City of Baltimore.

65-Acre Parcel:

a. Place CCB in Cell 1 area to level above perimeter road.
b. Focus on filling specific areas to attain final slope configuration and vegetative stabilization around perimeter of landfill.
c. In conjunction with b, fill and grade berms/swales and install storm water management/E&S system at milestone elevations in accordance with permit design and drawings approved by MDE/City of Baltimore.

2. Develop specific Sequence of Placement Work Plan to identify areas of priority (Both Parcels):
   a. Identify accessible areas on landfill site plan using experience of truck haul road stability and moisture content of in-place waste.
   b. Identify key areas which need filling to accomplish general (long term) goals and near future access requirements for times of inclement weather (such as elevated internal haul roads).
   c. Focus drying efforts on key areas when materials are too wet to be accessed by trucks.

E. Moisture Control

1. If necessary, dry waste materials to target moisture contents by spreading in thin (1 foot or less) layers and agitating, turning, and discing. Monitor progress of drying by taking samples and running in-situ moisture content tests. All moisture contents are on a dry weight basis.
2. Materials which cannot be dried due to weather or time constraints should be stockpiled for future drying or deposited in the center of the landfill where finished slopes will not be affected in accordance with the Sequence of Placement Work Plan.

F. Landfill Grading

30-Acre Parcel:

1. Reference drawings and notes approved by City of Baltimore for Erosion and Sediment Control (Grading) Permits for Phase I and Phase II construction.
2. Slope configuration: Maintain 2 horizontal to 1 vertical slope configuration for final grading. This slope configuration has been verified as stable for Millennium waste solids from the chloride process in a Study of Slope Stability, Millennium HPP Landfill, November 5, 2001 and January 31, 2006, provided that material contains no more than approximately 50 to 80 percent moisture on a dry weight basis. A separate study of slope

stability will be performed for the clay fill from the 65-acre parcel and adjustments made, if necessary, to maintain stable slopes.

3. Berms: place berm at every 20-foot vertical increment of height. Provide correct slope of berm to drain toward proper downslope pipe. Establish and maintain drainage divides on berms in accordance with the approved drawings so that design watersheds are created in the field.
4. Defined watersheds and sub-drainage areas: Provide final grading of landfill surface and berm construction consistent with defined drainage areas on approved design drawings.

65-Acre Parcel:

1. Grade landfill in accordance with drawings and notes approved by City of Baltimore for Erosion and Sediment Control (Grading) Permits .
2. Slope configuration: Maintain 2 horizontal to 1 vertical slope configuration (or flatter) for final grading.
3. Berms: Install berms at elevations noted in the permit design and drawings approved by the MDE/City of Baltimore to direct the stormwater runoff to proposed discharge structure(s). Establish and maintain drainage divides on the berms in accordance with the approved design and drawings.
4. Defined watersheds and sub-drainage areas: Provide final grading of landfill surface and berm construction consistent with defined drainage areas in the approved design and drawings.

G. Vegetative Stabilization

1. Inactive areas: Seed and mulch within 7 days in accordance with the approved sediment and erosion control drawings, Drawing No. SE-8.

2. Completed slopes: As perimeter slopes attain design berm level, grade to final configuration as soon as possible and seed and mulch within 7 days.

3. Waterways - swales: Periodically inspect for siltation, erosion, and loss of vegetation. Remove sediment and re-stabilize with seed and mulch or sod, as necessary.

V. LEACHATE COLLECTION AND CONVEYANCE

A. Pipe Network

1. Description: The pipe network in the 30-acre parcel consists of 6-inch HDPE coated perforated metal pipes surrounded by 18 inches of washed pea gravel wrapped in needle punched geo-fabric designed for drainage applications. See as-built drawings for locations and invert elevations.
   The pipe network in the 65-acre parcel will consist of HDPE pipes surrounded by gravel wrapped in needle-punched geotextile designed for drainage applications in accordance with permit design and drawings approved by the MDE.
2. Purpose: Collect leachate to prevent more than a one foot depth of leachate over the floor of the landfill and convey leachate to the sumps.

3. Objective: Keep pipe system functional through the life of the landfill.
4. Maintenance: Monitor performance of system by measuring outflow. (It should be understood that as the landfill ages and the waste materials consolidates, the leachate generated will be reduced). If system appears clogged, pipes shall be cleaned as necessary using specialty contractor.

B. Leachate Collection Basin and Tunnel

1. Description: The primary sump for the 30-acre parcel consists of a 10-foot high by 7.5-foot wide by 21.5-foot long (exterior dimensions) reinforced concrete basin at the southeast corner of the floor of landfill with top of floor slab at El. 6.0 MSL. A 6-inch leachate pipe from landfill enters with invert El. 8.0 MSL. The tunnel consists of an 8.5-foot high by 7.5-foot wide by 109-foot long reinforced concrete structure rising from the sump up to the leachate equipment house.

   A supplemental reinforced concrete leachate collection sump box with a square footprint measuring 5 feet by 5 feet and 5 feet high, riser pipes and pump house were installed midway along the east slope of the waste limit during the preparation of the depressed area between Phase I and Phase II to receive waste solids. The as-built details of the supplemental leachate collection sump, pipes and pump house are being finalized and will be provided as part of this manual upon completion.

   The 65-acre parcel will be provided with a sump and a HDPE riser in accordance with the permit design and drawings approved by the MDE. The sump will be constructed using HDPE pipe surrounded by gravel wrapped in needle-punched geotextile designed for drainage applications. The 24-inch diameter riser(s) will extend from the base of the sump floor to about 3 feet above the perimeter berm.
2. Purpose: The basin/sump provides reservoir/storage capacity for periodic evacuation by pumps. The tunnel/riser is an enclosure for leachate conveyance pipes and pumps and provides access to the collection basin/sump for maintenance.
3. Objective: Maintain structure to receive leachate inflow for life of leachate collection system.
4. Maintenance: Periodically check basin/sump and tunnel/riser for cracks, spalling, deterioration, extraneous seepage inflow, and cracks which widen with time. Check basin/sump for sediment build-up and remove sediment when level approaches leachate pipe invert level. All work in leachate basin/sump and tunnel/riser requires a confined space entry permit from the MIC Safety, Health and Environment (SHE) Department.

C. Leachate Equipment House (30-acre parcel only)

1. Description: 11.5-feet high by 10-feet wide by 16-feet long masonry block building with concrete slab roof and concrete slab floor with turn-down perimeter footing. Located at top of leachate tunnel. Top of slab floor el. 54.0 MSL. Standard metal entry door on north wall and removable metal plate over small access door at base of east wall to facilitate removal of pump and discharge hose.

2. Purpose: Provide secure entrance to tunnel and weather protection for instrumentation, pump controls, other equipment and personnel working in the tunnel.
3. Objective: Keep structure functional for life of leachate collection system.
4. Maintenance: Periodically check building for cracks, spalling and other deterioration. Repair as necessary.

D. Leachate Pump System

1. Description: The primary pump system at the 30-acre parcel consists of 2 Grundfos 16S07-8 15 gpm pumps (or equal), 109+ feet of 1-1/4-inch flexible hose for each pump, twin 18-inch HDPE pipes for guideways to raise and lower pumps, two winches to raise and lower pumps, quick disconnects for hoses, power disconnect for pumps, floats on the wall of the basin to automatically monitor leachate height and progressively switch pumps on and off, pump power supply and control electrical boxes, automatic high water alarm, an in-line Brooks flow meter, piping and valves. A new, near identical supplemental pump system has been installed midway along the east slope of the landfill limit and the as-built details will be provided upon completion.

   A pump system will also be provided at the 65-acre parcel in accordance with the permit design and drawings approved by the MDE. The pumps will be controlled by a leachate control panel with a weather-proof encasement located close to the 24-in. riser pipes.
2. Purpose: Pump leachate collected in basin before reaching critical alarm level, convey leachate to storage tank, monitor water levels in basin/sump, measure flow rates and quantities.
3. Objective: Keep all pumps and monitoring system functional for life of leachate collection system. At the 30-acre parcel, both pumps are required for redundancy and to supply sufficient capacity during periods of peak flow. At the 65-acre parcel, an additional pump will be required on site for redundancy and to supply sufficient capacity during periods of peak flow.
4. Maintenance: Periodically check pumps for operation to ensure efficient flow. High water levels trigger an alarm in the office trailer and a flashing light at the landfill entrance resulting in notification to MDE. Periodically clean sediment from pumps, hoses and piping and/or replace as necessary. This work is typically required on the average of every 4 to 6 weeks. Check floats for correct operation as the leads can become entangled and the bulbs can leak resulting in faulty pump control. Perform repairs as necessary. Check that HDPE pipes remain securely fastened to the tunnel walls and exercise the winches, power cutoffs and pipe valves to ensure correct operation. Periodically dismantle the in-line flow meters and check for clogging with sediment. Clean or replace meters as necessary. Power cutoff during maintenance needs to follow standard lock out procedures established for the site.

E. Leachate Equipment House Safety Appurtenances (30-acre parcel only)

1. Description: The Leachate equipment house contains a rescue basket, fire extinguisher a fresh air recirculation fan for the tunnel/riser and lighting for the house and tunnel/riser.

2. Purpose: Provide safe working conditions in leachate equipment house and tunnel during operation and maintenance.
3. Objective: Keep safety appurtenances functional for life of the leachate collection system.
4. Maintenance: Periodically check each item for correct operation and repair or replace as necessary.

F. Leachate Storage Tank/Pond

1. Description: The leachate solids settling tank at the 30-acre parcel consists of an 8.5-foot high by 10-foot wide by 16-foot long (outside dimensions) precast concrete tank with three internal chambers installed below grade in the landfill on the north side of the leachate equipment house. The tank serves to aerate the leachate flow to cause and retain precipitates from oxidation and to capture suspended solids in the leachate discharge stream. Each chamber can be accessed by one of three manholes in the top slab of the tank.

   A separate leachate storage tank (or a leachate storage pond) will be constructed at the 65-acre parcel to handle the leachate from the CCB. The leachate storage tank/pond will be constructed in accordance with the permit design and drawings approved by the MDE. Once collected, the leachate will be recirculated onto the working face of the landfill or transported for treatment to an approved wastewater treatment facility.
2. Purpose: To capture solids at a central location before entering the leachate pipe conveyance. .
3. Objective: Maintain integrity of structure for the life of the leachate collection system and maintain sufficient sediment-free volume so settling of solids can occur.
4. Maintenance: Periodically check sediment level and remove sediment when level reaches three (3) feet from the top of tank/pond. This work may be performed by specialty contractor.

G. Leachate Conveyance Pipe

1. Description: The 30-acre facility consists of 1000 feet of 6-inch HDPE pipe draining (by gravity) the Leachate Sedimentation Tank to the treatment box (the 002 mixing box between the Upper Settling Basin and Lower Settling Basin at the plant). Clean-outs are located every 100 feet (approx.). The as-built drawings indicate the location and invert elevations of the pipe.

   A leachate conveyance pipe from the sumps to the leachate collection tank will be constructed at the 65-acre parcel. The leachate conveyance pipe will be constructed in accordance with the permit design and drawings approved by the MDE.
2. Purpose: At the 30-acre parcel, to Convey leachate flow from the landfill to the 002 treatment box. Maintain leachate flow from landfill to 002 treatment box for the life of the leachate collection system. At the 65-acre parcel, to convey leachate from the landfill to leachate tank for the life of the leachate collection system.
4. Maintenance: Periodically check for sediment build-up in pipe. Clean the pipe as necessary and check for breaks in pipe during cleaning . Repair or replace the broken pipe as necessary. Replace any missing clean-out caps.

H. Internal Seepage Control (30-acre parcel only)

1. Description: Due to the relatively low permeability of the waste, the placement of waste in approximate horizontal layers, and the high moisture content, not all leachate will migrate vertically to the leachate collection system. It is possible that some leachate may daylight at seams or zones in the waste surface, especially as the landfill rises higher. Ordinarily, this occurrence will not be an issue because the amount of moisture reaching the surface of the waste will be so small that evaporation will cause the seepage to go unnoticed. In the event that such seepage becomes pronounced and persistent, it should be captured and conveyed to the leachate collection system.
2. Purpose: Control extraneous water in landfill.
3. Objective: Prevent off-site release of potential leachate.
4. Maintenance : To be determined based on location and quantity of seepage. Potential solutions may be to capture, store, and pump from the site of the seepage to the leachate collection system or pipe to existing leachate collection system.

VI. GROUNDWATER CONTROL

A. Groundwater Seepage Collection Pipes

1. Description: During the construction of Phase I of the 30-acre parcel, seepage was encountered on the south and east faces of the cut slope which required collection and conveyance to the permitted surface discharge point. Approximately 400 feet of 6-inch perforated pipe was installed in trenches excavated at approximate elevation 35 MSL along the south and east slopes and directed to the vicinity of the leachate collection tunnel. The trenches were backfilled with washed pea gravel and capped with compacted clay to isolate the system from waste materials. The pipes pass under the perimeter road and outer drainage swale to a collection well at the southeast corner of the site. The well pumps the perched groundwater to the outer swale which drains to the primary storm water management pond, Pond No. 3. During the construction of Phase II, perched groundwater seepage was encountered along the east slope and approximately 150 feet of perforated pipe was installed to extend the pipe placed during Phase I.
   If perched groundwater seepage is encountered during development of the 65-acre parcel, a similar collection and conveyance system will be installed on an as needed basis. As noted earlier, a 60-mil HDPE geomembrane will be used in the bottom liner system in the 65-acre parcel. As a result, if a groundwater seepage collection and conveyance system is installed, it will need to be maintained only until sufficient waste is placed over the bottom liner system to prevent uplift of the liner system.
2. Purpose: Collect and convey perched groundwater in a controlled manner.
3. Objective: Prevent uncontrolled seepage from causing slope instability and prevent mingling of perched groundwater with waste materials.
4. Maintenance : Periodically check pump and controls for correct operation. Repair or replace as necessary.

VII. STORMWATER MANAGEMENT

A. Collection of Stormwater
   1. Description: Currently, runoff on the 30-acre parcel drains from two sources, one from areas which have been vegetatively stabilized and the other from areas of open waste solids. The former drains directly to the primary sediment collection/stormwater management basin in the southwest corner of the parcel. The latter drains to the depression between Phase I and Phase II landfill areas and is collected and evacuated by portable pumps to the leachate solids settling tank. Contact water, if any, at the 65-acre parcel will be handled by temporary sumps. Also, at the 65-acre parcel, the amount of contact water will be minimized by keeping the maximum active area at about 6 acres at any time. For this 65-acre parcel, a contact water basin will be constructed in accordance with the permit design and drawings approved by the MDE/City of Baltimore. The stormwater from each parcel will not be allowed to comingle.
   2. Purpose: The depression and contact water pond act as collection points for storm water runoff while landfill floor is below the surrounding grade (perimeter access road) for eventual evacuation by pumping to a leachate collection/conveyance system.
   3. Objective: Comply with permit requirement of allowing no standing water on landfill surface.
   4. Maintenance : Observe water levels in depressed area and pump when necessary. Observe sediment levels in pond and excavate when levels approach five feet above pond floor or sooner if sediment interferes with draining of pond by the storm water pumps. Place excavated sediment on the active face of the respective parcel. Observe erosion patterns around pond and control drainage by temporary berms and silt fence to minimize erosion and sediment inflow.

B. Contact Water Basin Pump
   1. Description: Storm water collected in the contact water basin or temporary sumps is removed by a portable pump which conveys flow to the leachate collection system on the 30-acre parcel and the Contact Water Basin on the 65-acre parcel. Stand-by pumps are available.
   2. Purpose: Pump contact storm water to leachate collection system on 30-acre parcel and discharge to a permitted outfall after treatment. Pump contact stormwater to Contact Water Basin on 65 acre site and haul to an approved treatment facility.
   3. Objective: Comply with permit requirement that no standing water be allowed on landfill surface.
   4. Maintenance : Periodically check pumps for correct operation and connection leaks. Repair and/or replace as necessary. Check discharge hoses for leaks and deterioration. Check discharge end of hose for erosion and/or sediment build-up in the drainage channel. Repair and/or replace hoses and remove sediment as necessary.

C. Primary Storm Water-Sediment Basin

1. Description: The primary storm water management and sediment basin in the 30-acre parcel is referenced as Basin No. 3 on the design drawings and is located in the southwest corner of the site. The pond covers approximately 0.75 acres with a floor elevation of 36.5 MSL and a crest at elevation 44.0 MSL. The basin is drained by a primary spillway consisting of a 36-inch corrugated steel riser pipe and a barrel of two 15-inch corrugated steel pipes. A Reno mattress (interlaced stone filled wire baskets) lined emergency spillway with a crest elevation of 41.7 MSL is provided alongside the outfall of the barrel pipes. The outfall area is protected from erosion by rip-rap. A similar storm water management and sediment basin will be constructed at the 65-acre parcel. The storm water management and sediment basin will be constructed in accordance with the permit design and drawings approved by the MDE/City of Baltimore.
2. Purpose: Capture sediment to minimize off-site migration of solid particles and provide controlled discharge of storm water.
3. Objective: Meet the requirements of the Baltimore City erosion and sediment control permit and the NPDES industrial discharge permit.
4. Maintenance: Monitor sediment level in the basin and clean the basin when level reaches the clean out elevation (El. 39.2 MSL for the 30-acre parcel) noted in the erosion and sediment control permit. Place excavated sediment in landfill. Periodically inspect earthen embankment, shoreline of pond, and downstream discharge channel for erosion, loss of ground or other instability. Observe pipes for clogging or deterioration. Check rip-rap and Reno mattress for loss of stone or deterioration of wire baskets. Repair or replace these items as necessary.

D. Perimeter Swales

1. Description: The landfill on the 30-acre parcel is designed to have two grassed perimeter drainage swales, one on the inside edge of the perimeter road and one on the outside edge of road, both to convey storm water to the Primary Storm Water Sediment Basin located at the southwest corner of the site. The inner swale will not be completed until the landfill surface is uniformly above the level of the perimeter road and only the outer swale is currently in place. The outer swale cross-section consists of a flat bottom, five feet in width, a depth of three feet and 2 horizontal to 1 vertical side slopes. The slope of the swale is dictated by the site topography and ranges from about 7 percent along the north and south borders of the site to 1 percent along the east and west borders. Perimeter drainage swales will also be constructed at the 65-acre parcel in accordance with the permit design and drawings approved by the MDE/City of Baltimore.
2. Purpose: Convey non-contact storm water runoff from the landfill site with non-erosive velocities for the 10-year design storm to a permitted discharge point.
3. Objective: Comply with stormwater provision of the Baltimore City erosion and sediment control permit and the NPDES industrial discharge permit.
4. Maintenance: Monitor sediment level in swale and remove when 50 percent of the capacity is blocked. Check for erosion of the swale floor and side slopes and repair by filling and revegetating. Check for burrowing animals, eradicate and backfill holes.

E. Truck Wash
1. Description: A concrete lined basin, approximately 50 feet in length by 30 feet in width and 5 feet in depth is situated on the north side of the landfill parking lot near the landfill office trailer on the 30-acre parcel. The basin is in line with, and part of, the perimeter swale. The basin is connected to the perimeter swale along the west property line by an 18-inch pipe under the main entrance road to the landfill. City water supply is available at the basin. A similar truck wash will be constructed at the 65-acre parcel. The truck wash will be constructed in accordance with the permit design and drawings approved by the MDE/City of Baltimore.
2. Purpose: To wash waste material and mud from trucks and vehicles before leaving the landfill and to capture the washed sediment in the perimeter swale system for conveyance and settling in the Primary Storm Water Basin.
3. Objective: Prevent tracking of waste material and mud onto public roads as required by erosion and sediment control permit.
4. Maintenance : Monitor sediment level in basin and excavate when basin capacity reaches 50 percent. Opening to drain pipe and pipe at the west end of the basin must be kept clear of sediment. Check walls and floor of basin for cracking and deterioration and repair as necessary. Check water valves, hydrants and hoses for operation and leaks . Repair or replace as necessary.

VIII. UTILITIES

A. Water and Sewer
1. Description: Water from the Baltimore City Department of Public Works is provided to the administration area of the site by a four inch service line which enters the site from Fort Armistead Road along the landfill entrance driveway. The water is available to the office trailer and the truck wash. No public sewer is available at the landfill. Domestic wastewater from the trailer is collected in a tank on the west side of the trailer, which is periodically pumped and disposed of at a permitted facility.
   Water to the 65-acre parcel will be provided by a permanent line from the Baltimore City Department of Public Works. Because no public sewer is available at the landfill, domestic wastewater from the trailer will be collected in a tank and periodically disposed of at a permitted facility.
2. Purpose: Domestic water supply for trailer and vehicle cleansing at truck wash.
3. Objective: Sanitation and compliance with permit requirements to keep public roads free of mud and waste.
4. Maintenance : Keep pipes and plumbing in good repair. Periodically have the waste water tank pumped by a specialty contractor (currently A-1 Septic).

B. Electrical Power and Lighting
1. Description: Electrical power to the 30-acre parcel is provided by overhead wires originating in the plant which enter near the rear entrance gate. An electrical box is situated approximately 80 feet from the gate. Three phase 480 volt service is available.

Power is distributed around the perimeter road on poles spaced every 200 feet and lines for the primary leachate collection pump house, the supplemental pump house, the groundwater collection well, the office trailer and maintenance shed are serviced by underground wire from boxes on the poles. Overhead street lamps are placed on each pole.

The 65-acre parcel will employ a similar network throughout the site, but will be served by a separate system. Details of the electrical system will be provided after design is completed.

2. Purpose: Power supply for landfill.
3. Objective: Operation of pumps, office trailer, street lamps and maintenance shed.
4. Maintenance : Maintain boxes, lines, breakers, poles lamps and receptacles in good working order.

IX. GROUNDWATER MONITORING WELLS

A series of eleven groundwater monitoring wells were installed during the Phase I construction of the 30-acre parcel. Five of the wells are located around the perimeter of the 30 acre site and the remainder are situated on the 65 acre site. Groundwater levels in the wells are measured monthly and samples are obtained and analyzed for a specified set of parameters semi-annually. The details of the well locations, construction details, sampling and analytical testing requirements are contained in a Groundwater Monitoring Plan, dated April 27, 1992 and revised October 2001, which is maintained by the Environmental Division. The existing groundwater monitoring wells network will continue to be used during development of the 65-acre parcel. No additional wells are anticipated.

The monitoring well locations are sufficiently removed from landfill operations that the chance for disturbance or damage is remote. However, the wells must be protected so an uninterrupted sequence of data can be obtained during the life of the landfill and during the post closure period. The wells should be maintained by periodic painting of the outer casing, lubrication of the casing cap hinges and replacement of cap locks.

X. DAY TO DAY OPERATION

A. Personnel and Equipment

1. Adequate personnel and equipment shall be maintained at all times to insure proper operation and prompt attention to correct problems associated with the construction and maintenance of the landfill.
2. Standing agreements with alternate labor and equipment vendors will be maintained as contingency for both operating components.
3. The landfill shall be under the supervision of a responsible individual who is present at the landfill at all times during the active operation of the site.
4. Separate personnel will be utilized to operate each parcel.

B. Landfill Documents

1. Operation and administrative duties at the landfill on a daily basis, consistent with permit requirements, have been defined in a memorandum, HPP Landfill Procedure, No. 8602, from the MIC Environmental Department dated November 14, 2004. This document should be periodically reviewed and updated to reflect any changes in permit requirements and current practice.
2. A set of approved plans and specifications and the operation and maintenance manual shall be at each parcel of the landfill at all times during the landfill operation.

C. Operating Hours

1. Normal hours of the 30-acre parcel (set by MIC) are 7:00 am to 4:00 pm, Monday through Friday.
2. Normal hours of the 65-acre parcel (set by the Operator) are 7:00 am to 4:30 pm, Monday through Friday.
3. The landfill permit does not limit the time of operation for the landfill. However, the hours of operation must be posted at the gate.
4. The landfill will be closed on the noted holidays - New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas.

D. Safety and Security

1. The access to the landfill shall be controlled at all times. Access to the site shall be only through the gates that shall be secured when the facility is in operation and adequately closed when the landfill is not operating. No scavenging shall be allowed at the landfill.
2. All employees shall be provided with appropriate safety equipment. First-aid supplies shall be stocked in the on-site office trailer and other operating vehicles, as appropriate.

E. Posted Signs

1. Signs will be posted at the landfill entrance indicating the name of the facility, management, hours and days of operation, and the waste stream accepted at the site.
2. Signs to control the traffic, traffic direction, speed limit, and indicating other safety requirements will be posted along the access and haul roads.

F. Litter Control

1. Scattering of litter at the landfill shall be controlled by implementing appropriate operating procedures and other equipment/barriers, as needed.
2. Scattered litter shall be collected and disposed on the working face of the landfill.

G. Dust Control

30-Acre Parcel:

Dust at the 30-acre parcel has not been an issue in the 18 years of operation due to the following factors:

1. The waste materials received at the landfill are typically wet and the apparent cohesion provided by capillary action results in a stable mass with respect to wind.

2. Upon drying the waste material forms an outer crust which resists individual particles from becoming airborne in the face of wind.
3. When the crust is disturbed by vehicular traffic, especially on unpaved haul roads, the road surfaces are sprayed with water from a dedicated water truck which has adequately suppressed airborne dust. This practice will be continued.

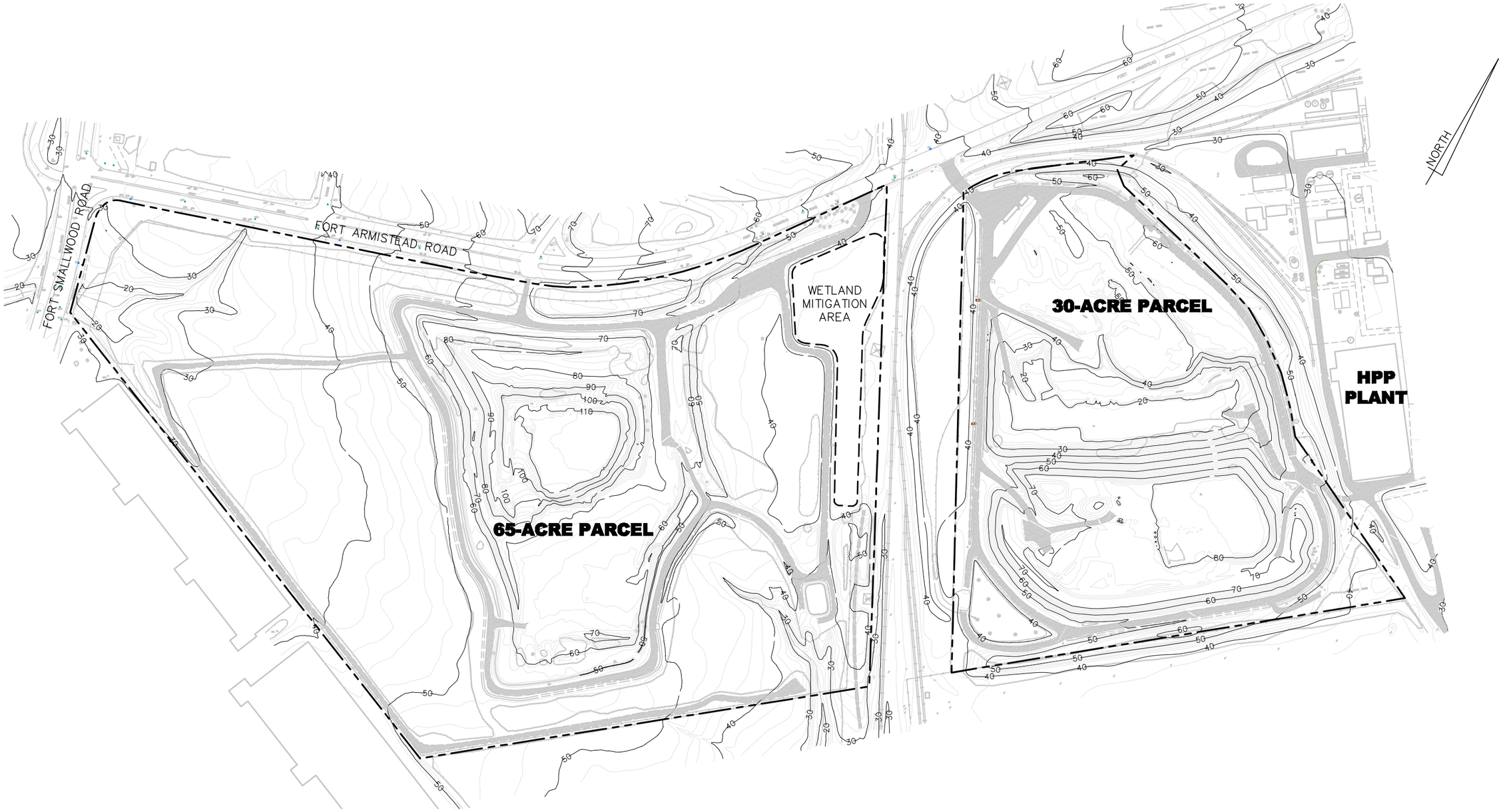
65-Acre Parcel:

1. Dust at the 65-acre parcel, shall be minimized by watering the access road, haul road, and other landfill areas, as needed. The site shall have continuous access to water for use, as needed, to minimize dust at the site.
2. In the event that watering of the active fill area is not available, the preferred alternate procedure for dust control would include the application of a four to six inch layer of bottom ash from Brandon Shores, H. A. Wagner or C.P. Crane power plants.
3. In the event that both water and bottom ash are not available to control fugitive dusting, the next alternate would include the application of mulch material to the dusting area, minus the seed content, via a hydroseeder.
4. If controls established in Items 1-3 above are unavailable, the final option would include excavation and placement of temporary soil cover (primarily retrieved from the landfill property) in an approximate four inch thickness.
5. No performance standards for dust control monitoring currently exist in the MDE landfill regulations. The site operator, at a minimum, will abide by the regulated standards.

H. Environmental Monitoring

The storm water, groundwater and leachate at the site will be monitored, collected, and/or tested in accordance with the approved site management plans for each. Both the waste on the 30-acre and the CCB on the 65-acre parcels will not produce gas and therefore gas will not be monitored.

P:\Argentina\ME0635-Millennium LF\Drawings\2009 Permit Mod\0635-002.dwg, b, 1/21/2009 11:38:51 AM, geosyntec consultants, inc (jpc)



LEGEND

- PROPERTY BOUNDARY
- 100 EXISTING GRADE CONTOUR (FEET, MSL)
- EXISTING BUILDING
- EXISTING ROAD
- EXISTING TREELINE
- CHAIN LINK FENCE
- CSX TRACK

NOTES:

1. EXISTING CONDITIONS FROM AUTOCAD FILES (HP_A08.DWG, HP_B08S1.DWG, AND HP_B08S2.DWG) BASED ON FLYOVER DATED 14 DECEMBER 2008 BY WINGS AERIAL MAPPING CO., INC.
2. THE 30-ACRE PARCEL IS CURRENTLY BEING USED BY MILLENNIUM FOR DISPOSAL OF INDUSTRIAL WASTE.
3. THE 65-ACRE PARCEL WAS INITIALLY USED BY MILLENNIUM FOR SOIL STOCKPILE.

300 150 0 300

SCALE: 1" = 300'

EXISTING SITE CONDITIONS

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	JANUARY 2009
PROJECT NO.	ME0635
DOCUMENT NO.	
FILE NO.	0635-002
FIGURE NO.	1

APPENDIX B
NPDES Permit

Maryland
Department of
the Environment

Larry Hogan
Governor

Boyd Rutherford
Lieutenant Governor

Ben Grumbles
Secretary

AUG 16 2016

CERTIFIED MAIL

Frank Martin, SH&E Superintendent
Cristal USA, Inc.
3901 Fort Armistead Road
Baltimore, MD 21226

Re: State Discharge Permit No. 15DP0164, NPDES Permit MD0001261

Dear Mr. Martin,

Enclosed is the issued discharge permit referenced above with the effective date indicated on the cover page. The permittee is responsible for complying with all permit conditions. You are therefore advised to read the permit carefully and become thoroughly familiar with the requirements.

The U.S. Environmental Protection Agency (EPA) recently promulgated a final rule to modernize Clean Water Act reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system (see 40 CFR 127.16). This final rule requires all National Pollution Discharge Elimination System (NPDES) regulated entities to electronically report Discharge Monitoring Reports (DMRs) **starting on December 21, 2016**.

The Maryland Department of the Environment offers NetDMR for filing your required NPDES DMRs. NetDMR is a freely available Web based tool that allows NPDES permittees to electronically sign and submit their DMRs to EPA via a secure internet connection. NetDMR is designed to improve data quality, reduce reporting liabilities, save paper, and provide cost savings. It allows participants to discontinue mailing in hard copy forms under 40 CFR 122.41 and 403.12. For more information go to the EPA website (www.epa.gov/netdmr) or call the MDE Water Management Administration, Compliance Program, at 410-537-3510 and ask to speak to a NetDMR coordinator.

As indicated in Condition II.A.2 of your permit, before you can submit official DMRs using NetDMR you must attend a training Webinar and successfully set-up and submit test monitoring results electronically. If you do not attend the required training in a timely manner, you will be at risk of violating the new U.S. EPA NPDES electronic reporting rule. While paper DMR reporting is being phased out, those who are unable to use the NetDMR system before December 21, 2016 may continue to submit paper copies. Enclosed are (EPA No. 3320-1) Discharge Monitoring Report (DMR) forms, which, unless you are already using NetDMR, must be completed for each reporting period and submitted to the Department in accordance with the requirements of the permit. Copies of these forms can also be downloaded from the Department's website (bit.ly/MDE-New-DMR). Using the latest version of Adobe Acrobat Reader, the DMR form can be completed from a keyboard and printed for mailing to the Department.

Confidentially provided to Daniel Flamholz Unknown 71.244.145.139 03/21/2018 7:46 AM

Enclosed is also a copy of the Federal Register, Part 136 - "Guidelines Establishing Test Procedures for Analysis of Pollutants". Unless otherwise specified, these guidelines are to be used for the analyses required by this permit. The most current version of 40 C.F.R. Part 136 can be found online at EPA's website (www.epa.gov/epahome/cfr40.htm). Finally you'll find enclosed a brochure for NetDMRs.

Please direct all future correspondence regarding permit compliance to the following address:

Attention: Discharge Monitoring Reports
Water Management Administration – Compliance Program
Maryland Department of the Environment
1800 Washington Boulevard, Suite 425
Baltimore, Maryland 21230-1708

If you have any other questions, please do not hesitate to call Jonathan Rice, Industrial and General Permits Division, at 410-537-3323.

Sincerely,

Virginia F. Kearney for

Lynn Buhl, Director
Water Management Administration

LB:aw

Enclosures (4)

Cc: William Lee (delivered electronically)
WMA-Compliance, Central Division Chief

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STATE DISCHARGE PERMIT NUMBER	15-DP-0164	NPDES PERMIT NUMBER	MD0001261
EFFECTIVE DATE	October 1, 2016	EXPIRATION DATE	September 30, 2021
MODIFICATION DATE:	N/A	REAPPLICATION DATE	September 30, 2020

Pursuant to the provisions of Title 9 of the Environment Article, Annotated Code of Maryland, and regulations promulgated thereunder, and the provisions of the Clean Water Act, 33 U.S.C. § 1251 et seq. and implementing regulations 40 CFR Parts 122, 123, 124, and 125, the Department of the Environment, hereinafter referred to as the "Department," hereby authorizes

Cristal USA, Inc.
3901 Fort Armistead Road
Baltimore, Maryland 21226

TO DISCHARGE FROM

a groundwater remediation project located on the site of a former chemical manufacturer

LOCATED AT

3901 Fort Armistead Road, Baltimore, Maryland 21226

VIA OUTFALLS

001 and 002 as identified and described below and from facility areas identified in the Stormwater Pollution Prevention Plan (SWPPP) referenced herein

TO

the Patapsco River, a designated Use II water body under COMAR 26.08.02.02 protected for water contact recreation, fishing, aquatic life, wildlife, and support of shellfish harvesting in accordance with the following special and general conditions and maps made a part hereof.

Confidentially provided to Daniel Flamholz Unknown 71.244.145.139 03/21/2018 7:46 AM

I. SPECIAL CONDITIONS

A.1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the effective period of this permit, the permittee is authorized to discharge groundwater and stormwater via Outfall 001 (Maryland Coordinates 1442.2 E and 561.8 N).

Discharges authorized from this outfall shall be limited and monitored by the permittee at one of two 27-inch concrete channels, immediately before the point where the effluent enters underground pipes leading to the final discharge point, as specified in the table below.

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				FREQUENCY OF ANALYSIS	SAMPLE TYPE	NOTES
	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS	MINIMUM	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS			
Flow	Report	Report	MGD					Continuous	Measured	
Total Suspended Solids (TSS)						100	mg/L	1/Week	24-Hour Composite	
pH				6.0		9.0	s.u.	1/Week	Grab	
Total Nickel					8.2	74	µg/L	1/Week	24-Hour Composite	(1)
Total Iron					3.5	7.0	mg/L	1/Week	24-Hour Composite	(1)
Total Arsenic					Report	Report	mg/L	1/Week	24-Hour Composite	
Total Lead					Report	Report	mg/L	1/Week	24-Hour Composite	

There shall be no discharge of floating solids or persistent foam in other than trace amounts. Persistent foam is foam that does not dissipate within one half-hour from the point of discharge.

(1) Limits for iron and nickel shall become effective thirty (30) months after the issue date of this permit. See Special Condition W. Monitoring without limits is required until the effective date.

Confidentially provided to Daniel Flannholz Unknown 71.244.145.139 03/21/2018 7:46 AM

I. SPECIAL CONDITIONS

A.2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the effective period of this permit the permittee is authorized to discharge neutralized groundwater, treated sanitary wastewater (from Monitoring Point 201), landfill leachate, hydrostatic test water from groundwater remediation system, and stormwater runoff via Outfall 002 (Maryland Coordinates 1442.2 E and 561.8 N).

Discharges authorized from this outfall shall be limited and monitored by the permittee at the sample tap of the diffuser discharge line, as specified in the table below:

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				FREQUENCY OF ANALYSIS	SAMPLE TYPE	NOTES
	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS	MINIMUM	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS			
Flow	Report	Report	MGD					Continuous	Measured	
Total Suspended Solids (TSS)					30	60	mg/L	1/Week	24-Hour Composite	
pH				6.0		9.0	s.u.	Continuous	Continuous	(1)
Total Nitrogen					Report	Report	mg/L	1/Quarter	Calculated	(3)
Total Nitrogen (Annual Load)		Report	lbs/ year					1/Year	Calculated	(4)
Ammonia (as N)					Report	Report	mg/L	1/Quarter	24-Hour Composite	(2) (3)
Nitrate-Nitrite (as N)					Report	Report	mg/L	1/Quarter	24-Hour Composite	(2) (3)
Organic Nitrogen					Report	Report	mg/L	1/Quarter	24-Hour Composite	(2) (3)

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I. SPECIAL CONDITIONS

A.2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS – Continued from previous page

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				FREQUENCY OF ANALYSIS	SAMPLE TYPE	NOTES
	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS	MINIMUM	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS			
Total Phosphorus					Report	Report	mg/L	1/Quarter	24-Hour Composite	(3)
Total Phosphorus (Annual Load)		Report	lbs/ year					1/Year	Calculated	(4)

There shall be no discharge of floating solids or persistent foam in other than trace amounts. Persistent foam is foam that does not dissipate within one half-hour from the point of discharge.

The permittee shall alert the Department when its annual average flow exceeds 400,000 gallons per day (gpd). The permittee shall evaluate any change in annual average flow each year and, in accordance with General Condition B.1, notify the Department by May 1 if the annual average flow is expected to exceed this level. This requirement is not a flow limit.

(1) pH excursions are permitted to the extent allowed by Special Condition R.

(2) All three types of nitrogen must be tested from the same sample.

(3) After 1 year (4 values collected) the Department may reduce or eliminate the monitoring requirement upon written request by the permittee.

(4) The annual load (in lbs/year) for total nitrogen and total phosphorus shall be calculated by the following equation:

Average of four quarterly samples (mg/L) x Annual Average Flow (MGD) x 8.34 (conversion factor)

"Annual Average Flow" shall be determined by dividing the total flow for the calendar year by the number of days in that year.

Confidentially provided to Daniel Flamholz Unknown 717.244.1451139 03/21/2018 7:46 AM

I. SPECIAL CONDITIONS

A.2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the effective period of this permit the permittee is authorized to discharge treated sanitary wastewater from Monitoring Point 201 via Outfall 002 (Maryland Coordinates 1442.2 E and 561.8 N).

Discharges authorized from this outfall shall be limited and monitored by the permittee at the discharge pipe from the sewage treatment facility located in the NE area of the upper pond, as specified in the table below:

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				FREQUENCY OF ANALYSIS	SAMPLE TYPE	NOTES
	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS	MINIMUM	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS			
Flow	Report	Report	MGD					1/Week	Measured	
Biochemical Oxygen Demand (as BOD_5)					30	45	mg/L	1/Week	24-Hour Composite	
Total Suspended Solids (TSS)					30	45	mg/L	1/Week	24-Hour Composite	
Enterrococci					35		MPN/ 100 mL	1/Week	Grab	(1)
Total Nitrogen					Report	Report	mg/L	1/Quarter	Calculated	
Total Nitrogen (Annual Load)		Report	lbs/ year					1/Year	Calculated	(3)
Ammonia (as N)					Report	Report	mg/L	1/Quarter	24-Hour Composite	(2)
Nitrate-Nitrite (as N)					Report	Report	mg/L	1/Quarter	24-Hour Composite	(2)

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I. SPECIAL CONDITIONS

A.2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS – Continued from previous page

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				FREQUENCY OF ANALYSIS	SAMPLE TYPE	NOTES
	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS	MINIMUM	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS			
Organic Nitrogen					Report	Report	mg/L	1/Quarter	24-Hour Composite	(2)
Total Phosphorus					Report	Report	mg/L	1/Quarter	24-Hour Composite	
Total Phosphorus (Annual Load)		Report	lbs/ year					1/Year	Calculated	(3)

There shall be no discharge of floating solids or persistent foam in other than trace amounts. Persistent foam is foam that does not dissipate within one half-hour from the point of discharge.

The permittee shall alert the Department when its annual average flow exceeds 9,000 gallons per day (gpd). The permittee shall evaluate any change in annual average flow each year and, in accordance with General Condition B.1, notify the Department by May 1 if the annual average flow is expected to exceed this level. This requirement is not a flow limit.

(1) The monthly average shall be the geometric mean of the samples taken during a given month.

(2) All three types of nitrogen must be tested from the same sample.

(3) The annual load (in lbs/year) for total nitrogen and total phosphorus shall be calculated by the following equation:

Average of four quarterly samples (mg/L) x Annual Average Flow (MGD) x 8.34 (conversion factor)

"Annual Average Flow" shall be determined by dividing the total flow for the calendar year by the number of days in that year.

Confidentially provided to Daniel Flamhoff Unknown 71.244.145.139 03/31/2018 7:46 AM

I. SPECIAL CONDITIONS

B. DEFINITIONS

1. "Biochemical Oxygen Demand (BOD)" means the amount of oxygen consumed in a standard BOD_5 test without the use of a nitrification inhibitor at 20 degree centigrade on an unfiltered sample.

2. "Bypass" means the intentional diversion of wastes from any portion of a treatment facility.

3. "Clean Water Act" means the Federal Water Pollution Control Act Amendments of 1972," 33 U.S.C. 1251, 86 Stat. 866, as amended by the "Clean Water Act of 1977," 91 Stat. 1566, and all other amendments to that act.

4. "CFR" means the Code of Federal Regulations.

5. "COMAR" means the Code of Maryland Regulations.

6. "Composite sample" means a combination of individual samples obtained at a minimum of hourly intervals over a specified time period, where the volume of each individual sample (or the sampling interval when using constant volume samples) is proportional to discharge flow rates recorded during the sampling period.

7. "Daily determination of concentration" means an analysis performed on an effluent sample representative of flow for that calendar day, with concentration expressed in mg/l or other appropriate unit of measurement.

8. "Daily maximum effluent concentration" means the highest reading of any daily determination of concentration.

9. "Department" means the Maryland Department of the Environment (MDE).

10. "Estimated flow" means a calculated volume or discharge rate based on a technical evaluation of sources contributing to the discharge, including but not limited to pump capabilities, water meters and batch discharge volumes.

11. "Grab sample" means an individual sample collected over a period of time not exceeding 15 minutes. Grab samples collected for pH and total residual chlorine must be analyzed within 15 minutes from the time of collection.

12. "Measured flow" means any method of liquid volume measurement for which accuracy has been previously demonstrated in engineering practice, or for which a relationship to absolute volume has been obtained.

13. "Minimum value" means the lowest value measured during a 24-hour period.

14. "Monthly, quarterly, semi-annual, or annual average effluent concentration" means the value calculated by computing the arithmetic mean of all daily determinations of concentration made during any respective calendar-month, 3-month, 6-month, or 12-month period.

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15. "National Pollutant Discharge Elimination System (NPDES)" means the national system for issuing permits established under §402 of the Clean Water Act (1972).

16. "NetDMR" means a nationally-available electronic reporting tool, initially designed by states and later adapted for national use by EPA, which can be used by NPDES-regulated facilities to submit discharge monitoring reports (DMRs) electronically to EPA through a secure Internet application over the National Environmental Information Exchange Network (NEIEN). EPA can then share this information with authorized states, tribes, and territories.

17. "Nitrogen, Total" means the sum of organic nitrogen, ammonia nitrogen, nitrate, and nitrite, where all values are reported as nitrogen (as N).

18. "Outfall" means the location where effluent is discharged into receiving waters.

19. "Permittee" means an individual or organization holding a discharge permit issued by the Department.

20. "Sampling Point" means the effluent sampling location in the outfall line(s) downstream from the last addition point or as otherwise specified.

21. "Total Maximum Daily Load (TMDL)" means the maximum amount of a pollutant a waterbody can receive and still meet water quality standards, calculated using the formula (TMDL = ΣWLA + ΣLA + MOS) where WLA is the sum of wasteload allocations (point sources), LA is the sum of load allocations (nonpoint sources and background), and MOS is the margin of safety.

22. "Total Suspended Solids (TSS)" means the residue from an effluent sample retained on a filter measured in accordance with ASTM D5907-09, *Standard Methods for Filterable and Nonfilterable Matter in Water* (2009), or other approved methods.

23. "Upset" means an exceptional incident where unintentional and temporary noncompliance with technology-based permit effluent limitations occurs due to factors beyond the reasonable control of the permittee. An upset does not include noncompliance caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

C. TOXIC POLLUTANT REPORTING

The permittee shall notify the Department as soon as it is known or suspected that any toxic pollutants which are not specifically limited by this permit have been discharged in excess of notification levels specified in 40 CFR Part 122.42(a).

D. REMOVED SUBSTANCES

1. Within 30 days after notification the permittee shall provide the Department with information on the disposal of any removed substances defined above under General Condition B.7. Requested information may include, but may not be limited to:

   a. A map clearly showing all areas used for disposal of removed substances.

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b. A description of physical, chemical, and biological characteristics of any removed substances as well as their quantities and methods of disposal.

c. The identity of any contractor or subcontractor, their mailing address and information specified in a and b above, if disposal is handled by persons other than the permittee.

2. The Department's notification may also require the permittee to provide the above information prior to use of new or additional disposal areas, contractors, or subcontractors.

E. ANALYTICAL LABORATORY

Within 30 days after the effective date of this permit, the permittee shall submit to the Department the name and address of the analytical laboratory (including the permittee's own laboratory) used to perform the monitoring required by this permit.

If the laboratory changes during the effective period of this permit, the permittee shall notify the Department of the new laboratory within 30 days after the change.

F. WASTEWATER OPERATOR CERTIFICATION

As of the effective date of this permit, the permittee's facility shall be operated by an industrial wastewater operator duly certified by the Maryland Board of Waterworks and Waste Systems Operators. Certification shall be for operation of a Class 6 industrial wastewater works, unless the Board determines a different classification is appropriate. At no time during the effective period of this permit shall any treatment facility be operated for more than two months without a certified operator.

G. FLOW MONITORING

In lieu of providing measured flow (defined under Special Conditions in section B above) at Outfalls 001 and 002, the permittee may estimate flows and submit the following information when submitting the initial discharge monitoring report and/or upon any change in methodology:

1. A description of the methodology used to estimate flow at each outfall where flow measurement equipment is not present.

2. Documentation appropriate to the methodology utilized which provides information to support the validity of the reported flow estimate. If actual measurements or observations are made, a description of typical sampling times, locations, and persons performing the measurements/observations must also be provided.

3. A description of factors (e.g., batch discharges, intermittent operation, etc.) which caused flow at the outfall to fluctuate significantly from the previously provided estimate.

H. FLOW BASIS FOR ANNUAL DISCHARGE PERMIT FEE

The Department will calculate permit fees annually and invoice the permittee based on annual average discharge flow. Permit fees are payable to the Department in advance by July 1 of each fiscal year (July 1 through June 30).

The permittee shall provide notification of any flow revision to the Department's Industrial and General Permits Division by May 1 of each year to update the annual average discharge flow value used for the

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next billing period, if the flow volume used to calculate the most recent annual permit fee (or application fee if the permit was renewed within the past year) differs significantly from either of the following flow determinations:

1. Average flow data reported on the permittee's discharge monitoring reports for the current fiscal year, or

2. Estimated flow volume for the next billing period based on recent changes at the facility.

The flow revision notification shall include a summary of flow data reported on discharge monitoring reports for the previous year and any other supporting documentation to be used as the basis for the revised flow determination.

I. REAPPLICATION FOR A PERMIT

The Department is implementing a revised schedule for issuance of discharge permits grouped by geographical areas (watersheds). To implement the new watershed-based schedule the Department may revoke and reissue this permit concurrently with other permits in the watershed. Unless the Department grants permission for a later date the permittee shall submit a permit renewal application no later than 12 months prior to the expiration date of the current permit, or notify the Department of their intent to cease discharging by the permit's expiration date. In the event that a timely and sufficient reapplication has been submitted and through no fault of the permittee the Department is unable to issue a new permit before the expiration date, the terms and conditions of this permit are automatically continued and remain in full force and effect.

J. PERMIT REOPENER FOR TOTAL MAXIMUM DAILY LOAD (TMDL)

This permit may be reopened as a major modification to implement any applicable requirements associated with a Total Maximum Daily Load (TMDL) issued or approved for (BALTIMORE HARBOR WATERSHED, BASIN CODE 02.13.09.03), including but not limited to: enterococci or chromium.

This permit is consistent with the terms and conditions of the Chesapeake Bay Total Maximum Daily Load (TMDL) for Sediments, Nitrogen and Phosphorus established December 29, 2010 (76 Fed. Reg.549, January 5, 2011). Based on facility operations and/or discharge characteristics this permit limits discharges of total suspended solids to prevent water quality degradation of receiving waters and ultimately the Chesapeake Bay, but does not impose limits for total nitrogen and total phosphorus.

To ensure the Chesapeake Bay and its tributaries are protected from discharges of sediments, nitrogen and phosphorus this permit may be reopened as a major modification to implement any future requirements associated with the Chesapeake Bay TMDL. At that time the permittee may become subject to a Department-issued General Permit for the discharge of such pollutants.

K. BIOMONITORING PROGRAM – [Reserved]

L. TOXICITY REDUCTION EVALUATION

A Toxicity Reduction Evaluation (TRE) is an investigation conducted to identify the causative agents of effluent toxicity, isolate the source(s), determine the effectiveness of control options, implement necessary control measures and confirm the reduction in toxicity. The permittee shall conduct a TRE when a review of toxicity test data by the Department indicates unacceptable, acute, or chronic effluent toxicity.

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1. Within 90 days following notification by the Department that a TRE is required the permittee shall submit a study plan and schedule for conducting the TRE. The permittee shall conduct the TRE in a manner consistent with the plan and schedule submitted to the Department.

2. The plan should follow the framework set forth in *Generalized Methodology for Conducting Industrial Toxicity Reduction Evaluations* (EPA/600/2-88/070, April 1989).

3. Beginning 60 days following the date of the Department's acceptance of a TRE study plan and every 60 days thereafter the permittee shall submit progress reports including all relevant test data to the Department. The permittee shall continue to submit progress reports every 60 days until the toxicity reduction confirmation is completed.

4. Within 60 days following completion of the toxicity identification (source isolation) phase of the TRE the permittee shall submit a plan and schedule to the Department for implementing measures necessary to eliminate acute toxicity and/or reduce chronic toxicity to acceptable levels. Implementation of the measures identified shall begin immediately upon submission of this plan.

5. Within 60 days after completing the implementation of control measures to eliminate or reduce toxicity the permittee shall submit a study plan to the Department for approval, to confirm the elimination or reduction of toxicity using biomonitoring.

6. If for any reason the implemented measures do not result in compliance with the Department's toxicity limitations the permittee shall continue the TRE.

M. MIXING ZONES AND POLLUTION PREVENTION

"Chesapeake 2000" is a comprehensive Agreement for the restoration of the Chesapeake Bay signed June 28, 2000 by the State of Maryland, Commonwealths of Virginia and Pennsylvania, the District of Columbia, U.S. Environmental Protection Agency and Chesapeake Bay Commission. Among its goals the Agreement includes the following:

> "Through continual improvement of pollution measures and other voluntary means, strive for zero release of chemical contaminants from point sources, … Particular emphasis shall be placed on achieving elimination… of mixing zones for persistent or bioaccumulative toxics."

To support attainment of this goal the permittee shall strive to meet water quality standards (WQS) for toxic substances at the point of discharge, including WQS for nickel through continual improvement of pollution prevention measures and other means. The permittee shall report to the Department annually on progress made toward the elimination of mixing zones for persistent or bioaccumulative toxics.

N. PROTECTION OF WATER QUALITY

It is a violation of this permit to discharge any substance not otherwise listed under this permit's "Effluent Limitations and Monitoring Requirements" at levels which would cause or contribute to any exceedance of the numerical water quality standards set forth in COMAR 26.08.02.03, unless the level and substance were disclosed in writing in the permit application prior to issuance of the permit. If a discharge regulated by this permit causes or contributes to an exceedance of water quality standards in COMAR 26.08.02.03, including but not limited to general water quality standards, or if the discharge includes a pollutant not disclosed or addressed in the public record for the permit determination; the

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Department is authorized to modify, suspend or revoke this permit or take enforcement action to address unlawful discharges.

O. PROPER OPERATION AND MAINTENANCE

At all times, the permittee shall operate and maintain all facilities and treatment systems which are installed or used to achieve compliance with the conditions of this permit. The permittee shall report any instances where the diffuser at Outfall 002 is not operating properly (at a ratio of 19:1 or greater) for 24 consecutive hours. During times of diffuser malfunction, the permittee must limit discharges from Outfall 002 to every extent practical.

P. STORMWATER DISCHARGES FROM STORAGE TANK CONTAINMENT STRUCTURES

This provision applies to stormwater drainage from areas behind dikes, berms, walls, or any other form of containment which surrounds petroleum storage tanks. The outlet from containment structures shall be kept closed at all times other than during deliberate draining of stormwater. The permittee shall inspect the containment area(s) at least once per month and maintain a log of observations, including notes regarding any spills of leaks of product.

The permittee shall also follow the guidance below regarding spill prevention and response, specifically regarding the aforementioned containment areas:

Spill Prevention and Response Procedures: You must minimize the potential for leaks, spills and other releases that may be exposed to stormwater and develop plans for effective response to such spills if or when they occur. These procedures are complementary to and do not replace any requirements of RCRA (42 U.S.C. §6901), the Department's Land Management Administration Oil Control Program, NFPA 30 Flammable and Combustible Liquids Code or the Spill Prevention, Control and Countermeasure (SPCC) Plan (as a requirement of 40 CFR § 112). At a minimum, you must implement:

1. Procedures for plainly labeling containers (e.g., "Used Oil," "Spent Solvents," "Fertilizers and Pesticides," etc.) that could be susceptible to spillage or leakage to encourage proper handling and facilitate rapid response if spills or leaks occur;

2. Quarterly inspection procedures for containers that are susceptible to spillage or leakage (e.g., used oil) to ensure the containment structures have no leaks/cracks, and that the outlets are properly sealed. Check that plugs are properly affixed, that valves are in working condition, and that neither are leaking;

3. Procedure for the discharge of any stormwater from a containment structure, requiring that a sample is taken to ensure that no visible or odorous pollutants are discharged. If a sample contains a visible sheen, floating solids or a noxious smell, then you must discharge the remaining wastewater to a sanitary sewer system or haul it to a recycler or TSDF (Treatment Storage & Disposal Facilities) or disposal facility;

4. Preventative measures such as barriers between material storage and traffic areas, secondary containment provisions, and procedures for material storage and handling;

5. Procedures for expeditiously stopping, containing, and cleaning up leaks, spills, and other releases. Employees who may cause, detect, or respond to a spill or leak must be trained in

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these procedures and have necessary spill response equipment available. If possible, one of these individuals should be a member of your stormwater pollution prevention team; and

6. Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies. Where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302, occurs during a 24-hour period, you must notify the Department's Emergency Spill Response number at (866) 633-4686 and EPA's National Response Center (NRC) at (800) 424-8802 or, in the Washington, DC, metropolitan area, call (202) 267-2675 in accordance with the requirements of 40 CFR Part 110, 40 CFR Part 117, and 40 CFR Part 302 as soon as you have knowledge of the discharge. Local requirements may necessitate reporting spills or discharges to local emergency response, public health, or drinking water supply agencies. Contact information must be in locations that are readily accessible and available.

Q. LEACHATE DISCHARGE REQUIREMENTS

The permittee is authorized to discharge cell water and leachate from its Hawkins Point Plant landfill through the Outfall 002 treatment system. The permittee shall keep records of all transfer operations noting the volume of leachate and the date and time of each transfer.

R. EXCURSIONS FROM pH LIMITATIONS

1, Excursions to the pH limitations established in Special Condition A.2 are allowed to the extent authorized by 40 CFR Part 401.17.

2. Notwithstanding item 1 above, the permittee shall report any excursions below a pH of 2 or above a pH of 12.5 that exceeds ten consecutive minutes. Such notification shall be made no later than the Department's next business day. All exceedances of over one hour in length require immediate notification to the Water Management Administration Compliance Program by calling 410-537-3510.

S. FLOW PROPORTIONAL COMPOSITE SAMPLING

All composite samples shall be collected by flow proportional composite sampling methods. There samples shall either be collected as a constant sample volume at time intervals proportional to effluent flow OR by increasing the volume of each aliquot with increasing flow while maintaining a constant time interval.

T. GROUNDWATER DISCHARGE

The permittee shall collect leachate and groundwater between the impoundment and the slurry cut-off wall for treatment prior to discharge via Outfall 002.

U. SETTLING BASIN CONSTRUCTION

All lagoons, ponds, and settling basins operated by the permittee for the treatment of wastewater shall conform with the following design requirements, unless alternative designs are approved by the Department following a demonstration that safe and effective treatment is provided.

1. The minimum embankment top width shall be 10 feet to permit access of maintenance vehicles.

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2. Gabions or other protective material shall be installed on the outer embankment slopes of the settling basins to provide stability against erosion.

3. The point of entry for raw wastewater shall be set to minimize short circuits and localized stagnation.

4. The lowest drop-off point shall be at least one foot off the settling basin bottom to control eroding velocities and avoid pickup of bottom deposits.

5. Any modifications to existing basins or construction of new basins must be designed by a qualified engineer and approved by the Department prior to implementation.

V. PROHIBITED DISCHARGES

The permittee is prohibited from discharging vehicle wash water, hydrostatic test water (other than for the remediation system, regulated in Special Condition A.2), or blowdown water from the neighboring Kemira Water Solutions.

W. COMPLIANCE SCHUEDLE FOR METALS

1. Every six months, the permittee shall submit to the Department a status report detaining current plans for meeting the iron and nickel limits at Outfall 001 (Special Condition A.1). This report is due six months after the effective date of the permit and every six months thereafter until the effective date of the permit limits. The plans may include alternative treatment technologies or other discharge options which will result in compliance with the final discharge limitations.

2. No later than 24 months after the effective date of this permit, the permittee may apply for a permit modification to revise or remove the permit limit(s) based on any combination of the following options allowed under COMAR 26.08:

   a. Chemical or Biological Translator: The permittee shall complete all studies supporting use of the translator under COMAR 26.08.04.02-3C, paragraphs (1), (3) and (4) for biological translators or under COMAR 26.08.04.02-4C, paragraphs (1), (3) and (4) for chemical translators and submit the results to the Department as part of the application for a permit modification.

   b. Mixing Zone Study: As part of the application for a permit modification, the permittee shall include the proposed dilution calculation and appropriate demonstration, using dye studies or simulation models, that the dilution calculation is applicable during periods of ambient stream conditions, flow rates, and distances specified in COMAR 26.08.02.05. A mixing zone study is applicable only to water quality-based limits.

   c. Additional Data: As part of the application for a permit modification, the permittee may submit any new or additional data which demonstrates that there is no reasonable potential for violation of applicable water quality standards or technology-based limitations.

   Alternatives for making such a demonstration include, but are not limited to, the following:

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i. collection of effluent data using analytical methods which have lower detection levels;

ii. collection of data using techniques designed to minimize the effects of contamination on sample results; and

iii. collection of data utilizing alternate monitoring locations to show compliance with water quality standards.

X. STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY – [Reserved]

II. GENERAL CONDITIONS

A. MONITORING AND REPORTING

1. REPRESENTATIVE SAMPLING

Samples and measurements taken as required herein shall be taken at such times as to be representative of the quantity and quality of the discharges during the specified monitoring periods.

2. REPORTING-MONITORING RESULTS SUBMITTED QUARTERLY

Monitoring results obtained during each calendar month shall be summarized and submitted electronically using NetDMR once the permittee is granted access to this tool. Results shall be submitted to the Department via NetDMR no later than the 28th of the month following the end of the reporting month. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

a. NetDMR is a U.S. EPA tool allowing regulated Clean Water Act permittees to submit monitoring reports electronically via a secure Internet application. At the earliest from the effective date of this permit, the permittee must apply for access to NetDMR at www.epa.gov/netdmr and register for a NetDMR Webinar. Before the permittee can submit official DMRs using NetDMR the permittee must attend a training Webinar and successfully set-up and submit test monitoring results electronically.

b. Hard copies of monitoring results obtained before the permittee is granted access to NetDMR or before December 21, 2016, whichever comes first, shall be submitted postmarked no later than the 28th of the month following the end of the reporting month. Signed copies of the results shall be submitted to the Department at the following address:

Attention: Discharge Monitoring Reports
Water Management Administration
Compliance Program
Maryland Department of the Environment
1800 Washington Boulevard, STE-425
Baltimore, MD 21230-1708

c. The permittee may be eligible for a temporary waiver by MDE from NPDES electronic reporting requirements if the permittee has no current internet access and is physically

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located in a geographic area (i.e., zip code) that is identified as under-served for broadband internet access in the most recent National Broadband Map from the Federal Communications Commission (FCC); or if the permittee can demonstrate that such electronic reporting of the monitoring data and reports would pose an unreasonable burden or expense to the NPDES-permitted facility. Waiver requests must be submitted in writing to the Department for written approval at least 120 days prior to the date the permittee would be required under this permit to begin using NetDMR. This demonstration shall be valid for five (5) years from the date of the Department approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to the Department unless the permittee submits a renewed waiver request and such request is approved by the Department. All waiver requests and subsequent hardcopy DMRs shall be sent to the following address with "Attn: DMRs":

Attention: NetDMR Waiver Request
Maryland Department of the Environment
WMA – Compliance Program
1800 Washington Blvd., Suite 425
Baltimore, MD 21230

3. SAMPLING AND ANALYSIS METHODS

The analytical and sampling methods used shall conform to procedures for the analysis of pollutants as identified in Title 40 CFR Part 136 – "Guidelines Establishing Test Procedures for the Analysis of Pollutants" unless otherwise specified.

4. DATA RECORDING REQUIREMENTS

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. the exact place, date, and time of sampling or measurement;
b. the person(s) who performed the sampling or measurement;
c. the dates and times the analyses were performed;
d. the person(s) who performed the analyses;
e. the analytical techniques or methods used; and
f. the results of all required analyses.

5. MONITORING EQUIPMENT MAINTENANCE

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation to insure accuracy of measurements.

6. ADDITIONAL MONITORING BY PERMITTEE

If the permittee monitors any pollutant, using approved analytical methods as specified above, at the locations designated herein more frequently than required by this permit, the results of such monitoring, including the increased frequency, shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report form (EPA No. 3320-1).

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7. RECORDS RETENTION

All records and information resulting from the monitoring activities required by this permit, including all records of analyses performed, calibration and maintenance of instrumentation, and original recordings from continuous monitoring instrumentation shall be retained for a minimum of three years. This period shall be automatically extended during the course of litigation, or when requested by the Department.

B. MANAGEMENT REQUIREMENTS

1. CHANGE IN DISCHARGE

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit at a level in excess of that authorized shall constitute a violation of the terms and conditions of this permit. The permittee shall report any anticipated facility expansions, production increases, or process modifications which will result in new, different or an increased discharge of pollutants by submitting a new application at least 180 days prior to the commencement of the changed discharge except that if the change only affects a listed pollutant and will not violate the effluent limitations specified in this permit, by providing written notice to the Department. Following such notice, the permit may be modified by the Department to include new effluent limitations on those pollutants.

2. NONCOMPLIANCE WITH EFFLUENT LIMITATIONS

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum or daily minimum effluent limitation specified in this permit, the permittee shall notify the Inspection and Compliance Program by telephone at (410) 537-3510 within 24 hours of becoming aware of the noncompliance. Within five calendar days, the permittee shall provide the Department with the following information in writing:

a. a description of the non-complying discharge including its impact upon the receiving waters;

b. cause of noncompliance;

c. anticipated time the condition of noncompliance is expected to continue or if such condition has been corrected, the duration of the period of noncompliance;

d. steps taken by the permittee to reduce and eliminate the non-complying discharge;

e. steps to be taken by the permittee to prevent recurrence of the condition of noncompliance; and

f. a description of the accelerated or additional monitoring by the permittee to determine the nature and impact of the noncomplying discharge.

3. FACILITIES OPERATION

All treatment, control and monitoring facilities, or systems installed or used by the permittee, are to be maintained in good working order and operated efficiently.

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4. ADVERSE IMPACT

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to waters of the State or to human health resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. BYPASSING

Any bypass of treatment facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited unless:

a. the bypass is unavoidable to prevent a loss of life, personal injury or substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources;

b. there are no feasible alternatives;

c. notification is received by the Department within 24 hours (if orally notified, then followed by a written submission within five calendar days of the permittee's becoming aware of the bypass). Where the need for a bypass is known (or should have been known) in advance, this notification shall be submitted to the Department for approval at least ten calendar days before the date of bypass or at the earliest possible date if the period of advance knowledge is less than ten calendar days; and

d. the bypass is allowed under conditions determined by the Department to be necessary to minimize adverse effects.

6. CONDITIONS NECESSARY FOR DEMONSTRATION OF AN UPSET

An upset shall constitute an affirmative defense to an action brought for noncompliance with technology-based effluent limitations only if the permittee demonstrates, through properly signed, contemporaneous operating logs, or other relevant evidence, that:

a. an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. the permitted facility was at the time being operated in a prudent and workman-like manner and in compliance with proper operation and maintenance procedures;

c. the permittee submitted a 24-hour notification of upset in accordance with the reporting requirements of General Condition II.B.2 above;

d. the permittee submitted, within five (5) calendar days of becoming aware of the upset, documentation to support and justify the upset; and

e. the permittee complied with any remedial measures required to minimize adverse impact.

7. REMOVED SUBSTANCES

Wastes such as solids, sludges, or other pollutants removed from or resulting from treatment or control of wastewaters, or facility operations, shall be disposed of in a manner to prevent any

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removed substances or runoff from such substances from entering or from being placed in a location where they may enter the waters of the State.

8. POWER FAILURE

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. provide an alternative power source sufficient to operate the wastewater collection and treatment facilities or,

b. halt, reduce or otherwise control production and all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater collection and treatment facilities.

C. RESPONSIBILITIES

1. RIGHT OF ENTRY

The permittee shall permit the Secretary of the Department, the Regional Administrator for the Environmental Protection Agency, or their authorized representatives, upon the presentation of credentials to:

a. enter upon the permittee's premises where an effluent source is located or where any records are required to be kept under the terms and conditions of this permit;

b. access and copy, at reasonable times, any records required to be kept under the terms and conditions of this permit;

c. inspect, at reasonable times, any monitoring equipment or monitoring method required in this permit;

d. inspect, at reasonable times, any collection, treatment, pollution management, or discharge facilities required under this permit; and

e. sample, at reasonable times, any discharge of pollutants.

2. TRANSFER OF OWNERSHIP OR CONTROL OF FACILITIES

In the event of any change in ownership or control of facilities from which the authorized discharge emanates, the permit may be transferred to another person if:

a. the permittee notifies the Department in writing, of the proposed transfer;

b. a written agreement, indicating the specific date of proposed transfer of permit coverage and acknowledging responsibilities of current and new permittees for compliance with the liability for the terms and conditions of this permit, is submitted to the Department; and

c. neither the current permittee nor the new permittee receive notification from the Department, within 30 calendar days, of intent to modify, revoke, reissue or terminate the existing permit.

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3. REAPPLICATION FOR A PERMIT –[Reserved]

4. AVAILABILITY OF REPORTS

Except for data determined to be confidential under Section 308 of the Clean Water Act, 33 U.S.C. § 1318, all submitted data shall be available for public inspection at the offices of the Department and the Regional Administrator of the Environmental Protection Agency.

5. PERMIT MODIFICATION

A permit may be modified by the Department upon written request of the permittee and after notice and opportunity for a public hearing in accordance with and for the reasons set forth in 40 CFR § 122.62 and 122.63.

6. PERMIT MODIFICATION, SUSPENSION, OR REVOCATION

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked and reissued in whole or in part during its term, in accordance with the provisions set forth in COMAR 26.08.04.10, for causes including, but not limited to, the following:

a. violation of any terms or conditions of this permit;

b. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;

c. a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge; or

d. a determination that the permitted discharge poses a threat to human health or welfare or to the environment and can only be regulated to acceptable levels by permit modification or termination.

e. upon a final, unreviewable determination that the permittee lacks, or is in violation, of any federal, state, or local approval necessary to conduct the activities by this permit.

7. TOXIC POLLUTANTS

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such toxic effluent standard or prohibition) is established by the U.S. Environmental Protection Agency, or pursuant to Section 9-314 of the Environment Article, Annotated Code of Maryland, for a toxic pollutant which is present in the discharges authorized herein and such standard is more stringent than any limitation upon such pollutant in this permit, this permit shall be revoked and reissued or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified. Any effluent standard established in this case for a pollutant which is injurious to human health is effective and enforceable by the time set forth in the promulgated standard, even absent permit modification.

8. OIL AND HAZARDOUS SUBSTANCES PROHIBITED

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibility, liability, or penalties to which the permittee may

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be subject under Section 311 of the Clean Water Act (33. U.S.C. § 1321), or under the Annotated Code of Maryland.

9. CIVIL AND CRIMINAL LIABILITY

Except as provided in permit conditions on "bypassing," "upset," and "power failure," nothing in this permit shall be construed to preclude the institution of any legal action nor relieve the permittee from civil or criminal responsibilities and/or penalties for noncompliance with Title 9 of the Environment Article, Annotated Code of Maryland or any federal, local, or other State law or regulation.

10. PROPERTY RIGHTS/COMPLIANCE WITH OTHER REQUIREMENTS

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, State or local laws or regulations.

11. SEVERABILITY

The provisions of this permit are severable. If any provisions of this permit shall be held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this permit to any circumstances is held invalid, its application to other circumstances shall not be affected.

12. WATER CONSTRUCTION AND OBSTRUCTION

This permit does not authorize the construction or placing of physical structures, facilities, or debris, or the undertaking of related activities in any waters of the State.

13. COMPLIANCE WITH WATER POLLUTION ABATEMENT STATUTES

The permittee shall comply at all times with the provisions of the Environment Article, Title 7, Subtitle 2 and Title 9, Subtitle 3 of the Annotated Code of Maryland and the Clean Water Act, 33 U.S.C. § 1251 et seq.

14. ACTION ON VIOLATIONS

The issue or reissue of this permit does not constitute a decision by the State not to proceed in administrative, civil, or criminal action for any violations of State law or regulations occurring before the issue or reissue of this permit, nor a waiver of the State's right to do so.

15. CIVIL PENALTIES FOR VIOLATIONS OF PERMIT CONDITIONS

In addition to civil penalties for violations of State water pollution control laws set forth in Section 9-342 of the Environment Article, Annotated Code of Maryland, the Clean Water Act provides that any person who violates Section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act or in a permit issued under Section 404 of the Act, is subject to a civil penalty not to exceed $37,500 per day for each violation.

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16. CRIMINAL PENALTIES FOR VIOLATIONS OF PERMIT CONDITIONS

In addition to criminal penalties for violations of State water pollution control laws set forth in Section 9-343 of the Environment Article, Annotated Code of Maryland, the Clean Water Act provides that:

a. any person who negligently violates Section 301, 302, 306, 307, 308, 318, or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, or in a permit issued under Section 404 of the Act, is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than one (1) year, or by both.

b. any person who knowingly violates Section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, or in a permit issued under Section 404 of the Act, is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than three (3) years, or by both.

c. any person who knowingly violates Section 301, 302, 306, 307, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, or in a permit issued under Section 404 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, is subject to a fine of not more $250,000 or imprisonment of not more than 15 years, or both.

d. any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under the Act or who knowingly falsifies, tampers with or renders inaccurate any monitoring device or method required to be maintained under the Act, is subject to a fine of not more than $10,000 or by imprisonment for not more than two (2) years, or by both.

17. DUTY TO PROVIDE INFORMATION

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

18. SIGNATORY REQUIREMENTS

All applications, reports, or information submitted to the Director shall be signed and certified as required by 40 CFR 122.22.

19. REOPENER CLAUSE FOR PERMITS

This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301, 304, and 307 of the Clean Water Act [33 USCS §§ 1311, 1314, 1317] if the effluent standard or limitation so issued or approved:

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a. contains different conditions or is otherwise more stringent than any effluent limitation in this permit or

b. controls any pollutant not limited in this permit. This permit, as modified or reissued under this paragraph, shall also contain any other requirements of the Act then applicable.

D. AUTHORITY TO ISSUE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITS

On September 5, 1974, the Administrator of the U.S. Environmental Protection Agency approved the proposal submitted by the State of Maryland for the operation of a permit program for discharges into navigable waters pursuant to Section 402 of the Clean Water Act, 33 U.S.C. Section 1342.

Pursuant to the aforementioned approval, this discharge permit is both a State of Maryland discharge permit and a NPDES permit.

This permit and the authorization to discharge shall expire at midnight on the expiration date. The permittee shall not discharge after that date unless a new application has been submitted to the Department in accordance with the renewal application provisions of this permit.

Lynn Buhl, Director
Water Management Administration

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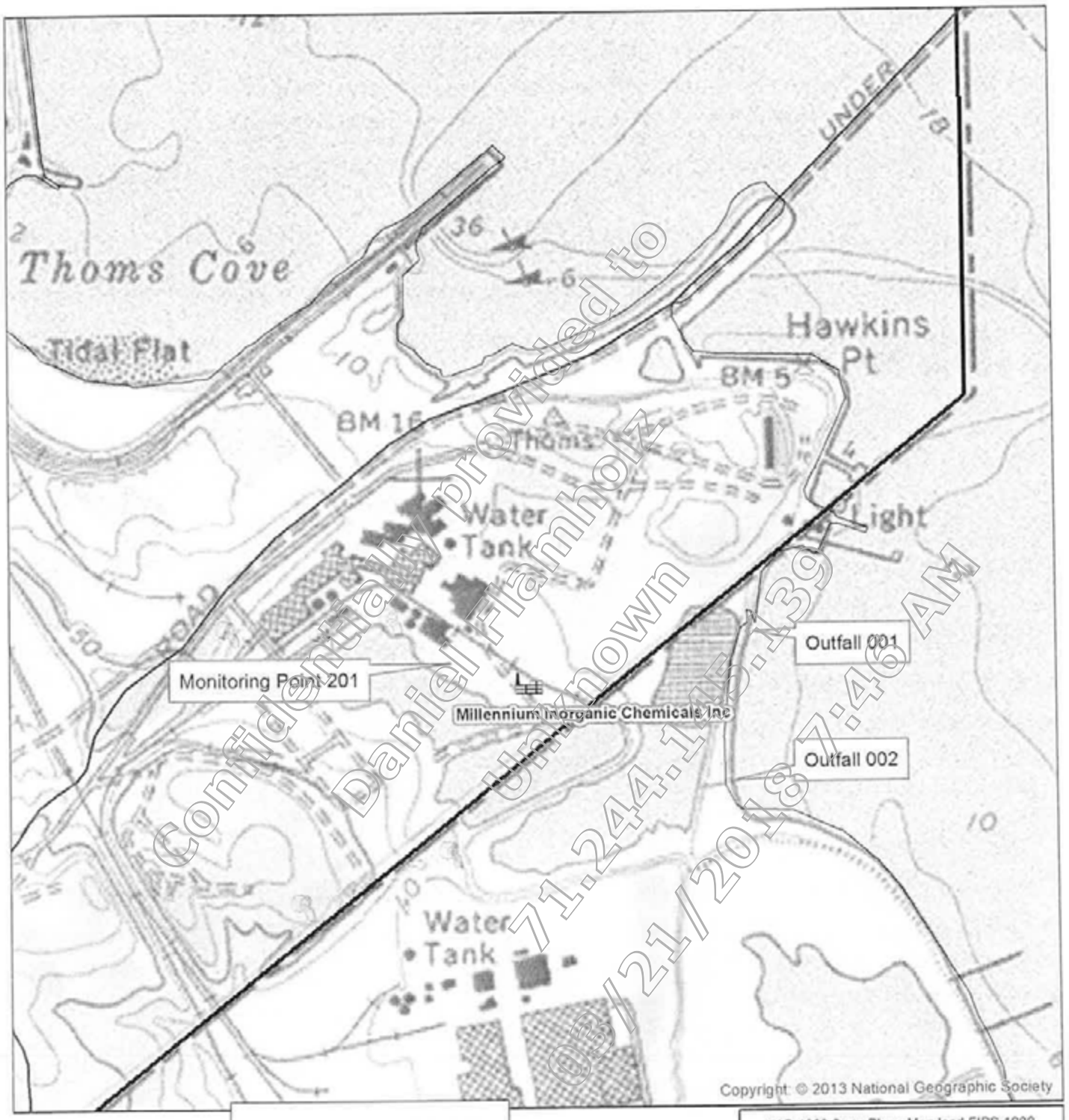

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Facilities and Outfalls

MDE

Facilities Industrial Outfalls

Significant

Insignificant

NAD 1983 State Plane Maryland FIPS 1900
Projection: Lambert Conformal Conic
GCS: North American 1983

0 462.5 925

Feet

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
NAME

ADDRESS

FACILITY LOCATION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved.
OMB No. 2040-0004

PERMIT NUMBER

DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM				TO			

☐ Check here if No Discharge

NOTE: Read Instructions before completing this form

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

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Paperwork Reduction Act Notice

Public Reporting Burden for this collection information is estimated to vary from a range of 10 hours as an average per response for some minor facilities, to 110 hours as an average per response for some major facilities, with a weighted average for major and minor facilities of 18 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to ICR Coordinator, Office of Wastewater Management (MC4201M), US Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

General Instructions

1. If form has been partially completed by preprinting, disregard instructions directed at entry of that information already preprinted.

2. Enter *"Permittee Name/Mailing Address* (and facility name/location, if different)," *"Permit Number,"* and *"Discharge Number"* where indicated. (A separate form is required for each discharge.)

3. Enter dates beginning and ending *"Monitoring Period"* covered by form where indicated.

4. Enter each *"Parameter"* as specified in monitoring requirements of permit.

5. Enter *"Sample Measurement"* data for each parameter under *"Quantity"* and *"Quality"* in units specified in permit.

6. Enter *"Permit Requirement"* for each parameter under *"Quantity"* and *"Quality"* as specified in permit.

7. Under *"No Ex"* enter number of sample measurements during monitoring period that exceed maximum (and/or minimum or 7-day average as appropriate) permit requirement for each parameter. If none, enter "0".

8. Enter *"Frequency of Analysis"* both as *"Sample Measurement"* (actual sample type used during monitoring period) and as *"Permit Requirement,"* specified in permit. (e.g., Enter *"Cont."* for continuous monitoring, *"1/7"* for one day per week, *"1/30"* for one day per month, *"1/90"* for one day per quarter, etc.)

9. Enter *"Sample Type"* both as *"Sample Measurement"* (actual sample type used during monitoring period) and as *"Permit Requirement,"* (e.g., Enter *"Grab"* for individual sample, *"24HC"* for 24-hour composite, *"N/A"* for continuous monitoring, etc.)

10. Where violations of permit requirements are reported, attach a brief explanation to describe cause and corrective actions taken, and reference each violation by date.

11. If "no discharge" occurs during monitoring period, enter *"No Discharge"* across form in place of data entry.

12. Enter *"Name/Title of Principal Executive Officer"* with *"Signature of Principal Executive Officer of Authorized Agent," "Telephone Number,"* and *"Date"* at bottom of form.

13. Mail signed Report to Office(s) by date(s) specified in permit. Retain copy for your records.

14. More detailed Instructions for use of this *Discharge Monitoring Report (DMR)* form may be obtained from Office(s) specified in permit.

Legal Notice

This report is required by law (33 U.S.C. 1318; 40 C.F.R. 125.27). Failure to report or failure to report truthfully can result in civil penalties not to exceed $ 10,000 per day of violation; or in criminal penalties not to exceed $25,000 per day of violation, or by imprisonment for not more than one year, or by both.

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NetDMR training conducted by the EPA Headquarters for permittees

April 19, May 17, June 14, July 19, August 16, September 13, October 18, November 15, and December 13

To register for the EPA Webinar monthly training visit https://epawebconferencing.acms.com/netdmrapr2016/event/eventinfo.html

Training is also available through the College of Southern Maryland (CSM), Maryland Center for Environmental Training (MCET), and Maryland Department of the Environment at 1800 Washington Blvd., Baltimore, MD 21230

Training will be held on the following dates:

June 1, & 22, July 13,
August 3, & 24, September 14, October 5, & 26, November 16, and December 7
These classes are scheduled from 8:30 A.M. to 4:30 P.M.

Visit www.mcet.org to register for the NetDMR training provided by the Maryland Department of the Environment.

The EPA's final rule requires permittees to use existing, available information technology to electronically report information and data related to the NPDES permit program in lieu of filing paper-based reports. All authorized programs are required to electronically transmit the federally-required data (identified in appendix A to 40 CFR part 127) to EPA.

Who must report electronically?

NPDES permittees required to submit discharge monitoring reports (DMRs) must submit their DMR electronically using NetDMR by December 21, 2016, after requesting and receiving authorization from the Maryland Department of the Environment. The NetDMR tool enables permittees to complete their DMRs and submit the DMRs to the EPA via secure internet connection. This means that any DMRs due on or after December 21, 2016 must be reported electronically.

Maryland has received notification from EPA that it meets the requirements of the Cross-Media Electronic Reporting Rule (CROMERR). CROMERR specifies standards that govern electronic reporting to allow states under EPA-authorized programs, such as the NPDES program to submit data electronically. The CROMERR standards are designed to provide these electronic submittals with the same level of legal dependability as the corresponding paper submittals.

Maryland
Department of the Environment

We've gone GREEN!

Save a tree,

You MUST submit electronically by December 21, 2016

For more information, go to the EPA website at **www.epa.gov/netdmr**

or you can contact our NetDMR Team at the

Maryland Department of the Environment at mde.netdmr@maryland.gov

or

NetDMR contact:

(410) 537-3520

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What is NetDMR?

NetDMR is a Web-based tool that allows National Pollutant Discharge Elimination System (NPDES) permittees to electronically sign and submit their Discharge Monitoring Reports (DMRs) to the EPA's Integrated Compliance Information System (ICIS-NPDES) via the Environmental Information Exchange Network. NetDMR is designed to reduce the burden on EPA, states, and the regulated community; improve data quality; provide a cost savings; and expand the ability of both states and EPA in targeting their limited resources to meet environmental goals. An essential component of NetDMR is the exchange of data with ICIS-NPDES, which allows permittees to complete a DMR that is specific to their permit limits and outfalls.

NetDMR

WHO MUST REPORT ELECTRONICALLY?

NPDES permittees required to submit DMRs are required to use NetDMR before December 21, 2016. Permittees must receive appropriate training before requesting and receiving permission to use NetDMR. Once approved a facility may begin submitting its DMRs and other reports electronically.

GOOD FOR THE ENVIRONMENT

GOOD FOR YOU

What are the Maryland Department of the Environment plans for NetDMR Implementation?

Be sure to Catch the Wave! The NetDMR program is available for permittees and data providers. NPDES permittees are required to attend the EPA's training that is offered by Webinar. Training is also available through MCET at the Maryland Department of the Environment in Baltimore. Upon completion of NetDMR training, permittees will be able to log onto NetDMR and perform direct DMR entry into the Integrated Compliance Information System (ICIS). After successful training you must submit the signed subscriber agreement to the Maryland Department of the Environment, get approval for signatory and permit administrator authority, and go "live" in time for your future DMR submittals.

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APPENDIX C
Emergency Contingency Plan

Prepared for:

HAWKINS POINT LLC
3901 Fort Armistead Road
Baltimore, Maryland 21226

EMERGENCY CONTINGENCY PLAN

APPENDIX E OF APPLICATION FOR AN INDUSTRIAL WASTE LANDFILL PERMIT: PHASE III REPORT

Hawkins Point Plant Industrial Waste Landfill Baltimore, Maryland

Prepared by

Geosyntec consultants

10211 Wincopin Circle, 4th Floor
Columbia, Maryland 21044

Project Number: MEM1653

September 2019

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Table 2: Safety and Emergency Equipment General List
Table 3: Emergency Response Contacts

1. INTRODUCTION

1.1 Terms of Reference

This Emergency Contingency Plan describes the safety and emergency response procedures that are to be followed during the operation of the existing Hawkins Point Plant (HPP) Landfill, an industrial waste disposal facility located at 3901 Fort Armistead, Baltimore, Maryland. This Emergency Contingency Plan has been prepared in accordance with the requirements of COMAR 26.04.07.08. and addresses the following:

- Emergency provisions for users of potable water supply
- A spill containment and prevention plan for any leachate collected or stored at the site; and
- Emergency telephone numbers and contact persons for fires, medical emergencies, and spills.

These items are addressed in the following subsections. This report was prepared by Ms. Alex Ambrosino and reviewed by Mr. Thomas Ramsey, P.E., both of Geosyntec's Columbia, Maryland office, in accordance with Geosyntec's internal review policy.

1.2 Site and Project Description

The HPP Landfill is an existing landfill that is currently permitted under the existing Refuse Disposal Permit (No. 2015-WIF-0527A). The design of the HPP Landfill was originally approved and permitted by MDE in 1991. The entire disposal footprint of the landfill has been constructed, covering approximately 23 acres of the 30-acre site and includes a bottom liner and leachate collection system. This Plan has been prepared as part of a Phase III permit application that is required to re-permit the landfill to a new owner, HPP Landfill LLC.

1.3 Purpose

The purpose of this Plan is to help prevent, minimize, and abate hazards to human health, safety, and the environment from fires, explosions, or releases of toxic, hazardous, or other polluting materials to the air, soil, surface water, or groundwater during operation of the HPP facility.

1.4 Organizational Format

This Emergency Contingency Plan for the HPP facility addresses each of the requirements of COMAR 26.04.07.08. The organization of this document is as follows:

- in Section 2, the designated emergency coordinators for the facility are presented and their responsibilities and limits of authority are outlined;

- in Section 3, a list of emergency equipment and communications systems that will be present at the facility is provided;
- in Section 4, the dissemination procedures for the Emergency Contingency Plan are provided;
- in Section 5, a description of arrangements with local emergency response agencies for coordination and delivery of emergency services to the facility during operations is presented, including the evacuation routes and routes to the nearest hospital;
- in Section 6, emergency response actions to be followed are described;
- in Section 7, the procedures that will be implemented in the event of a spill or leak are presented;
- in Section 8, the Fire Control Plan for the facility is presented; and
- in Section 9, the protocol for making amendments to this plan is provided.

2. DESIGNATED EMERGENCY COORDINATOR

The Emergency Coordinator for the HPP Landfill facility will be responsible for directing emergency response measures necessary to minimize or prevent harm to human health and the environment in the event of a fire, explosion, potentially hazardous emissions, and/or discharge of unacceptable materials into the air, soil, surface water, or groundwater.

Both an Emergency Coordinator and Alternative Emergency Coordinator are designated for the HPP facility as follows:

- The Emergency Coordinator is authorized to carry out and/or direct the procedures outlined herein the Emergency Contingency Plan in the event of an emergency and to commit the resources necessary to carry out the activities described in this Emergency Contingency Plan.

- The Alternative Emergency Coordinator is authorized to fulfill the responsibilities of the Emergency Coordinator in the event that the Emergency Coordinator is on leave, incapacitated, otherwise unavailable, or when directed to assume responsibility by the Emergency Coordinator.

Details and contact information for the Emergency Coordinator and Alternative Emergency Coordinator are provided in Table 1. In the remainder of this document, the single term "Emergency Coordinator" is used to identify both the Emergency Coordinator and Alternative Emergency Coordinator (i.e., the person assuming responsibility to implement this Emergency Contingency Plan in accordance with the above designations).

The Emergency Coordinator will be available during working hours and non-working hours. Communication procedures for responding to emergencies that occur during non-working hours are presented in Section 3.3. The Emergency Coordinator will be trained to be familiar with this Plan, the location and characteristics of materials handled, the location of records, and the layout of the facility. The Emergency Coordinator will also be required to be familiar with the Operation Plan for the facility. The Emergency Coordinator will be responsible for ensuring a first aid kit is available.

3. EMERGENCY EQUIPMENT

3.1 Overview

The emergency equipment at the HPP facility will include fire extinguishers, spill control equipment, and communication systems. Table 2 shows a list of emergency equipment to be stored at the Site. The locations of emergency equipment will be posted at the office trailer. The basic procedures for operating and using the safety and emergency equipment will be posted near the respective equipment. Equipment will be maintained in a ready state at all times. Basic first aid procedures will be posted at strategic locations at the facility.

3.2 Fire Fighting Equipment

At least three fire extinguishers will be available on-site, either at the administrative building, equipment, or pick-up trucks. Additional on-site equipment, such as a water truck, bulldozer, or track loader (as available) may also be used to fight fires. In addition to on-site emergency firefighting equipment, the Baltimore Fire Department will be contacted, if necessary.

3.3 Communication

The internal and external communications system at the site will consist of: (1) voice and hand signals where workers are in close proximity; and (2) mobile phones that are available to landfill personnel and the Emergency Coordinator. The contact information for the Emergency Coordinator is listed in Table 1 along with contact telephone numbers at which they can be reached during working hours and non-working hours.

The appropriate outside agencies (i.e., Fire Department, Sheriff's Office, etc.) will be contacted by telephone in the event of an emergency. A list of telephone numbers for emergency agencies will be placed near each office telephone.

3.4 First Aid/Safety Equipment

Wall-mounted industrial grade first aid kits will be kept in the on-site office trailer.

4. PLAN DISSEMINATION

A copy of this Emergency Contingency Plan will be kept at the on-site office and will be made available to HPP Landfill staff responsible for developing, monitoring, and implementing this Plan. This Emergency Contingency Plan will also be made available to all of the local emergency response contacts indicated in Table 3.

5. EMERGENCY RESPONSE AGENCIES

5.1 Arrangements with Agencies

The Emergency Coordinator is listied in Table 1 along with contact telephone numbers for working and non-working hours. Emergency response teams from the local Police Office, Fire Department, Rescue Squad, and/or Hospital will be contacted as deemed necessary by the Emergency Coordinator in the event of an emergency at the facility. In Table 3, a list of the telephone numbers of the appropriate Emergency Response Contacts is presented. This list will be kept up to date and posted near all telephones on-site to provide "ready" access to emergency response agencies.

5.2 Evacuation Plan for Personnel

5.2.1 General

In an emergency situation, the Emergency Coordinator is responsible for determining when evacuation of the facility is required. Imminent or actual dangers which may require evacuation include:

- a generalized fire or threat of fire that cannot be avoided;
- an explosion or threat of explosion that cannot be avoided; and
- a major spill or leak that cannot be contained and constitutes a threat to human health.

Personnel who are at the site of the emergency prior to the arrival of the Emergency Coordinator should evacuate the incident site if imminent danger or health threats exist.

The basic evacuation plan consists of moving the personnel to an off-site reassembly point where they are safe from danger. The reassembly point can be the entrance gate or other location decided by the Emergency Coordinator.

The personnel will remain at the prescribed reassembly point until directed to reenter the facility. The Emergency Coordinator is responsible for issuing the reentry order. The secondary reassembly point will be used if the primary point is inaccessible or is in danger from exposure to the emergency incident.

5.2.2 Outdoor Incident

If an emergency occurs outdoors, employees shall move far enough away from the incident to avoid harm, proceed to the primary reassembly point, then reassemble at the primary reassembly point. Employees should wait at the reassembly point until further instructions are received from the Emergency Coordinator. If reassembly at the primary point is not feasible, then the secondary reassembly point will be used.

5.2.3 Indoor Incident

If an emergency occurs indoors that requires the evacuation of a building (i.e., the office trailer), employees should exit the building by the most accessible exit and then proceed to the primary reassembly point. Employees evacuating the area of concern will proceed to the most accessible site gate, and then reassemble at the primary reassembly point. Employees should wait at the reassembly point until further instructions are received from the Emergency Coordinator. If use of the primary reassembly point is not advisable, then the secondary reassembly point will be used.

5.2.4 Personnel Movement

Generally, the Emergency Coordinator or appropriate supervisor will give the order to evacuate an area. Employees will be advised during training sessions not to wait for orders from the Emergency Coordinator or supervisor if imminent danger or health threats exist.

When notified of an emergency that requires evacuation of personnel, supervisors should:

1. quickly and quietly notify employees in their respective work areas where to move and by what route;
2. check all working areas, store rooms, conference rooms, and restrooms for personnel;
3. contact each of the employees when arriving at the reassembly point. Ascertain that all employees and visitors are accounted for;
4. relay headcount statistics to Emergency Coordinator; and
5. stay in contact with the Emergency Coordinator to provide assistance as necessary.

The Emergency Coordinator will direct reentry to buildings or other areas. No personnel will reenter the incident area until the Site is cleared and the Emergency Coordinator has approved the Site for reentry.

6. EMERGENCY RESPONSE ACTIONS

6.1 Accident or Injury

In the event that an accident or injury occurs, the following procedures will be implemented:

- equipment involved in the accident or injury will be shut down;
- the Emergency Coordinator will be notified;
- the extent of an individual's injuries (i.e., location, seriousness, etc.) will be determined;
- if severe, Emergency Medical Service (EMS) Coordinator (911) will be contacted and the following information provided;
    - location on site where the injury occurred,
    - presence of consciousness, a pulse, and unaided breathing of the victim, and
    - description of injuries; and
    - if necessary, the victim will be transported offsite to an appropriate medical treatment facility by qualified medical personnel.
- appropriate first aid measures will be implemented;
- victims will not be moved, unless:
    - victim is in a location potentially dangerous to others, or
    - victim can be moved without risk of causing additional injury;

7. EMERGENCY PROVISIONS FOR USERS OF POTABLE WATER SUPPLY

As discussed in detail in the Phase II report [Geosyntec, 2019], the Patapsco Aquifer is not used as a source of drinking water (i.e., there are no drinking water wells within 0.5 miles of the HPP Landfill) and it is overlain by approximately 100 ft of low permeability clay. Therefore, should contaminants leak from the liner system, the risk for leachate migration to residential water supply wells is minimal (i.e., there are no potential receptors). Nevertheless, in the unlikely event that a drinking well becomes impacted by contaminants attributable to the HPP Landfill, bottled potable water will be supplied to the affected parties and the appropriate remedial action will be taken to correct the degradation of their water supply. In order for the HPP Landfill facility to be confirmed as the source of contamination, the following must occur:

- The results of analytical tests must show impacts to the water supply source;
- The HPP Landfill owner must be given the opportunity to sample the groundwater from the source and analyze the sample; and
- All records that are available regarding the water supply source shall be available for review.

If additional testing and evaluation confirms that the HPP Landfill has impacted the source, then the HPP Landfill permittee will submit to MDE a detailed engineering design plan describing the manner in which alternative water supplies will be provided to potentially affected areas around the landfill. Short-term replacement methods may include supplying bottled drinking water to affected areas. In the meantime, the HPP Landfill will develop a plan describing the manner in which alternative long-term water supplies will be provided to potentially affected areas around the landfill. This plan must:.

- Be drafted and submitted to MDE for review within one year of notification by MDE;
- Be revised in accordance with any reasonable requirement of MDE;
- Contain sufficient detail to serve as construction and implementation documents for the proposed water supply;
- Include a schedule of all activities necessary to implement the plan, including all activities to be performed by HPP to bid, oversee, and implement the plan as well as all activities by contractors; and
- Consider all areas within ½ mile of the property boundary of the landfill and any other groundwater use located downgradient of the landfill. The plan may also contain provisions for expansion of the area of impact should it become necessary to protect public health.

The plan may also include provisions for partial or staggered implementation, based on specific information about the cause and extent of the triggering event. Upon approval by MDE, the water supply contingency plan shall become attached as part of the refuse permit.

Should MDE determine that migration of contaminants from the property on which the landfill is located has occurred or is likely to occur, the HPP Landfill shall immediately implement the water supply contingency plan in accordance with the approved schedule.

8. SPILL AND LEAK RESPONSE PROCEDURES

8.1 General

The purpose of this section defines the response procedures to be followed during a spill or leak of a material that could have an adverse effect on human health or the environment.

In general, the following procedures will be implemented in any of the following spill or leak situations:

- the spill or leak could result in the release of potentially harmful material, thus creating the potential for contamination or harm of people and/or the environment;
- the spill or leak could result in release of flammable, ignitable, or combustible liquids or vapors, thus causing a fire or gas explosion hazard;
- the spill or leak can be contained on site, but the potential exists for groundwater or other environmental contamination; and
- the spill or leak cannot be contained on site, resulting in off-site soil contamination and/or ground or surface water pollution.

8.2 Potential Sources of Spills or Leaks

Areas at the HPP facility where spills or leaks may occur include the following:

- fuel oil storage tanks;
- landfill mobile equipment;
- motor oil storage tanks;
- cleaning solvents; and
- leachate forcemain (piping).

8.3 Spill/Release Response

If a spill or release involving a potentially hazardous substance occurs, site personnel shall take the following actions immediately:

1. Call the Emergency Coordinator.
2. Make an initial survey of the scene, determining:
   - if people are potentially threatened or injured;
   - if the environment is potentially threatened;

- the volume of material spilled or leaked;
- the presence of fire, smoke, or fumes;
- overall condition of the vehicle or container;
- location of storm sewers, sanitary sewers, or sumps; and
- location of nearest water body or stream.

3. Rescue the injured, if necessary and possible.

4. The Emergency Coordinator will identify the specific hazardous substance by noting container labels, shipping papers, vehicle placards, or material characteristics.

5. Do not release any substance from containers.

6. The Emergency Coordinator may contact the shipper(s) or manufacturer(s) of the substance for additional information.

7. If necessary, immediate assistance will be requested by:
   - Fire Department 911
   - Police Department 911

The types of materials that could be accidentally spilled or released include the following general categories:

- cleaning chemicals;
- fuel;
- lubricants; and
- leachate.

If any employee observes a spilled or released hazardous material or substance, the employee will immediately call the Emergency Coordinator. The Emergency Coordinator will make an evaluation of the spill or leak to determine appropriate response activities such as:

- building ventilation, using recirculation or outside air;
- notification of Fire Department, Police Department, or other emergency response agencies;
- containment and cleanup procedures to be used; and
- personnel evacuation, if necessary.

The basic hand equipment available onsite for containment and cleanup is as follows:

- absorbent such as vermiculite, perlite, bentonite, or soil;
- shovels and brooms;

- face shields and goggles;
- large plastic bags;
- crescent wrench, vise grips, and pipe wrench; and
- plastic shoe covers.

Earth moving equipment will also be available for use in containment and cleanup of spills and leaks.

Spills and leaks shall be contained to as small an area as possible using available equipment, tools, and materials. After containment is achieved, the spilled/leaked materials should be cleaned up and properly disposed of at an approved facility at the direction of the Emergency Coordinator.

9. FIRE CONTROL PLAN

9.1 Introduction

In this section of the Emergency Contingency Plan, the Fire Control Plan is presented, in which the procedures to be used to prevent and extinguish fires at the facility are provided. Personnel at the facility will have access to telephones or radios to contact the local fire department in the case of a fire.

Operations and training procedures are described within this section that will minimize the potential of fires on site. In addition, procedures are described for facility employees to follow in the event of a fire.

9.2 Fires on Equipment

In case of an equipment fire, the operator shall dismount the machine on the side opposite the fire and attempt to extinguish the fire using a portable fire extinguisher from the ground while maintaining a safe distance. Extinguishers from other nearby equipment may also be used. Diesel fuel tanks on equipment are not likely to explode. If appropriate, a water truck will be available on site to assist in extinguishing the fire. After the fire has been extinguished and the equipment has cooled, necessary repairs may be made. If portable fire extinguishers are not able to extinguish the fire, the Fire Department will be called.

9.3 Fires in Buildings

Employees will be trained in proper housekeeping procedures to reduce the potential for fires caused by flammable liquids or materials. Periodic inspections occur to identify any improperly

maintained heating equipment or improperly maintained electric tools. These inspections will be followed by repair of defective tools and defective equipment, if applicable.

If a fire starts in an on-site building, fire extinguisher(s) in the building may be used if the fire can be safely extinguished by personnel on the scene. If the fire cannot be extinguished be means of a fire extinguisher, the Fire Department will be contacted immediately. The building will be evacuated by way of the nearest and/or safest exit.

The Emergency Coordinator shall be immediately notified of all fires. If there is any question regarding the ability of on-site personnel to safely extinguish the fire, the personnel on the scene or the Emergency Coordinator will telephone the Fire Department.

9.4 Landfill Fires

The types of waste accepted at HPP landfill are generally non-combustible, therefore, fires potential is limited. In the unlikely case of a landfill fire, site personnel and equipment will contain, control, and extinguish the fire by smothering the fire with non-combustible soils and landfilled materials. Once the fire is extinguished, the area will be covered with daily cover soils.

9.5 Notifications

In the event a fire does occur, the Emergency Coordinator will be notified. If the fire cannot be controlled on-site, the Baltimore City Fire Department will be called for support.

Should the fire result in a spill or impact the environmental control or monitoring systems of HPP Landfill, MDE will be notified within 48 hours via email.

10. CONTINGENCY PLAN AMENDMENTS

The Emergency Contingency Plan will be reviewed and amended as necessary if:

- the plan fails in an emergency;
- changes occur to the project that warrant changes to the plan;
- the list of emergency equipment changes;
- there is a change in personnel for the Emergency Coordinator; and
- the list of emergency response contacts changes.

TABLES

Geosyntec consultants

TABLE 1

EMERGENCY COORDINATOR

HPP Industrial Waste Landfill
Baltimore, Maryland

Emergency Coordinator:

Paul Morris
HPP Landfill
3901 Fort Armistead Road
Baltimore, Maryland 21226

Telephone Number during Working Hours: (410) 943-1700

Telephone Number during Non-Working Hours: (302) 500-0549

Alternate Emergency Coordinator:

PLACEHOLDER

Telephone Number during Working Hours: PLACEHOLDER

Telephone Number during Non-Working Hours: PLACEHOLDER

TABLE 2

SAFETY AND EMERGENCY EQUIPMENT GENERAL LIST

HPP Industrial Waste Landfill
Baltimore, Maryland

- Absorbent materials
- Disposable gloves, hats, shoe covers, boots
- Fire extinguisher
- First aid supplies
- Pumps (Submersible)
- Spill containment materials

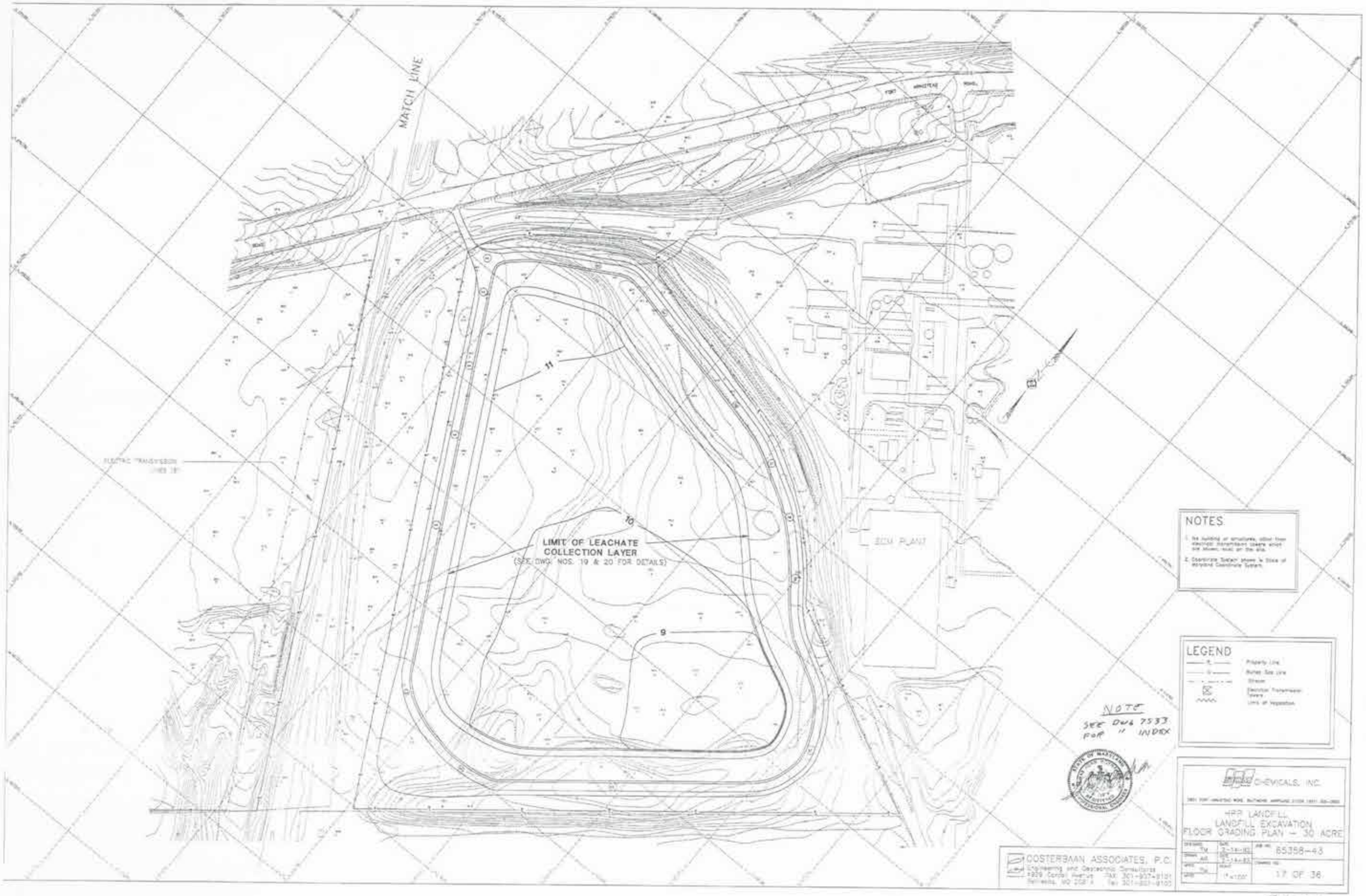
TABLE 3

EMERGENCY RESPONSE CONTACTS

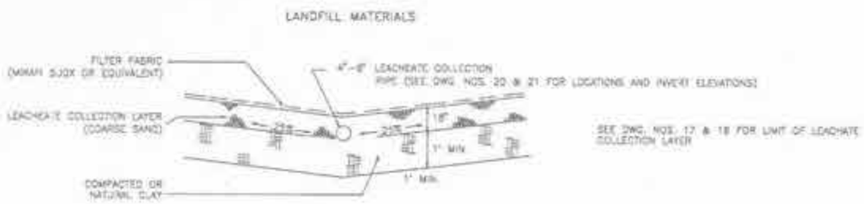
HPP Industrial Waste Landfill
Baltimore, Maryland

Local	Telephone Number	Emergency Number
Baltimore City Fire Department Fire Station No. 57 4427 Pennington Road Baltimore City, MD 21226	(410) 396-1257	911
Baltimore Police Department 10 Cherry Hill Road Baltimore, MD 21225	(410) 396-2499	911
Baltimore Washington Medical Center 301 Hospital Drive, Glen Burnie, MD 21061	(410) 787-4000	911
Priority Partners Medical Center 6704 Curtis Court Glen Burnie, MD 21060**	(410) 228-5511	
State		
Maryland Department of the Environment	(866) 633-4686	SHaile@mde.state.md.us
National		
United States Environmental Protection Agency (EPA):		
- National Response Center (to respond to Coast Guard)	(800) 424-8802	
- National Response Center	(800) 424-8802	
- Region III Philadelphia, PA	(215) 597-9905	
United States Coast Guard	(757) 484-8192	
Chemtrac (Chemical Transportation Emergency Center)	(800) 424-9300	
National Poison Control Center	(800) 222-1222	

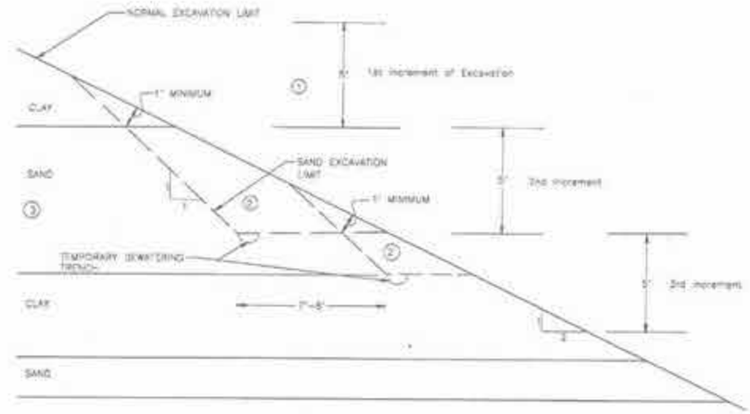
APPENDIX D
Leachate System Design


MATCH LINE
FORT MIDDLETON ROAD
ELECTRIC TRANSMISSION LINES 18'
11
10
9
LIMIT OF LEACHATE COLLECTION LAYER
(SEE DWG. NOS. 19 & 20 FOR DETAILS)
SCM PLANT
NOTES
1. No building or structures, other than electrical transmission towers which are shown, must be the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buffer Site Line
Stream
Electrical Transmission Towers
Limit of Vegetation
NOTE
SEE DWG 7533
FOR " INDEX
CHEMICALS, INC.
HPP LANDFILL
LANDFILL EXCAVATION
FLOOR GRADING PLAN – 30 ACRE
65358-43
17 OF 36
COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4929 Cordell Avenue
Bethesda, MD 20814

7599



DETAIL 'A' - TYPICAL LINER/LEACHEATE COLLECTION LAYERS

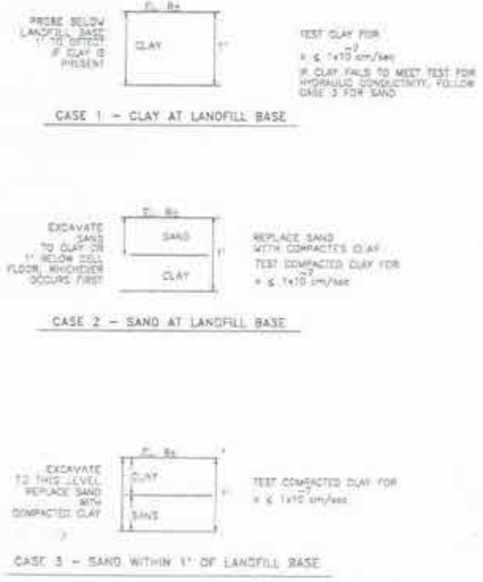


NOTES FOR DETAIL C NORMAL SLOPE CONSTRUCTION

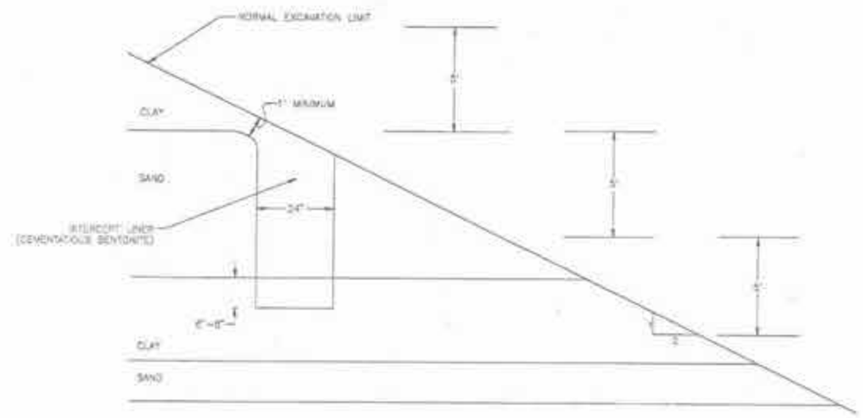
1. EXCAVATION TO PROCEED IN FIVE (5) FOOT INCREMENTS. SLOPES WILL BE OBSERVED AND TESTED AT EACH INCREMENT TO DEMONSTRATE CONTINUOUS CLAY, AT LEAST ONE (1) FOOT THICK.
2. EXCAVATED SAND LAYERS ALONG THE APPROXIMATE LINES SHOWN REPLACE SAND WITH COMPACTED CLAY.
3. TEMPORARY DEWATERING TRENCHES LEADING TO TEMPORARY SUMP AND PUMP WILL REMAIN IN OPERATION WHILE COMPACTED CLAY IS BEING PLACED.
4. IF INITIAL EXCAVATION ON SLOPE UNCOVERS A ZONE OF SEEPAGE OF A NOTICEABLE VOLUME OR A POTENTIALLY PERSISTENT BAND, THE CONTRACTOR WILL BE DIRECTED TO IMPLEMENT DETAIL 'D'

DETAIL C: NORMAL SLOPE CONSTRUCTION

NOT TO SCALE



DETAIL B: LANDFILL BASE PREPARATION



DETAIL D: CONTINGENT SLOPE CONSTRUCTION

NOT TO SCALE

NOTES FOR DETAIL D CONTINGENT SLOPE CONSTRUCTION

1. EXCAVATE INTERCEPT LINER TWO (2) FEET ON WIDTH THROUGH SAND LAYER TO CLAY.
2. BACKFILL INTERCEPT LINER WITH CEMENTACIOUS BENTONITE WITH HYDRAULIC CONDUCTIVITY OF $1x10^{-7}$ cm/sec.
3. ALLOW CEMENTACIOUS BENTONITE TO CURE UNTIL INITIAL SET.
4. CONTINUE NEXT INCREMENT OF GENERAL EXCAVATION

GENERAL NOTES

1. EXCAVATION FOR LANDFILL AT FINAL CUT SLOPES WILL PROCEED IN VERTICAL INCREMENTS NOT EXCEEDING FIVE (5) FEET.
2. FINAL CUT SLOPES WILL BE OBSERVED AND TESTED AT EACH INCREMENT BY A QUALIFIED FIELD TECHNICIAN UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL GEOTECHNICAL ENGINEER TO DEMONSTRATE CONTINUOUS CLAY, AT LEAST ONE (1) FOOT THICK, REMAINING PERPENDICULAR TO THE SLOPE FACE AS SHOWN IN DETAILS 'C' AND 'D' ON THIS DRAWING SHEET.
3. CLAY TESTS WILL CONSIST OF IN-PLACE DENSITY TESTS, MOISTURE CONTENTS, LIQUID AND PLASTIC LIMITS (LL AND PL), MECHANICAL ANALYSES TO DETERMINE THE PERCENT PASSING U.S. NO. 200 SIEVE AND FIELD OR LABORATORY HYDRAULIC CONDUCTIVITY TESTS PERFORMED ON FIELD SAMPLES OF COMPACTED CLAY.
4. ACCEPTABLE TESTS WILL BE AS FOLLOWS:
   A. IN-PLACE DENSITY: $\gamma \geq$ 95% ASTM D-698.
   B. PLASTIC INDEX, (PI=LL-PL) $\geq$ 7.
   C. PERCENT PASSING NO. 200 SIEVE $\geq$ 40%
   D. HYDRAULIC CONDUCTIVITY: $k \leq 1x10^{-7}$ cm/sec.
5. FREQUENCY OF TESTS:
   A. IN-PLACE DENSITY: 10 PER ACRE
   B. PLASTIC INDEX: 10 PER ACRE
   C. PERCENT PASSING NO. 200 SIEVE: 10 PER ACRE
   D. HYDRAULIC CONDUCTIVITY: 1 PER ACRE, OR MORE
   E. CLAY THICKNESS PROBES: 10 PER ACRE
   * IN-PLACE DENSITY, PL, AND PERCENTAGE PASSING NO. 200 SIEVE WILL BE USED AS INDICATOR TESTS AFTER CORRELATION WITH HYDRAULIC CONDUCTIVITY TESTS
6. SAND USED FOR LEACHATE COLLECTION LAYER SHALL BE CLEAN SILICA SAND WITH LESS THAN 3% OF THE MATERIAL PASSING THE U.S. NO. 200 SIEVE AND WITH A HYDRAULIC CONDUCTIVITY $k \geq 5x10^{-3}$ cm/sec.
7. IN CIRCUMSTANCES WHERE SEEPAGE OF NOTICEABLE VOLUME OR A POTENTIALLY PERSISTANCE BAND IS ENCOUNTERED IN SURFICIAL SAND, AN EXCAVATION TWO (2) FEET OF WIDTH, WILL BE CONSTRUCTED ON THE STORMWATER CONVEYANCE CHANNEL SIDE OF THE ACCESS ROAD. THE EXCAVATION WILL PROCEED VERTICALLY TO CLAY AND BE FILLED WITH SAND MEETING THE REQUIREMENTS OF THE LEACHATE COLLECTION LAYER SAND IN GENERAL NOTE NO.6 ABOVE. THE EXCAVATION WILL BE GRADED TO DRAIN BY GRAVITY TO A DOWNGRADIENT LOCATION IN THE STORMWATER CONVEYANCE CHANNEL AND/OR A STORMWATER MANAGEMENT BASIN.

NOTE
SEE DWG 7533
FOR " " INDEX

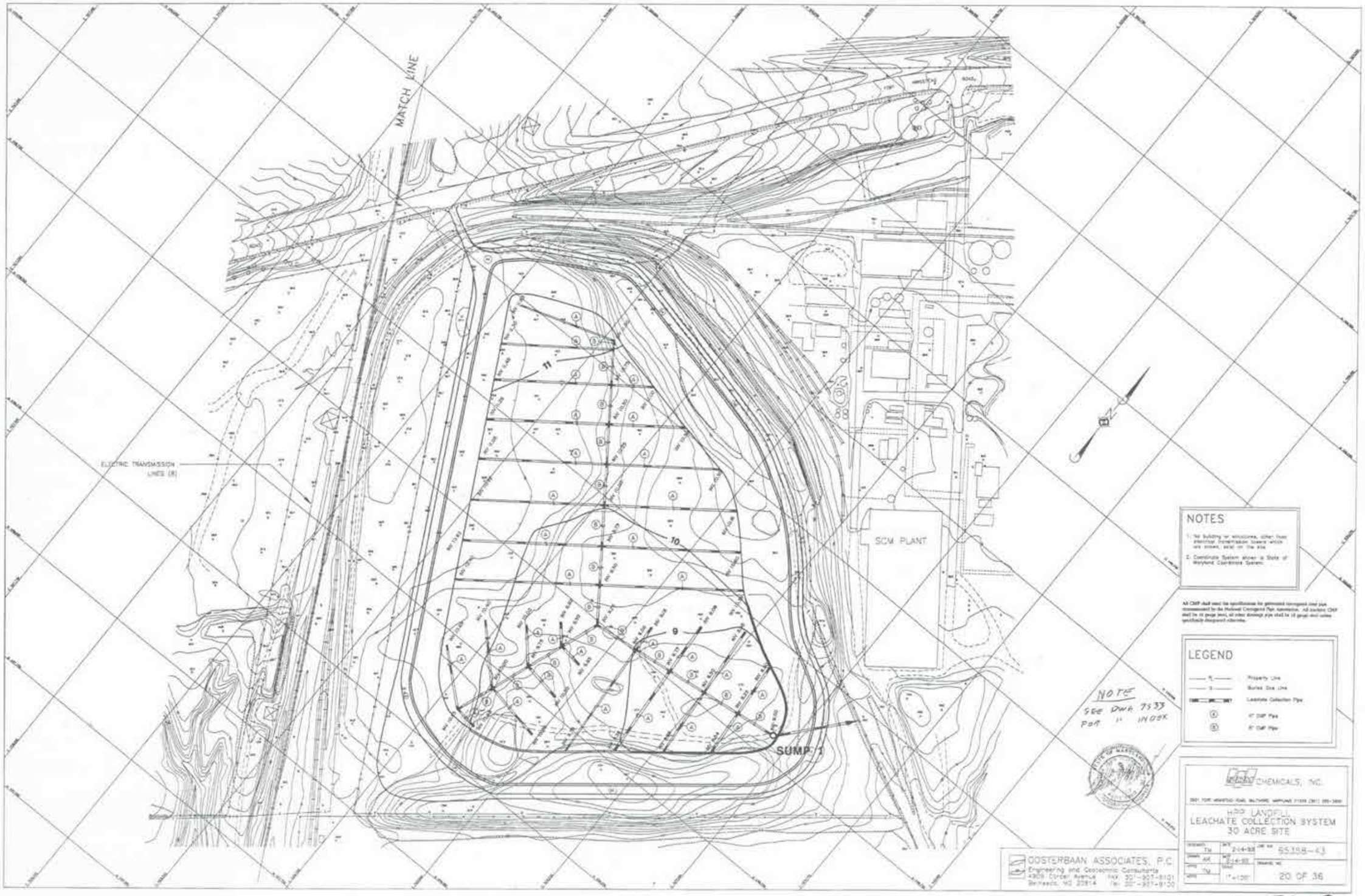
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants
4806 Corset Avenue FAX: 301-907-8101
Berwyn, MD 20814 Tel: 301-907-8100

CHEMICALS, INC.

HPP LANDFILL
CLAY LINER DETAILS
SECTIONS & SPECIFICATIONS

DESIGNED TM	DATE 3-14-92	JOB NO. 85358-43	
DRAWN AB	DATE 3-14-92	DRAWING NO. 18 OF 38	
CHKD TV	SCALE AS SHOWN		

7601


MATCH LINE
ELECTRIC TRANSMISSION LINES (8)
SCM PLANT
SUMP 1
11
10
9
NOTES
LEGEND
NOTE
SEE DWG 7533 FOR 11 INDEX
CHEMICALS, INC.
HPP LANDFILL
LEACHATE COLLECTION SYSTEM
30 ACRE SITE
65358-43
20 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants

7602

MILLENNIUM CHEMICALS, INC.

BALTIMORE, MARYLAND

HPP LANDFILL

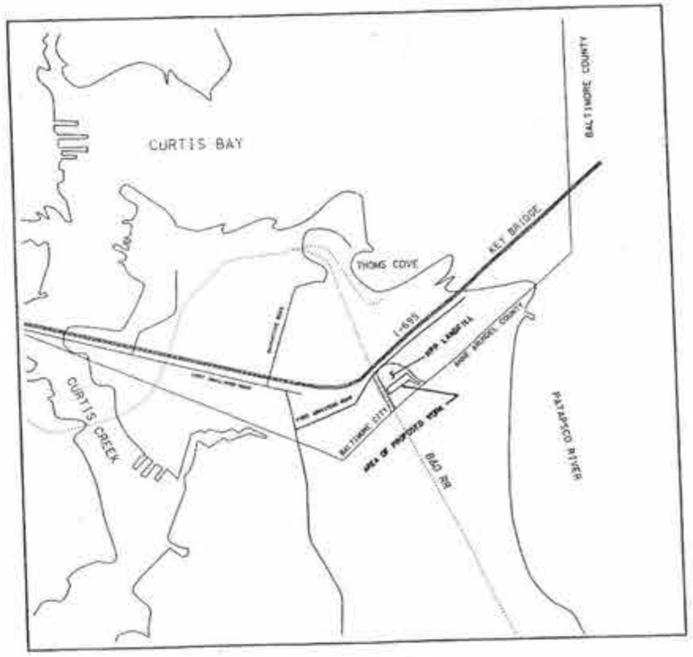
WORK GROUP II

IMPROVEMENTS TO LEACHATE COLLECTION SYSTEM

LIST OF DRAWINGS

1. COVER SHEET
2. GRADING PLAN
3. PLAN, LEACHATE COLLECTION IMPROVEMENTS
4. DETAILS - LEACHATE COLLECTION IMPROVEMENTS

Plus
P+ID (1): F01
I+C Drawings (3): E01, E02, E03

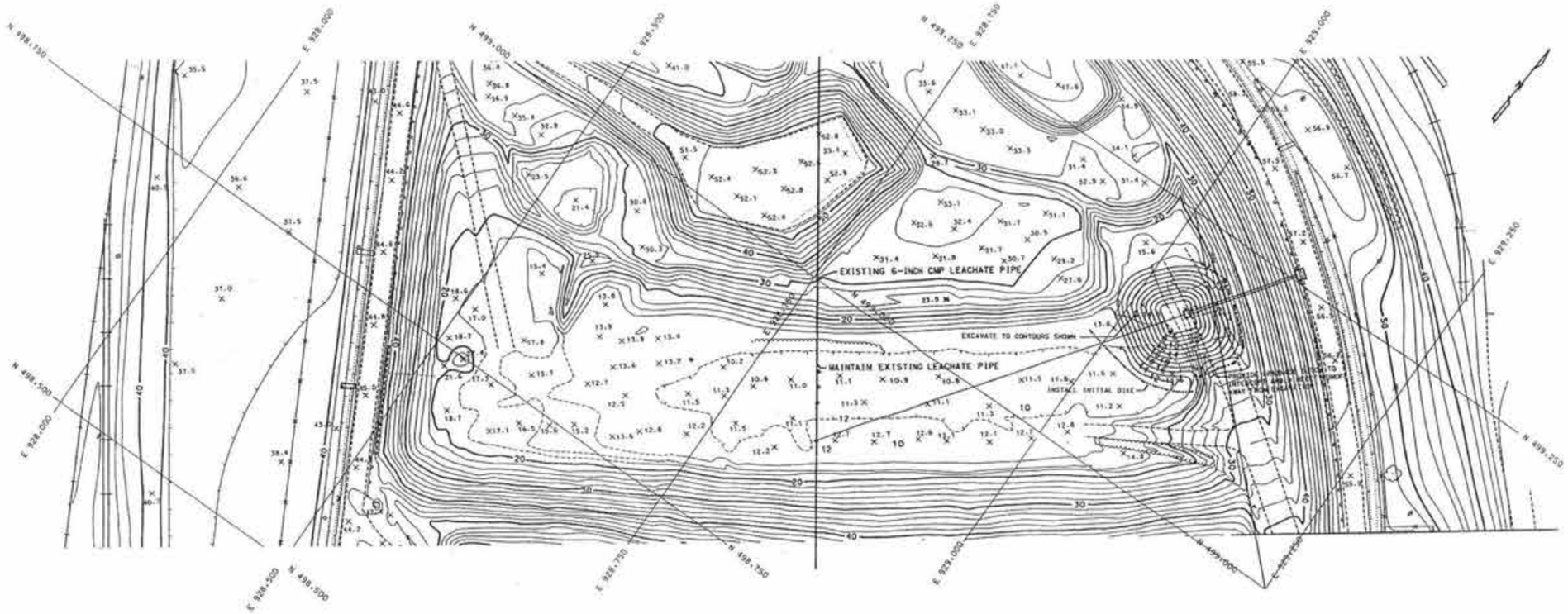


VICINITY MAP
SCALE: 1" = 3000'

NOVEMBER 23, 2005

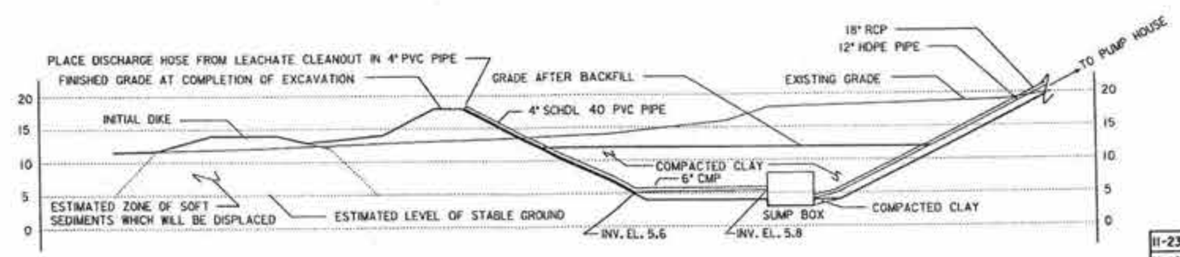
TM ENGINEERING, INC.
2501 WESTMINSTER DRIVE (301) 924-0273
OLNEY, MARYLAND 20832 (410) 792-2467

MCH# 170-SP-016



GRADING NOTES:

1. PLACE CUT MATERIAL FROM EXCAVATION IN POND TO CREATE INITIAL DIKE TO RETAIN WATER AND SOFT SEDIMENT
2. CONTINUE EXCAVATION AND PLACEMENT OF CUT MATERIAL TO CONSTRUCT EMBANKMENT
3. REMOVE SOFT POND SEDIMENT WITHIN EMBANKMENT FOOTPRINT AS FILL PROCEEDS.
4. OBTAIN ADDITIONAL FILL FROM CLAY STOCKPILE AS NECESSARY.
5. COMPACT ALL FILL TO 95% OF STANDARD PROCTOR, ASTM D-698.
6. MAINTAIN DRY EXCAVATION BY PUMPING ANY WATER FROM SEEPAGE, PRECIPITATION AND/OR RUNOFF
7. CONSTRUCT SUMP BOX AND PLACE UPSLOPE PIPES TO AT LEAST EL. 20
8. INSTALL 6-INCH CMP DISCHARGE PIPE AND TEMPORARY EXTENSION
9. BACKFILL EXCAVATION TO EL. 12.0 WITH APPROVED, COMPACTED CLAY



SECTION THROUGH EXCAVATION SCALE: 1" = 10'

11-23-05	CONSTRUCTION	TM
11-14-05	MCH REVIEW	TM

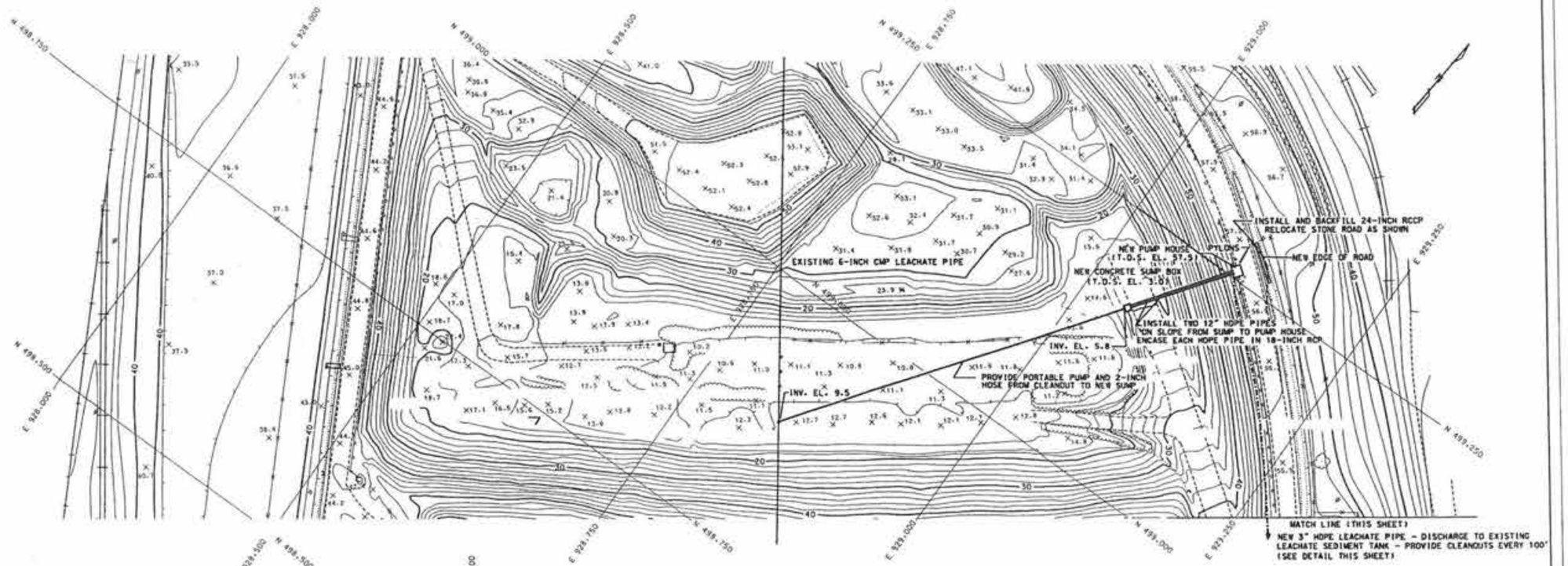
Millennium Chemicals, Inc.
HAWKINS POINT PLANT
BALTIMORE, MARYLAND

HPP LANDFILL
LEACHATE COLLECTION IMPROVEMENTS
GRADING PLAN - SUMP - SLOPE PIPES

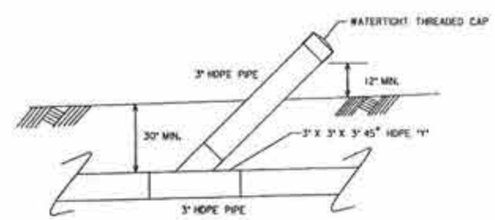
TM ENGINEERING, INC.
2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832

DRAWN BY:
CHECKED BY:
ACCEPTED BY:
APPROVED BY:

PROJECT NO. 05-003
DATE: 11-14-05
SCALE: 1"=50'
MCH# 170-SP-017
DRAWING NO. 2 OF 4



PLAN SCALE: 1" = 50'



CLEANOUT DETAIL NOT TO SCALE

11-23-05	CONSTRUCTION
11-14-05	MCH REVIEW

Millennium Chemicals, Inc. — HAWKINS POINT PLANT, BALTIMORE, MARYLAND

HPP LANDFILL

LEACHATE COLLECTION IMPROVEMENTS

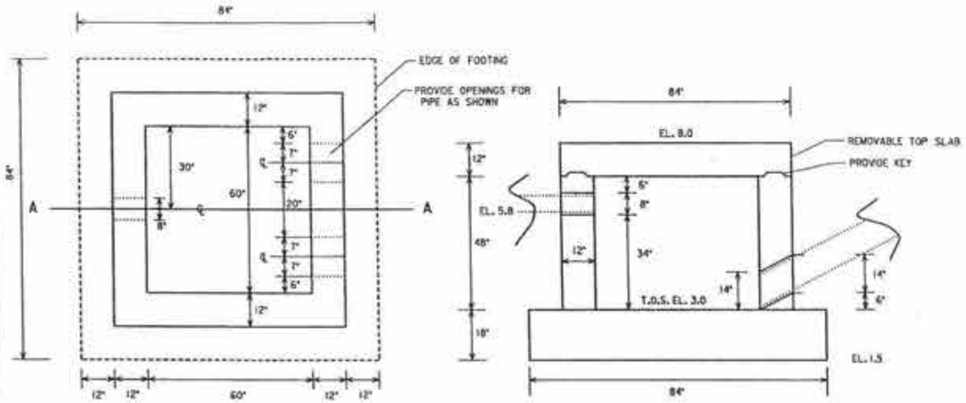
TM ENGINEERING, INC.
2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832

DRAWN BY:
CHECKED BY:
ACCEPTED BY:
APPROVED BY:

PROJECT NO. 05-003

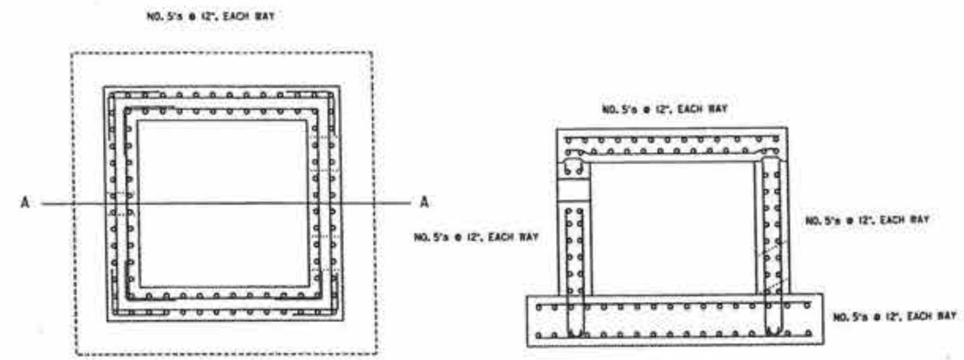
DATE: 11-14-05

DRAWING NO. 3 OF 4
MCH# 170-SP-018



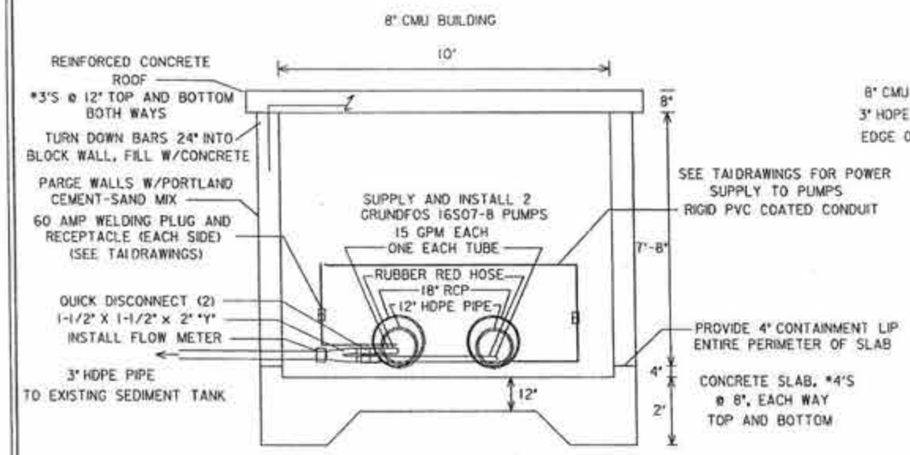
PLAN SECTION A-A

CONCRETE SUMP BOX - DIMENSIONS SCALE: 1/2" = 1'

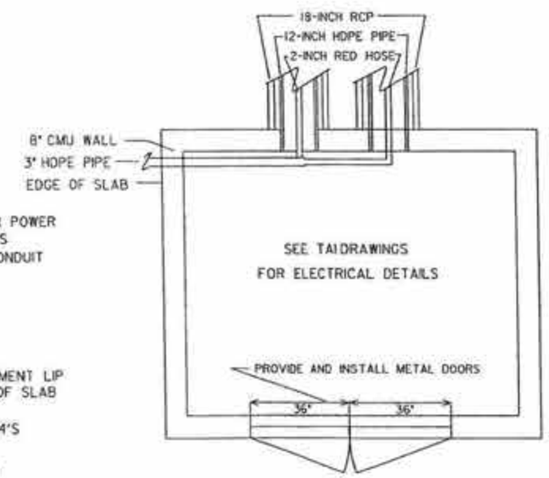


PLAN SECTION A-A

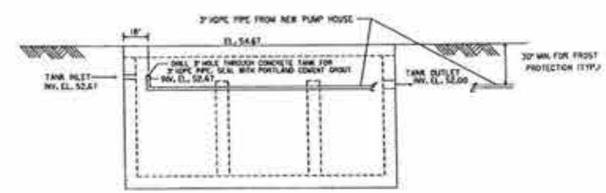
CONCRETE SUMP BOX - REINFORCING STEEL DETAILS SCALE: 1/2" = 1'



SECTION - WEST WALL SCALE: 1/2" = 1'



PLAN SCALE: 1/2" = 1'



EXISITNG LEACHATE SEDIMENT TANK -EAST WALL

NEW LEACHATE PIPE TIE-IN SCALE: 1/4" = 1'

NEW PUMP HOUSE

11-23-05	CONSTRUCTION
11-14-05	REVIEW BY MCH

Millennium Chemicals, Inc. — HAWKINS POINT PLANT, BALTIMORE, MARYLAND

HPP LANDFILL
LEACHATE COLLECTION IMPROVEMENTS
STRUCTURES AND DETAILS

TM ENGINEERING, INC.
2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832

DRAWN BY:
CHECKED BY:
ACCEPTED BY:
APPROVED BY:

PROJECT NO. 05-003
DATE: 11-14-05
DRAWING NO. 4 OF 4
MCH# 170-SP-019

ELECTRICAL LEGEND

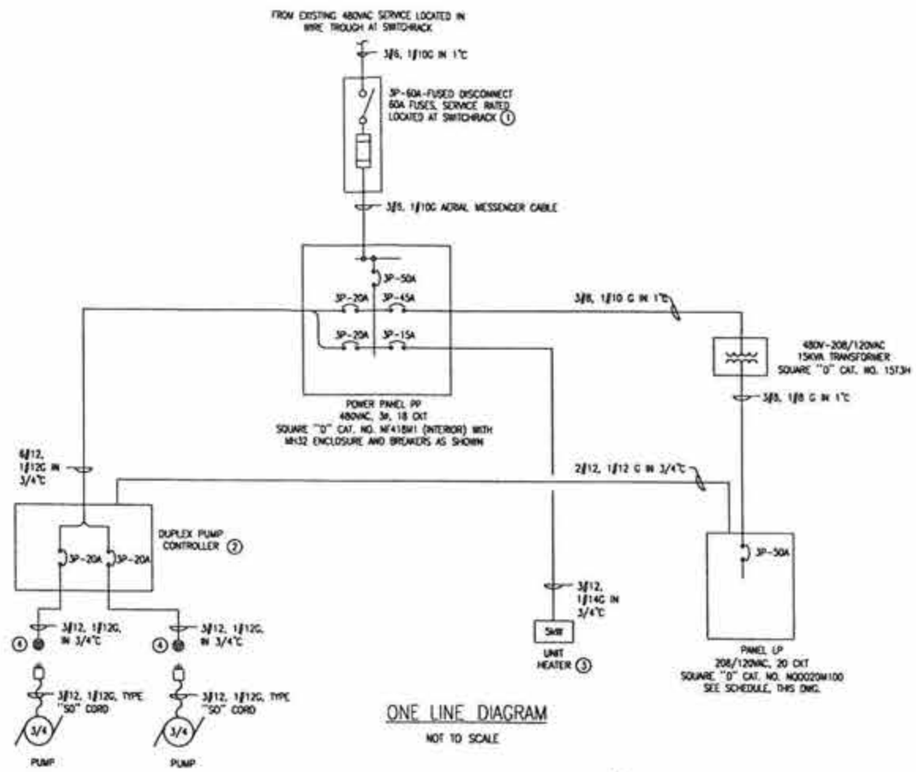
	FUSE
A	FIXTURE-FLUORESCENT-SURFACE MOUNTED AT TOP OF CABINET, INTEGRAL SWITCH
GFI	RECEPTACLE-20A-125VAC-DUPLEX -GROUND FAULT INTERRUPTING
	RECEPTACLE-20A-480VAC-TWIST LOCK
	PLUG-20A-125VAC-TWIST LOCK
	HOMERUN TO PANEL-NO. OF ARROWS INDICATE NO. OF CIRCUITS AND NO. OF CROSS LINES INDICATE NO. OF CONDUCTORS
M	ELECTRICAL METER
UT	ULTRASONIC TRANSDUCER
MPZ	MINI POWER ZONE
J	JUNCTION BOX
	HAND/OFF/AUTOMATIC SWITCH
R	INDICATING LIGHT R-RED, G-GREEN
	MOTOR LOAD - NUMBER INDICATES HP RATING
T	THERMOSTAT
	PUSHBUTTON, NORMALLY CLOSED
	TOGGLE SWITCH
	CONTACT, NORMALLY OPEN
	CONTACT, NORMALLY CLOSED
	OVERCURRENT ELEMENT (THERMAL TYPE)

ELECTRICAL ABBREVIATIONS

A	AMPERE	JB	JUNCTION BOX	S/N	SOLID NEUTRAL
AIC	AMPERE INTERRUPTING CAPACITY	KV	KILOVOLTS	SS	SAFETY SWITCH
C	CONDUIT	KVA	KILOVOLT AMPERES	ST	SINGLE THROW
CB	CIRCUIT BREAKER	KW	KILOWATTS	TYP	TYPICAL
CKT	CIRCUIT	LV	LOW VOLTAGE	UG	UNDERGROUND
DN	DOWN	MH	MOUNTING HEIGHT	V	VOLTS
DT	DOUBLE THROW	MPZ	MINI POWER ZONE	W	WIRE
DO-T	DIGITAL OUTPUT-TELEMETRY	NC	NORMALLY CLOSED	WP	WEATHERPROOF
DWG	DRAWING	NEC	NEUTRAL	XP	EXPLOSION PROOF
EX	EXISTING	NEUT	NATIONAL ELECTRICAL CODE	PH	PHASE
F	FUSED	NF	NON-FUSED	1P	SINGLE POLE
GFI	GROUND FAULT INTERRUPTING	NO	NORMALLY OPEN	2P	TWO POLE
G	GROUND	NTS	NOT TO SCALE	3P	THREE POLE
HOA	HAND-OFF-AUTOMATIC	OH	OVERHEAD	NIC	NOT IN CONTRACT
HP	HORSEPOWER	PB	PUSH BUTTON		
HZ	HORTZ	PVC	POLYVINYL CHLORIDE		

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	LAMPS	MOUNTING	MANUFACTURER
A	SURFACE MOUNTED FLUORESCENT 4' LIGHTING FIXTURE WITH WRAPAROUND PRISMATIC DIFFUSER AND COLD WEATHER BALLAST	1-F40-T12 120 VOLTS	SURFACE	LITHONIA 2UC-40-120-SWR OR APPROVED EQUAL
B	EMERGENCY LTG FIXTURE, GLASS SEALED BEAM LAMPS, MAINTENANCE FREE NICKEL-CADMIUM BATTERY, UL LISTED, 12 VOLTS DC, 120/277 VOLTS AC INPUT	N1212, 12 WATT, 12 VOLT	WALL MTD., 7'-0" AFF	LITHONIA QUANTUM ELM4 OR APPROVED EQUAL



ONE LINE DIAGRAM

NOT TO SCALE

SCHEDULE OF PANEL "LP"

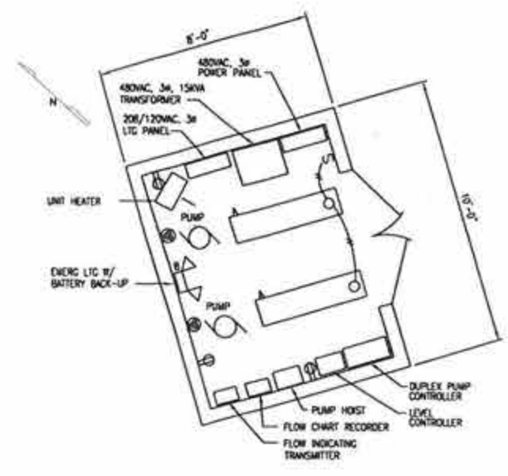
VOLTAGE: 480VAC PHASE: 3ø WIRE: 3 BUS: 125A MAIN CB: 50A 10000K AIC
LOCATION: PUMP HOUSE BUILDING MOUNTING: WALL ENCLOSURE: 1

CKT. NO.	EQUIPMENT SERVED	LOAD (VA) Aø	Bø	Cø	CKT.BKR. P	TRIP (AMP)	WIRING (NO-AWG SIZE) PH.	NEUT.	GRD.	COND. (INCH)
1	LTG	.13			1	20	1-12	1-12	1-12	3/4
3	RECEPTACLES		0.54		1	20	1-12	1-12	1-12	3/4
5	EMERG LTG.			.	1	20	1-12	1-12	1-12	3/4
7	SPARE	-								
9	PUMP HOIST		0.91		1	20	1-12	1-12	1-12	3/4
11	SPARE			-						
13	SPACE	-								
15	SPACE		-							
17	SPACE									
	SUB-TOTALS	.13	1.45	.						

CKT. NO.	EQUIPMENT SERVED	LOAD (VA) Aø	Bø	Cø	CKT.BKR. P	TRIP (AMP)	WIRING (NO-AWG SIZE) PH.	NEUT.	GRD.	COND. (INCH)
2	FLOWMETER	0.01			1	15	1-12	1-12	1-12	3/4
4	FLOW RECORDER		0.05		1	15	1-12	1-12	1-12	3/4
6	LEVEL CONTROL UNIT			0.01	1	15	1-12	1-12	1-12	3/4
8	DUPLEX PUMP CONTROL	0.2			1	20	1-12	1-12	1-12	3/4
10	SPARE		-		1	-	-	-	-	-
12	SPARE			-	1	-	-	-	-	-
14	SPACE	-			-	-	-	-	-	-
16	SPACE		-		-	-	-	-	-	-
18	SPACE									
	SUB-TOTALS	0.21	0.05	0.01						

CONNECTED LOAD:
Aø: - VA - AMPS
Bø: - VA - AMPS
Cø: - VA - AMPS

NOTES: -



PUMP HOUSE PLAN

SCALE: 3/8" = 1'-0"

PROJECT NOTES:

1. SCOPE: FURNISH ALL LABOR AND MATERIALS NECESSARY FOR THE INSTALLATION OF THE COMPLETE ELECTRICAL SYSTEM AS SPECIFIED HEREIN AND SHOWN ON THE CONTRACT DRAWINGS. OUTLINE DESCRIPTION AND DIAGRAMMATIC REPRESENTATION OF SYSTEM OPERATION AND EQUIPMENT DOES NOT LIMIT CONTRACTOR LIABILITY FOR FURNISHING AND INSTALLING COMPLETE AND OPERABLE SYSTEMS. CONTRACTOR SHALL FURNISH AND INSTALL ALL ELECTRICAL COMPONENTS SHOWN ON THIS DRAWING UNLESS OTHERWISE NOTED.
2. APPLICABLE CODES: THE INSTALLATION SHALL COMPLY WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE AND CODE OF THE LOCAL AUTHORITY HAVING JURISDICTION.
3. PERMITS: THE CONTRACTORS SHALL INCLUDE IN HIS BID PRICE THE PAYMENT OF ALL NECESSARY PERMITS. HE SHALL FURNISH THE OWNER PRIOR TO THE FINAL PAYMENT A CERTIFICATE FROM THE ELECTRICAL INSPECTION DEPARTMENT HAVING JURISDICTION CERTIFYING THAT THE ELECTRICAL WORK MEETS ALL REQUIREMENTS OF THE LOCAL INSPECTION AUTHORITIES AND/OR THE NATIONAL BOARD OF FIRE UNDERWRITERS.
3. CONTRACTOR SHALL ADHERE TO ALL SAFETY REGULATIONS AND PROCEDURES REQUIRED BY THE PROJECT FACILITY.
4. ALL WORK SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER.
5. ELECTRICAL SERVICE: SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE UTILITY COMPANY FURNISHING THE SERVICE. CONTRACTOR TO PROVIDE ALL LABOR AND MATERIALS AND MAKE ALL ARRANGEMENTS WITH THE UTILITY COMPANY. SERVICE TO BE 3-PHASE, 4-WIRE, 277/480 VOLTS.
6. GROUNDING: ALL SYSTEM SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE, ANY AND ALL LOCAL CODES, THE UTILITY COMPANIES, AND SPECIAL SYSTEMS AND EQUIPMENT AS REQUIRED.
7. THE ELECTRICAL CONTRACTOR SHALL VISIT THE SITE AND CAREFULLY EXAMINE ALL EXISTING CONDITIONS THAT MAY AFFECT HIS BID. CONTRACTOR SHALL MATCH EXISTING PUMP HOUSE CONDUIT/WIRING PRACTICES WHERE APPLICABLE.
8. WHERE EXISTING ELECTRICAL WORK INTERFERES WITH NEW WORK AND WHERE SUCH INSTALLATIONS ARE TO REMAIN IN USE, THE INSTALLATIONS SHALL BE DISCONNECTED AND RELOCATED AND/OR RECONNECTED TO COORDINATE WITH WORK INDICATED ON THE CONTRACT DRAWINGS AND AS SPECIFIED.
9. GUARANTEE: THE ENTIRE ELECTRICAL INSTALLATION, MATERIAL AND WORKMANSHIP SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR.
10. THE EQUIPMENT, MATERIAL, INSTALLATION, FINAL INSTRUCTIONS IS SUBJECT TO REVIEW AND ACCEPTANCE. SUBMIT FOR REVIEW TO ELECTRICAL ENGINEER: MATERIAL AND EQUIPMENT LIST, DESCRIPTIVE DATA, SHOP DRAWINGS, INSTALLATION AND COORDINATION DRAWING. ALL WIRING, MATERIALS AND INSTALLATIONS, UNLESS OTHERWISE NOTED, SHALL BE SUPPLIED BY THE CONTRACTOR, AND SHALL COMPLY WITH NATIONAL ELECTRIC CODE, NFPA, AND APPLICABLE MARYLANDE STATE AND LOCAL CODES AN SHALL BE LISTED BY UNDERWRITER'S LABORATORIES, INC.

DRAWING NOTES:

1. 600VAC-3P-60A DISCONNECT SWITCH, NEMA 4X (304 STAINLESS STEEL). SQUARE "D" CAT. NO. H362DSCURRB OR EQUAL, WITH CLASS R FUSE KIT, 60A FUSES AND BOLT-ON WATER-TIGHT 1" CONDUIT HUB, LOCATED AT SWITCHRACK.
2. SQUARE "D" DUPLEX PUMP CONTROLLER, CLASS 8941, CAT. NO. CCA18VO2 (FORM C, C13 & C97), NEMA 12 ENCLOSURE, SIZE 1 CONTACTORS WITH 20A CIRCUIT BREAKERS, HOA SWITCHES, LEAD/LAG SWITCH AND ELAPSED TIME METER. DUPLEX PUMP CONTROL PANEL SHALL PROVIDE LEAD/LAG PUMP CONTROL. PROVIDE APPROPRIATE OVERLOAD HEATERS FOR FURNISHED MOTORS. SUMP LEVEL CONTROL TO BE USED AS PILOT DEVICE FOR LEAD/LAG CONTROL. REFER TO DWG. E03 FOR PUMP CONTROL SCHEMATIC.
3. 480VAC, WASH DOWN UNIT HEATER RATED NOT LESS THAN 5KW WITH INTEGRAL THERMOSTAT.
4. 480VAC-20A, NEMA 4 TWIST LOCK PLUG AND RECEPTACLE.

PROJECT DRAWING LIST

25366-E01	NEW PUMP HOUSE COVER SHEET, PROJECT NOTES, SINGLE LINE DIAGRAM AND PUMP HOUSE PLAN
25366-E02	NEW PUMP HOUSE - AREA SITE PLAN
25366-E03	PUMP CONTROL SCHEMATIC WIRING DIAGRAM
25366-E04	NEW PUMP HOUSE FLOW DIAGRAM

REV	DATE	BY	DESCRIPTION
B	12-05-05	TAI	ISSUED FOR BID
A	10-26-05	TAI	ISSUED FOR REVIEW

ENVIRONMENTAL		
SAFETY		
PRODUCTION		
MAINTENANCE		
INST. & CONT.		
PROC. ENG.		
PROJ. ENG.		
DEPARTMENT	DATE	APPROVAL

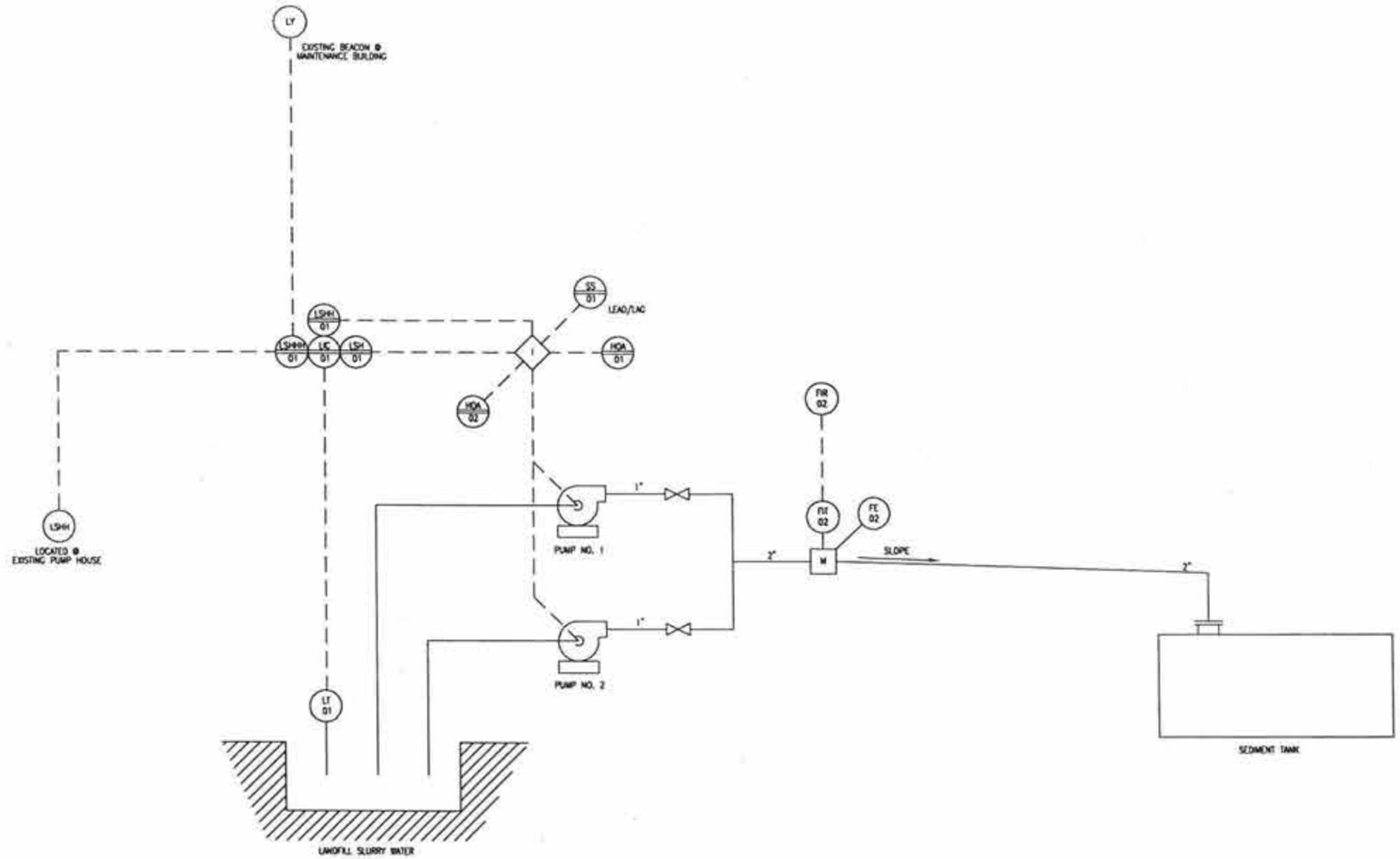
Millennium Inorganic Chemicals

NEW PUMP HOUSE
COVER SHEET, PROJECT NOTES, SINGLE LINE DIAGRAM & PUMP HOUSE PLAN

DESIGNER MAS	DATE 10/24/05	FILE NO. 25366-E01	
DRAWN MAS	DATE 10/24/05	DRAWING NO. 170-E-012	
APPR.	SCALE AS NOTED		
APPR.			

TAI

TAI PROJECT NO. 25366



REV	DATE	BY	DESCRIPTION
B	12-05-05	TAI	ISSUED FOR BID
A	10-26-05	TAI	ISSUED FOR REVIEW

DEPARTMENT	DATE	APPROVAL
ENVIRONMENTAL		
SAFETY		
PRODUCTION		
MAINTENANCE		
INST. & CONT.		
PROC. ENG.		
PROJ. ENG.		

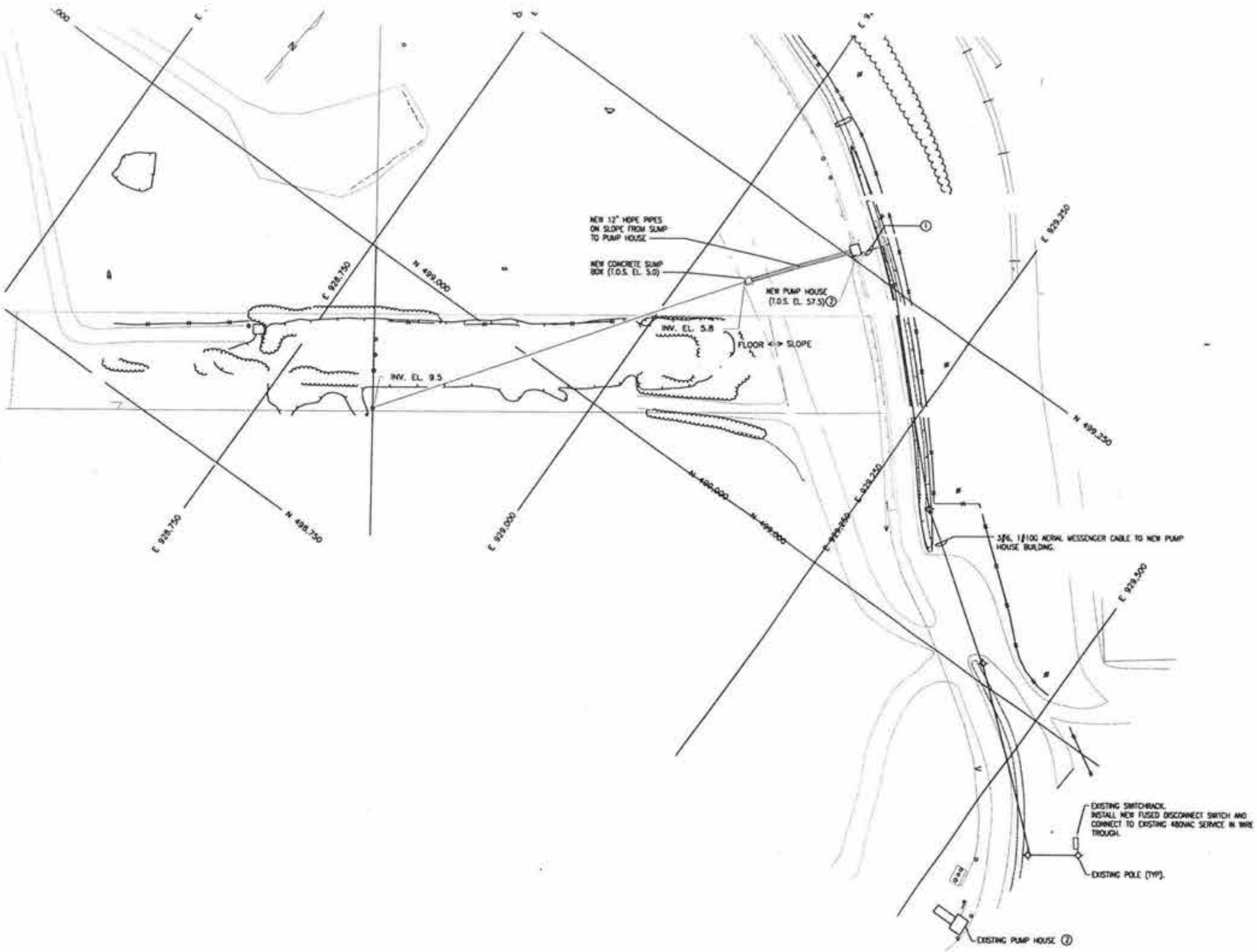
Millennium Inorganic Chemicals

NEW PUMP HOUSE
FLOW DIAGRAM

DESIGNED AB	DATE 10/26/05	TAI NO. 25366-F01	
DRAWN AB	DATE 10/26/05	DRAWING NO. 170-PD-010	
APPD.	SCALE AS NOTED		
APPD.			

TAI

TAI PROJECT NO. 25366



AREA SITE PLAN
SCALE: 1"=50'-0"

DRAWING NOTES:

① PROVIDE UNDERGROUND CABLE FEEDER FROM THE LAST WOODEN POLE IN 1" PVC CONDUIT TO PUMP HOUSE BUILDING. ALL MINIMUM NEC BURIAL DEPTHS SHALL BE MET INCLUDING A 24" BURIAL DEPTH UNDER ROADWAY. ADDITIONALLY, THE 1" PVC CONDUIT SHALL BE SLEEVED WITH A GALVANIZED RIGID PIPE UNDER ROADWAY AND EXTENDING 5 FEET ON EACH SIDE OF ROADWAY. PROVIDE STEEL CONDUIT TRANSITION AT BUILDING WALL ENTRANCE.

② A HIGH LEVEL SIGNAL PRESENTLY IS GENERATED BY THE LEVEL CONTROLLER LOCATED AT THE EXISTING PUMP HOUSE. A HIGH LEVEL ALARM PRESENTLY IS SENT FROM THE EXISTING PUMP HOUSE TO THE MAINTENANCE BUILDING, ROUTED ALONG THE ROAD THAT PASSES BESIDE THE NEW PUMP HOUSE. THE CONTRACTOR SHALL TIE THE NEW PUMP HOUSE HIGH LEVEL ALARM SIGNAL IN SERIES WITH THE EXISTING PUMP HOUSE'S EXISTING HIGH LEVEL ALARM SIGNAL FOR INDICATION OF EITHER AT THE MAINTENANCE BUILDING. REFER TO DWG. E-03 FOR SCHEMATIC REPRESENTATION OF THE ALARM CIRCUIT.

REV	DATE	BY	DESCRIPTION
B	12-05-05	TAI	ISSUED FOR BID
A	10-26-05	TAI	ISSUED FOR REVIEW

DEPARTMENT	DATE	APPROVAL
ENVIRONMENTAL		
SAFETY		
PRODUCTION		
MAINTENANCE		
INST. & CONT.		
PROC. ENG.		
PROJ. ENG.		

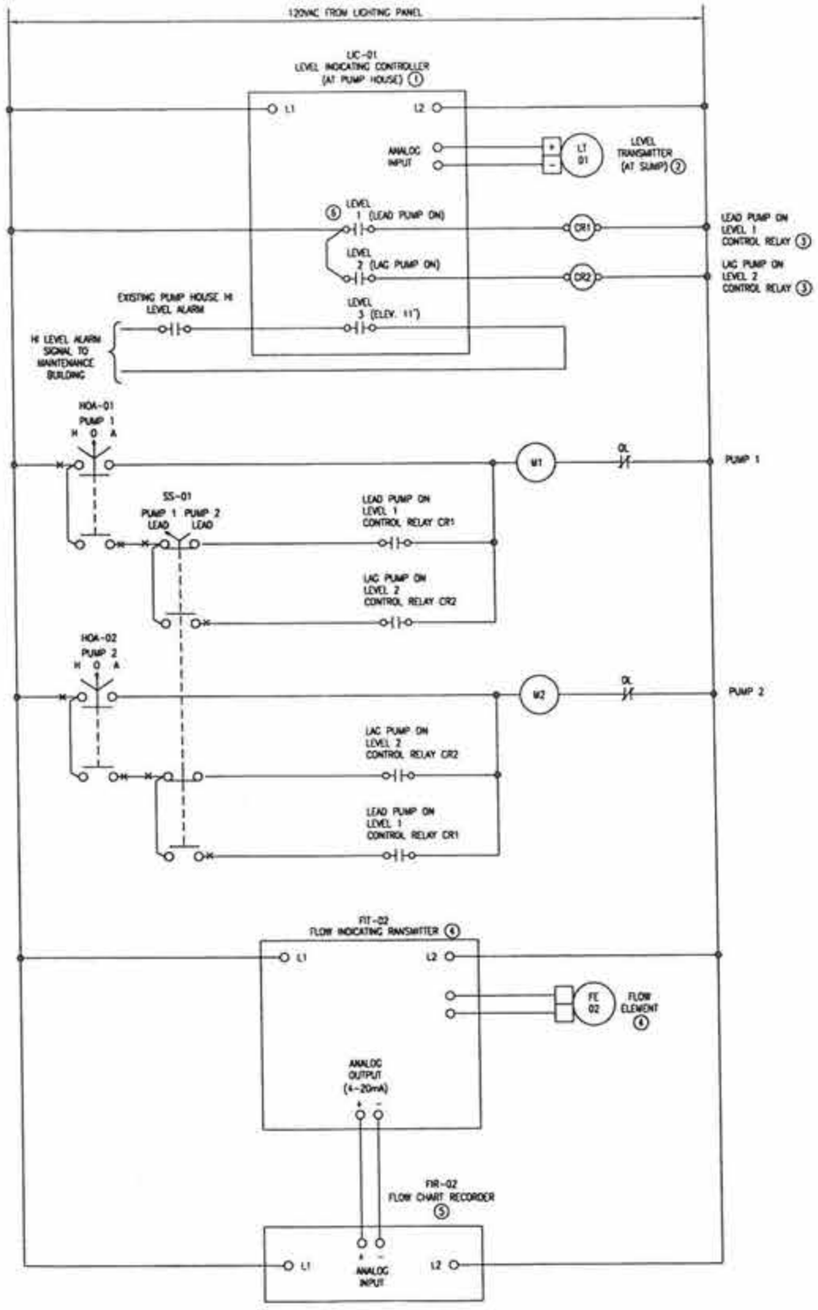
Millennium Inorganic Chemicals

NEW PUMP HOUSE
AREA SITE PLAN

DESIGNED MAS	DATE 10/24/05	TAI NO. 25366-E02	
DRAWN MAS	DATE 10/24/05		
APPR.	SCALE AS NOTED	DRAWING NO. 170-SP-020	
APPR.			

TAI

TAI PROJECT NO. 25366

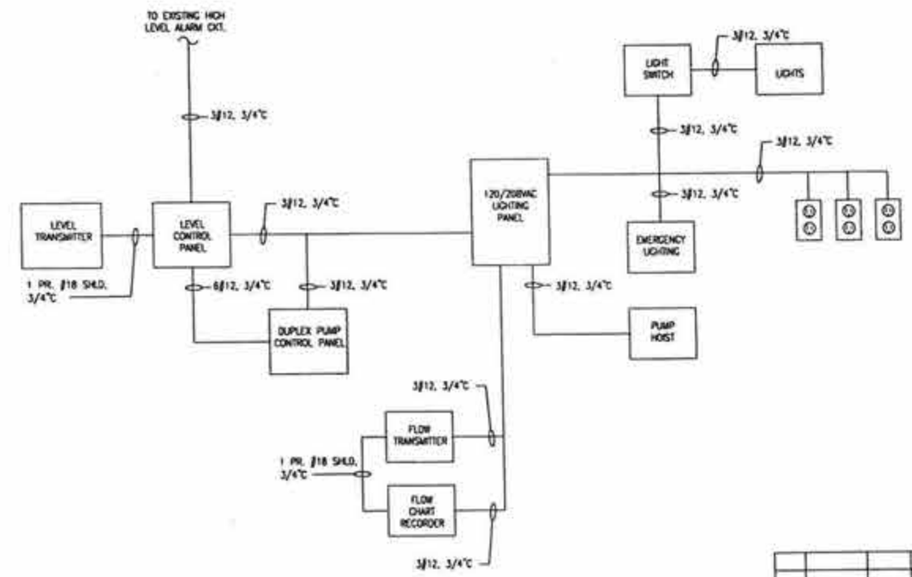


GENERAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR INITIAL CALIBRATION OF FLOWMETER, FLOW CHART RECORDER, LEVEL TRANSMITTER, AND LEVEL DISPLAY CONTROL UNIT. CONSULT PROJECT ENGINEER FOR DESIRED LEVEL AND FLOW CONTROL RANGES.

DRAWING NOTES

1. CONTRACTOR SHALL FURNISH AND INSTALL LEVEL CONTROL DISPLAY UNIT, PRECISION DIGITAL MODEL NUMBER PD690-3-18, IN A NEMA 12 ENCLOSURE AND PROVIDE WIRING SHOWN. DIGITAL DISPLAY SHOULD BE VISIBLE ON EXTERIOR OF NEMA 12 ENCLOSURE, PROPERLY GASKETED TO MAINTAIN NEMA 12 RATING.
2. CONTRACTOR SHALL FURNISH AND INSTALL LEVEL TRANSMITTER, BIKA MODEL NUMBER TYPE LH-10, 0-150 INWC IN SUMP AREA, AND ROUTE APPROPRIATE WIRING FROM LEVEL TRANSMITTER TO LEVEL CONTROL DISPLAY UNIT PANEL AS SHOWN.
3. CONTRACTOR SHALL FURNISH AND INSTALL TWO 120 VAC SPDT ICE CUBE RELAYS WITHIN DUPLEX PUMP CONTROL PANEL AND WIRE AS SHOWN.
4. CONTRACTOR SHALL FURNISH AND INSTALL MAGNETIC FLOWMETER, ROSEMOUNT MODEL NUMBER 8705TSA02C1W0N0B3 AND FLOW INDICATING TRANSMITTER, ROSEMOUNT MODEL NUMBER 8732CT12N0M4 AND WIRE AS SHOWN. INSTALL FLOWMETER IN A MANNER THAT MAINTAINS A FULL FLOW TUBE AT ALL TIMES.
5. CONTRACTOR SHALL FURNISH AND INSTALL CHART RECORDER FOR FLOW, HONEYWELL MODEL NUMBER DR4500CLASSIC. CHART RECORDER WILL TAKE 4-20mA FLOW SIGNAL IN AS INPUT AND PROVIDE TWO PENS, ONE FOR INSTANTANEOUS FLOW RECORDING, AND ONE TO RECORD TOTALIZED FLOW. CHART RECORDER WILL CONTAIN ONE-MONTH CHARTS.
6. CONTRACTOR SHALL CONFIGURE LEVEL CONTROLLER TO PROVIDE THE FOLLOWING LEVEL CONTROL SCHEME:
   - AT 4 FEET OF HEAD (LEVEL 1) RISING, ENERGIZE RELAY CR1 - LEAD PUMP ON
   - AT 6 FEET OF HEAD (LEVEL 2) RISING, ENERGIZE RELAY CR2 - LAG PUMP ON
   - AT 6 FEET OF HEAD (LEVEL 3) RISING, SEND HIGH LEVEL ALARM TO MAINTENANCE BUILDING
   - AT 4 FEET OF HEAD FALLING, DE-ENERGIZE RELAY CR2 - LAG PUMP OFF; DISABLE HIGH LEVEL ALARM
   - AT 1 FOOT OF HEAD FALLING, DE-ENERGIZE RELAY CR1 - LEAD PUMP OFF



CONDUIT BLOCK DIAGRAM

REV	DATE	BY	DESCRIPTION
B	12-05-05	TAI	ISSUED FOR BID
A	10-26-05	TAI	ISSUED FOR REVIEW

DEPARTMENT	DATE	APPROVAL
ENVIRONMENTAL		
SAFETY		
PRODUCTION		
MAINTENANCE		
INST. & CONT.		
PROC. ENG.		
PROJ. ENG.		

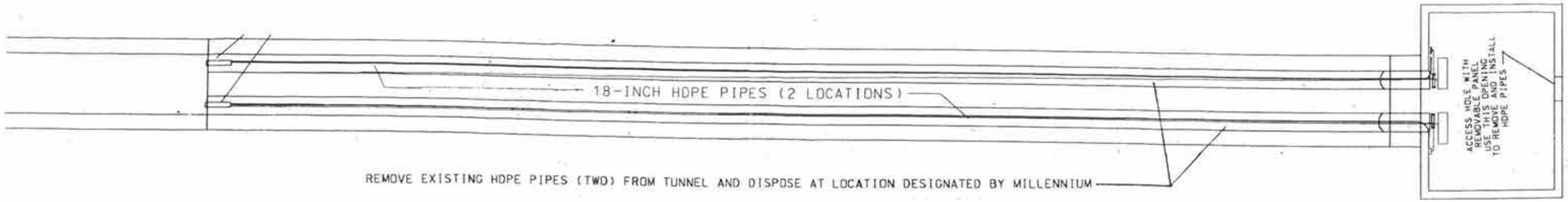
Millennium Inorganic Chemicals

NEW PUMP HOUSE
PUMP CONTROL SCHEMATIC

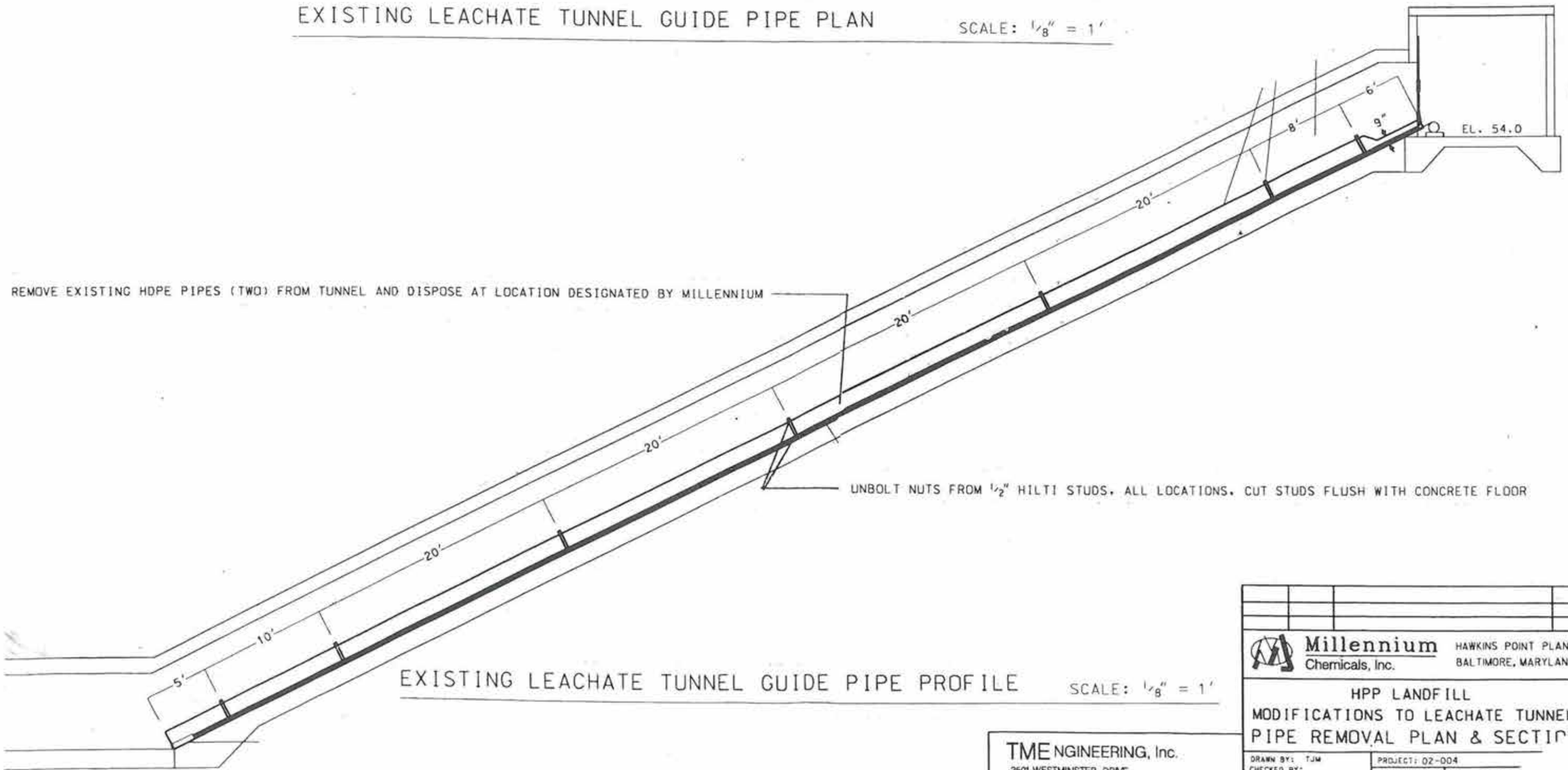
DESIGNED AB	DATE 10/26/05	TAI NO. 25366-E03	
DRAWN AB	DATE 10/26/05	DRAWING NO. 170-E-013	
APPR.	SCALE AS NOTED		
DATE			

TAI

TAI PROJECT NO. 25366



EXISTING LEACHATE TUNNEL GUIDE PIPE PLAN SCALE: 1/8" = 1'



EXISTING LEACHATE TUNNEL GUIDE PIPE PROFILE SCALE: 1/8" = 1'

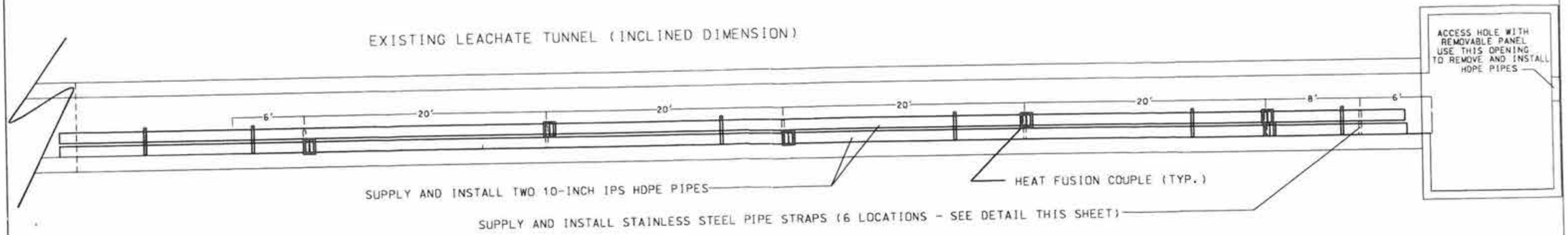
Millennium Chemicals, Inc.
HAWKINS POINT PLANT
BALTIMORE, MARYLAND

HPP LANDFILL
MODIFICATIONS TO LEACHATE TUNNEL
PIPE REMOVAL PLAN & SECTION

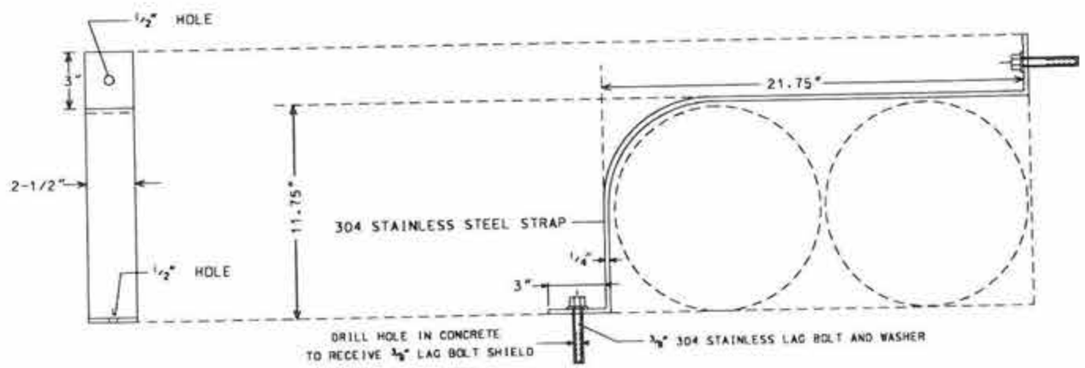
TME NGINEERING, Inc.
2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832 (410) 792-2467

DRAWN BY: TJM
CHECKED BY:
ACCEPTED BY:
APPROVED BY:

PROJECT: 02-004
DATE: 4-16-05
SCALE: AS SHOWN
DRAWING 1



LEACHATE TUNNEL GUIDE PIPE REPLACEMENT PLAN SCALE: 1/8" = 1'



STRAP FASTENER INSTALLATION
(TYPICAL ALL HOLES)

PIPE STRAP DETAIL SCALE: 1-1/2" = 1'

REV. 1	9-8-05	AS-BUILT	TJM

Millennium Chemicals, Inc.
HAWKINS POINT PLANT
BALTIMORE, MARYLAND

HPP LANDFILL
MODIFICATIONS TO LEACHATE TUNNEL
GUIDE PIPE REPLACEMENT

TME NGINEERING, Inc.
2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832 (410) 792-2467

DRAWN BY: TJM
CHECKED BY:
ACCEPTED BY:
APPROVED BY:

PROJECT: 02-004
DATE: 4-16-05
SCALE: AS SHOWN

DRAWING NUMBER
2 OF 2

APPENDIX E
Environmental Monitoring Plan

GROUNDWATER MONITORING PLAN

FOR THE

TRONOX

HPP LANDFILL

BALTIMORE, MARYLAND

April 27, 1992

REVISED June 2011

REVISED AUGUST 2019

Prepared For:

TRONOX PIGMENTS, USA

3901 FORT ARMISTEAD ROAD

BALTIMORE, MARYLAND 21226

Revised August 2019 By:

TM ENGINEERING, INC.

2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832

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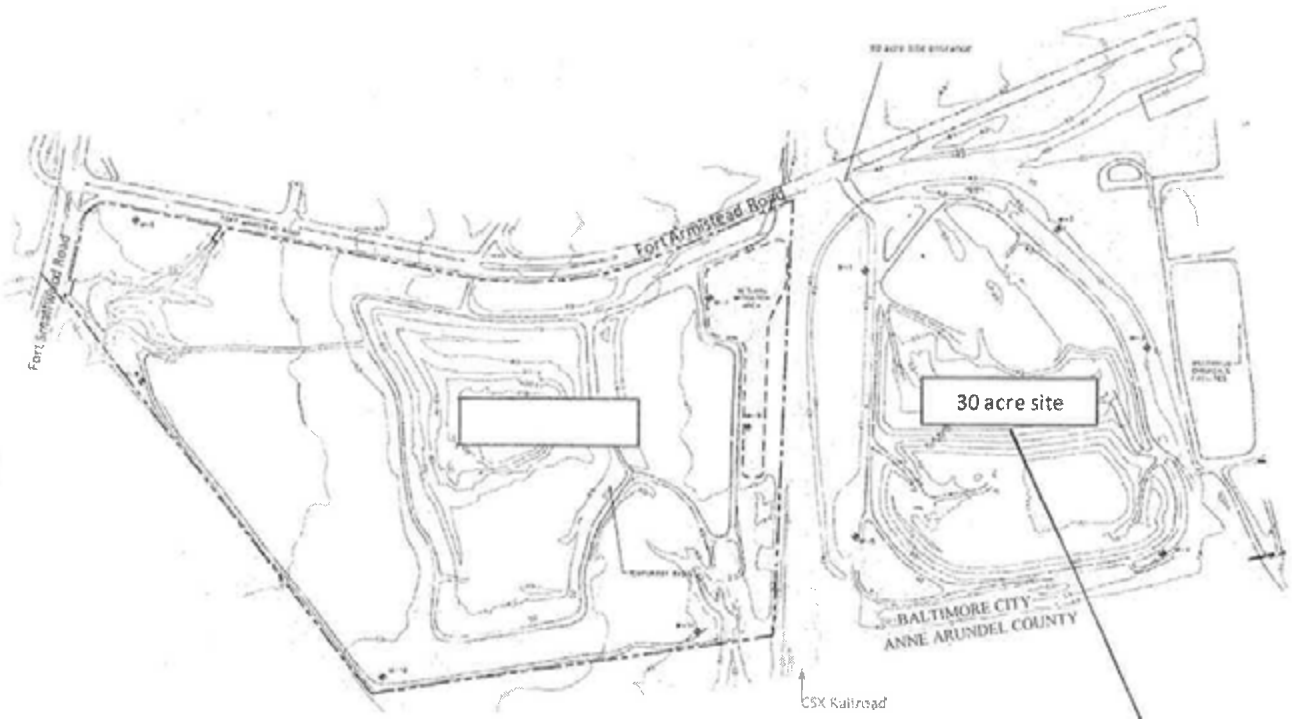
1.0 INTRODUCTION

This Groundwater Monitoring Plan has been prepared for TRONOX Hawkins Point Plant Landfill (HPP Landfill) operating under a Refuse Disposal Permit 92-24- 03-1 JA issued by the Maryland Department of the Environment (MDE) June 22, 1992 and re-issued, with the most recent permit, as Permit 2015-WIF-0527A on December 4, 2015. The Tronox HPP Landfill is a 30-acre parcel receiving non-hazardous industrial waste from titanium dioxide manufacturing operations. Although the manufacturing operations have ceased, the landfill still receives non-hazardous solid wastes generated during maintenance of environmental controls and plant property. These wastes consist of excavated soil, clean-up of residual titanium ore, titanium dioxide or other soil-like materials remaining from the manufacturing operations of the site. This plan sets forth the methods of sampling and analytical testing of groundwater samples from the monitoring well network at the landfill facility in accordance with the regulatory requirements of COMAR 24.07.08(17) and Permit 2005-WIF-0527A, Part III. Section F.

1.1 Facility Location

The HPP Landfill is located in an area known as Hawkins Point in the southern part of Baltimore City, Maryland at the southern border with Anne Arundel County. The city-county boundary marks the southern property line of the landfill tract. The landfill site is contiguous with the HPP Plant parcel and is bound on the north by Fort Armistead Road, on the west by the Cabot Industrial Park, on the south by Anne Arundel County and on the east by the Hawkins Point Plant. The location of the facility is shown in Figure 1.



TRONOX HPP LANDFILL

1.2 General Facility Information

The HPP Landfill consists of one monitorable unit situated on a 30-acre site. Monitoring-wells M-1 through M-5 were installed under the ownership of the original permittee in October 1992 at which time routine sampling and monitoring began.

1.3 Waste Stream Characteristics

The waste stream as allowed by Permit 2005-WIF-0527 A and subsequent amendments and renewals consists of the following constituents:

a. Primary gypsum
h. Secondary gypsum
c. Dewatered dredged solids from the chloride process settling basins
d. Refractory Brick and brick solids from the calciner kilns, batch attack vessels
e. Settled solids from the settling basins on the landfill
f. Batch Attack Mud
g. Batch Attack Vessel Refractory Brick and Brick Solids
h. Chlorinator Refractory Brick and Brick Solids
i. Excavated soil, clay and rubble
j. Residual magnesium hydroxide and unreacted ore residues from the batch attack process

Analytical tests are periodically performed on these wastes and submitted to MDE for review.

2.0 GROUNDWATER MONITORING WELL NETWORK

2.1 Introduction

The groundwater monitoring well network at the HPP Landfill consists of five (5) monitoring wells installed in the uppermost significant saturated zone within unconsolidated natural soil deposits beneath the landfill. Geologically, the sediments are part of the Patapsco Formation in the Patuxent Group within the Atlantic Coastal Plain. The initial hydrogeologic investigation for the landfill was submitted as Phase II of the Permit Application, and two supplements were subsequently provided on December 12, 1991 and February 7, 1992. Documentation of the monitoring well installations with well logs is contained in a report by Haley and Aldrich, Inc., December 9, 1992. A copy of the report is contained in Appendix A.

2.2 Monitoring Wells

In accordance with the Code of Maryland Regulations (COMAR) 26.04.07.08(17), COMAR 26.04.04, and provisions 1.1.2 and 1.1.6 of the Refuse Disposal Permit issued June 22, 1992, a groundwater detection monitoring system was installed to collect samples which meet the following:

- Represent groundwater quality of the geologic media being monitored;
- Capable of determining effect of operations on groundwater quality;
- Determine whether potentially contaminated groundwater is migrating off the property; and
- Represent groundwater quality directly downgradient of the limits of waste placement.

The groundwater monitoring wells consist of 5 wells, M-1 through M-5. The well locations along with the groundwater contour maps are shown in Appendix B, Monitoring Well Location and Groundwater Contour Map. The wells were constructed in general accordance with the Specifications for the Design and Construction of Groundwater Monitoring Wells at Solid Waste Disposal Facilities recommended by the Maryland Department of the Environment, Hazardous and Solid Waste Management Administration, updated December

9, 1991. A copy of the specifications recommended by MDE is contained in Appendix C. The wells range in depth from 137 to 192 feet below the existing ground surface and the screened portion of each well casing column is adjacent to the uppermost significant saturated zone encountered during drilling which was at least ten feet in thickness and capable of producing enough groundwater for sampling. A summary of the pertinent well details is presented in Table 1.

2.3 On-Site Decontamination Procedures

After each monitoring well installation, the drill rig, associated tools and down-hole equipment were decontaminated with a wash of de-ionized distilled water to minimize the potential for spreading potential contamination from one borehole to another. All decontamination procedures followed Standard Procedure 1 in Appendix D.

2.4 Protection and Maintenance of Monitoring Well System

The groundwater monitoring well network is situated away from anticipated operational traffic to avoid possible damage from equipment and vehicles. The integrity of each well will be maintained throughout the life of the monitoring program. All of the monitoring wells will be visually inspected each time the well is accessed for sampling or for water level measurements and the condition of the wells will be recorded. Maintenance or repairs will be made if damage or inability to obtain a reliable sample is reported. All repairs completed on monitoring wells will be documented in the reports of groundwater quality required to be submitted to MDE or in the annual operational report.

2.5 Monitoring Well Development

All monitoring wells were developed to remove excessive amounts of fine soil particles from the filter pack and geologic formation immediately adjacent to the well using a bailer, compressed air and/or submersible pump. Development procedures consisted of evacuating water in the well with

repeated intermittent pumping to create an agitating surge action to dislodge, suspend and evacuate fines. The development was continued until reasonably clear water was obtained from each well. Water removed from the wells was discharged away from the well head.

2.6 Field Surveys

Upon completion, all well locations were horizontally located in the field and elevations were measured by a registered land surveyor. The elevation of the ground surface at each well and the top of PVC casing (with cap removed) were determined to within 0.01 foot from project bench marks of known elevation. The elevations are presented in Table I.

2.7 Decommissioning (Abandonment) of Monitoring Wells

Wells which may become damaged beyond repair or wells which have attained the end of the monitoring period will be abandoned in accordance with COMAR 26.04.04. A copy of this regulation is contained in Appendix D as Standard Procedure 2.

3.0 GROUNDWATER SAMPLING PROGRAM

3.1 Introduction

In compliance with the requirements of Permit 2015-WIF-0527A, groundwater samples are collected from each of the 5 monitoring wells on a semi-annual basis. The samples are tested by an analytical laboratory approved by MDE for a parameter list specified in the permit. The parameters are compared to previous values to determine any changes and for exceedance of maximum concentration levels (MCLs). Water levels in each well are measured and recorded monthly.

3.2 Parameter List

The parameters which require analytical testing by Permit 2015-WIF-0527A are shown in the Permit as Table I, Volatile Organic Compounds and Table II, Elements and Indicator Parameters. The tables include the required practical quantitation limits (PQL's) for each parameter. Copies of these tables are included at the end of this narrative as Permit Table I and Permit Table II. Permit Table II corresponds to the majority of primary and secondary drinking water parameters.

Table 2 (as distinguished from Permit Table II) lists the required preservatives, sample containers, and holding times for the tested parameters. All information included in Table 2 is consistent with criteria established in 40CFR136. Specific methods and laboratory reporting limits are also listed in Table 2. The analytical methods to be used for laboratory analysis of the groundwater samples are consistent with Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Standard Methods (18th edition), Standard Methods for Chemical Analysis of Water and Wastes and/or other industry acceptable methods. All lab analyses reports shall detail the actual test parameters which shall conform to EPA procedures.

3.3 Sample Collection Frequency

In accordance with Permit 2015-WIF-0527A, Part III, F, groundwater samples are collected semi-annually in the first quarter, typically during the month of January, and in the third quarter, typically during July.

3.4 Groundwater Levels/Topographic Map/Groundwater Flow Direction

Groundwater levels are determined in each well on a monthly basis and during each sampling event prior to purging the well as a minimum. The groundwater elevation data are collected in accordance with Standard Procedure 3, the sampling contractor's Standard Operating Procedure for Groundwater Well Sampling. Annually, aerial photogrammetry is obtained for the active landfill and surface mining portion of the site and a topographic map prepared from the data. The monitoring well locations and groundwater level data are utilized to construct a piezometric surface map, indicating groundwater flow direction and rate of seepage.

4.0 SAMPLE COLLECTION PROTOCOL

To ensure that representative samples are obtained from the monitoring wells, the following sample collection protocol is followed:

4.1 Personnel Training

Each member in the sampling team is trained in the use of necessary sampling equipment, proper decontamination procedures, procedures for data recording, and chain of custody protocol. A copy of this Groundwater Monitoring Plan accompanies the sampling team. on each sampling event and is maintained at the facility. All members of the sampling team. have read and comprehended the contents of this Plan before application in the field.

4.2 Health and Safety

A health and safety program for groundwater sampling has been prepared and implemented to ensure the safety of all personnel. Each member of the sampling team is familiar with all health and safety procedures contained in the plan.

4.3 Field Equipment and Calibration

A variety of field equipment is used to collect representative samples from monitoring wells. A summary of equipment currently utilized at the landfill during groundwater sampling is provided below, but it should be recognized that substitute equipment of equal performance or greater performance as technological advances become available, will be implemented from time to time.

Water Level Indicator

An electrical water level indicator is currently used to measure groundwater levels in the monitoring wells. This device detects water levels by lowering a sensing tip attached to an electrical cable graduated with markers at every tenth of a foot. The sensing tip consists of two insulated electrodes creating an open circuit in air. When the tip comes in contact with the water surface, the circuit is closed and a light and audible alarm are turned on.

The depth to water is read on the graduated cable at the reference point (top of PVC well casing) and recorded. Standard Procedure 3, Section 7.1.5, in Appendix D is followed to obtain water levels. The maintenance frequency and calibration procedures follow the manufacturer's recommendations.

pH Meter

To determine the hydrogen ion activity of the groundwater sample, a combined pH and temperature meter is used when measurement of pH is conducted in the field. The proper use and calibration of this piece of equipment is documented in Standard Procedure 4 in Appendix D. This procedure is the sampling contractor's blanket Standard Operating Procedure for Field Determinationof Residual Chlorine, pH, Temperature, Dissolved Oxygen, Carbon Dioxide, Specific Conductance and Oxidation-Reduction Potential. It should be noted that only pH, temperature and specific conductance apply to the facility.

Electrical Conductivity Meter

An electrical conductivity meter is used to determine the specific conductivity of the sample in the field. Standard Procedure 4 in appendix D outlines the procedure for use and calibration of this instrument.

Purge Pumps

Grundfos or Wilden M-2 pumps are used to evacuate the wells prior to sampling and to extract the groundwater sample. The guidelines for operation and maintenance of the pumps are contained in Standard Procedure 3, Section 7.1, of Appendix D. If one pump is used it is decontaminated before sampling any wells, after each individual well sampling and at the end of the well sampling event before leaving the site. If the purge pump is ineffective, a bailer dedicated to each specific well is used to purge the well and obtain the sample.

Bailers

Bailers consisting of disposable fluorocarbon (Teflon) tubes with check valves at the base are used to purge and sample low yield wells in accordance with Standard Procedure 3, Section 7.1 in Appendix D.

4.4 Decontamination of Equipment

To assure the integrity of groundwater samples, dedicated or disposable purging and sampling equipment are employed. In the event that non-dedicated purging and sampling equipment are used, proper decontamination procedures are followed. These procedures include decontamination of all measuring, purging, sampling and field test equipment required in Standard Procedure 1 in Appendix D. This activity is to take place at the maintenance building adjacent to the administration trailer.

4.5 Monitoring Well Purging

Prior to sample collection, all monitoring wells are purged to remove any stagnant water in the casing to ensure that a sample representative of groundwater in the porous media is obtained. Standard Procedure 3, Section 7.1, in Appendix D outlines the proper purging procedures and documentation required at the facility. All discharge generated during purging and sampling is directed away from the well head into the surface water collection system where it is discharged from the site through a permitted surface water outfall.

4.6 Sampling Devices

Sampling devices consist of a dedicated in-well pump, but a hollow stainless steel or fluorocarbon (Teflon) tubes with an opening and check valve at the base may be used. The bailer is tethered to a nylon rope used to raise and lower the bailer into and out of the well. The diameter of the bailer is slightly smaller than the inside diameter of the PVC well casing. Sampling equipment is not allowed to come into contact with the ground.

Every well has a dedicated pump. Should a non-dedicated electrically operated pump or non-dedicated bailer ever be used, the bailer and pump will be decontaminated in accordance with the procedures of Section 4.4. before purging the well. After purging, a groundwater sample is collected from each well with the dedicated pump or a disposable Teflon bailer, one for each well. If a single bailer is used for all wells, the decontamination procedures of Section 4.4 are implemented after each well is sampled.

4.7 Sample Collection and Transportation

Containers used for sample collection are preserved by the laboratory using the appropriate preservative as listed in Table 2. The samples are transferred from the pump discharge lines to the containers in such a manner as to avoid agitation and aeration. After collection, the samples are delivered to the laboratory in coolers insulated to maintain four degrees centigrade (4° C). The procedures which are followed for sample collection are contained in Standard Procedure 3 in Appendix D. In general, the order in which the wells are sampled is based on well yield and the relative degree of contamination. Wells with low yield, poor recovery and low contamination levels are purged first, but due slow to very slow recovery, the sample may not be obtained until the latter part of the sampling event. If well yields are similar, the upgradient monitoring well(s) are sampled first, followed by the downgradient wells.

Typically, the order in which sample containers are filled with groundwater is based on the order of volatilization, with the samples for testing of the most volatile constituents containerized first. The general order of sampling occurs as follows:

1. Volatile Organic Compounds (VOC's)
2. COD
3. dissolved metals
4. total alkalinity
5. hardness
6. sulfate and chloride
7. nitrates
8. fluoride

Each time a groundwater sample is obtained from a monitoring well, temperature and specific conductance are measured in the field following their respective protocol defined in the Standard Procedure 4 contained in Appendix D. A trip blank is run for each sampling session. QA/QC samples are run in the lab every 10 samples to validate the tests and the equipment. Any random sample is analyzed in the laboratory using the same methods and procedures as the rest of the samples from the same sampling event.

4.8 Chain of Custody

To track samples from the time of collection through laboratory analysis, a chain of custody protocol has been established. Elements of the protocol include sample labels with specific information, field data sheets, chain of custody records and a laboratory logbook as defined in Standard Procedure 5, Appendix D. The elements are discussed in the following:

Sample Labels

The labels for sample bottles are provided by the analytical laboratory. The labels are waterproof and firmly affixed to the container to prevent loss of sample identification

The label is filled out with the following information:

1. facility where sample was obtained (Hawkins Point Plant (HPP) Industrial Waste Landfill)
2. location within facility where sample was obtained (landfill site)
3. monitoring Well No. from which sample was collected
4. date ofcollection
5. name ofcollector
6. preservatives used
7. parameter testrequested
8. sample identification number

Field Data Sheet

A field data sheet is completed for each monitoring well sampled. The field data sheet currently used is part of the Chain of Custody form. An example of the field data sheet is shown in Appendix E. This sheet includes:

1. project number
2. well number
3. well depth

4. facility name and location
5. name of personnel present
6. static water level
7. top of casing elevation (referenced to mean sea level, datum of 1929, see Table 1)
8. groundwater elevation
9. type of casing material and diameter (2-inch PVC, etc.)
10. volume of static water in well
11. screened interval within well
12. date of purging, purging method, purge volume and pumping rate
13. date, time and method of sampling
14. notation of any evidence of unauthorized tampering with www woo damage to lock or cap
15. field observations and notes

Chain of Custody Record Form:

A Chain of Custody Record form accompanies each sample to document possession of the sample from the time the sample is collected to the time the sample is received at the laboratory. The Chain of Custody Record from also serves as the Request for Analysis form. An example of the Chain of Custody record form appears in Appendix E. The Chain of Custody Record form contains the following information:

1. laboratory sample identification and number
2. sample matrix
3. number of samples
4. sampling date and time
5. names of samplers
6. client name, facility, project name and project number
7. name and signature of person relinquishing and of person receiving samples

8. temperature of sample cooler upon receipt at laboratory
9. time and date samples were relinquished and received
10. notes

5.0 QUALITY ASSURANCE/ QUALITY CONTROL

To ensure the validity of the sample collected and the data reported by the laboratory, a quality assurance and quality control (QA/QC) program is implemented for field and laboratory.

5.1 Field QA/QC

Laboratory analyses of a field blank (to check extraneous sample contamination from equipment or atmosphere) and a duplicate are performed for all sampling events at the facility. One field/equipment blank is collected on each day of the sampling event or ten percent of the total number of samples, whichever is greater. The field blank is collected in the same manner as the groundwater samples by passing distilled/de-ionized water through the equipment used in the field (including filters if samples are to be field filtered). This procedure ensures that equipment or ambient conditions at the time of sampling have not impacted the integrity of the groundwater samples. A custody seal is placed on each shipping container to discourage and detect sample tampering.

5.2 Laboratory QA/QC

The laboratory uses standards, duplicates, spikes and laboratory blanks to calibrate and identify any potential interference. The results of the laboratory quality control samples are used as an indicator of performance or to identify a source of cross contamination, but never to adjust the analytical data. All laboratory QA/QC is managed and maintained by the analytical laboratory. The laboratory is approved by MDE and copies of their QA/QC information should be available in MDE files. The laboratory analytical results provided in reports and required to be submitted to MDE will include the laboratory analytical method for each test along with the detection limit (PQL). The laboratory method detection limit, at a minimum, meets the corresponding established maximum contaminant level.

6.0 METHOD OF EVALUATING AND REPORTING DATA

6.1 General

Based upon the current Permit 2015-WIF-0527 A, Part III, Sections E and F, groundwater level measurements, analyses of groundwater quality, and a semiannual water quality report containing summary and interpretive discussion of all analyses of the chemical quality of groundwater from all of the monitoring wells specified in this landfill's approved groundwater monitoring plan (G&SWM) plan shall be submitted to MDE within 90 days of the close of the first and third calendar quarters.

A qualified groundwater scientist or professional shall evaluate the results of the analyses and advise the permittee of any changes in water quality or any exceedance of applicable State and Federal guidelines.

Parameters must be measured in their Practical Quantitation Limits (PQL) and all "J" values ("J" values are analytical results which are below the PQL but can be quantified by estimation) must be reported. A complete copy of the laboratory data and the interpretive findings shall be included in each semiannual water quality report. The analytical data for each well is to be presented in a spreadsheet in a time series format where quality data for each parameter can be observed simultaneously, to facilitate intra-well comparison.

6.2 Analysis

In order to assess whether a change in groundwater quality has occurred, the facility utilizes the Student "'t" test to determine whether a statistically significant change has occurred in the parameters. After each sampling event, the test result for each parameter is compared to the mean of a selected set of background data to determine if a significant difference has occurred in the groundwater constituents on an intra-well basis. The background data is periodically

updated when a sufficient number (four or more) data points becomes available. The "maximum contaminant levels" (MCL's) for Primary and Secondary Drinking Water Regulations from the U.S. Environmental Protection Agency are utilized by the facility to determine exceedance. A copy of these values, current as of March 2011, is contained in Appendix H. The MCL's are the same as those contained in COMAR 26.04.01.06.

Upon detection of the exceedance of an MCL, Action Level or other health standard for the first time, the MDE must be notified within 24 hours of the receipt of the analytical data and the monitoring point(s) in which the standard was exceeded must be immediately resampled to verify the initial detection. This resampling must occur as soon as possible, and no later than 30 days (or longer time, but as soon as possible, which allows for a statistically independent sample) following notification of the permittee of the exceedance of the standard by the groundwater professional after initially reviewing and assessing the analytical data.

6.3 Submittals and Time-lines

The following is an outline for time-lines for submittals as required in Permit 20~~01~~5-WIF-0527 A for the on-going monitoring program.

1. Groundwater levels from each well are measured and recorded monthly and included in the semi-annual water quality report.

2. All wells are sampled semi-annually during the first and third calendar quarter. The results of the analytical testing and the analysis of data by the groundwater professional are submitted to MDE within 90 days after the close of the first and third calendar quarter (before end of June and end of December).

3. If analytical results from samples collected from any sources associated with the shall advise the Department of the first-time exceedance and any significant increase thereafter above MCL levels within 24 hours of receipt of the analytical data verifying this occurrence.

4. The semi-annual report shall include a topographic map and piezometric contour map showing the locations of the monitoring wells and piezometers.

7.0 REFERENCES

1. Refuse Disposal Permit 92-24-03-l 3A, issued by the State of Maryland, Department of the Environment, Solid Waste Division, June 22, 1992, expiration date June 22,1997.

2. Refuse Disposal Permit 1997-WIF-0527 issued by the State of Maryland, Department of the Environment, Solid Waste Division, April 2, 1999, expiration date April 11,2004.

3. Refuse Disposal Permit 2004-WIF-0527 issued by the State of Maryland, Department of the Environment, Solid Waste Division, April 12, 2004, expiration date April 11, 2009.

4. Refuse Disposal Permit 2004-WIF-0527A issued by the State of Maryland, Department of the Environment, Solid Waste Division, January 5, 2011, expiration date January 4, 2016.

5. Letter from State of Maryland, Department of the Environment, November 12, 1999 signed by A. Hussain Alhija, chief Design and Certification Division with modifications to Permit - 1997-WIF-0527.

6. Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992. American Public Association, Washington, D.C.

7. Code of Maryland Regulations, COMAR, Title 26, Subtitle 04, Regulation of Water Supply, Sewage Disposal, and Solid Waste, Chapter 07, Solid Waste Management.

8. Refuse Disposal Permit 2015-WIF-0527A issued by the State of Maryland, Department of the Environment, Solid Waste Division, December 4, 2015, expiration date December 3, 2020.

TRONOX HPP LANDFILLL GROUNDWATER MONITORING PLAN

TABLE 1 MONITORING WELL DIMENSIONAL DATA

Well No.		Depth	Top of Casing(1)	Ground Surface	Well Screen Interval	Filter Sand	Saturated Zone	Clay Seal	Casing Diam.
Current	Prev.	el., ft. msl	el., ft. msl	el., ft. msl	el., ft. msl	el., ft. msl	el., ft. msl	el., ft. msl	m.
HPP-1	M-1	-92.0	46.8	45.0	-81 to -91	-74 to -92	-77 to -92	-71 to -74	4
HPP-2	M-2	-131.5	61.8	60.9	-119.6 to -129.6	-115 to -131.5	-118 to -131.5	-113 to -115	4
HPP-3	M-3	-119.0	57.8	56.0	-104 to -114	-96 to -119	-101 to -119	-94 to -96	4
HPP-4	M-4	-123.2	41.6	40.0	-110 to -120	-104.5 to -123.2	-102 to -123.2	-101 to -104.5	4
HPP-5	M-5	-120.0	47.1	45.0	-105 to -115	-100 to -120	-102 to -120	-97 to -100	4

(1) Top of PVC well casing inside of outer steel protective pipe = Reference point for groundwater measurements.

TABLE 2. SAMPLE HANDLING AND TESTING REQUIREMENTS

Parameter	Container (1)	Preservative (2)	Max. Holding Time	Method Utilized	Reporting Limit (mg/l)
pH	P,G	NONE	N/A	Field	0.1 (SU)
Alkalinity	P,G	NONE	14 days	EPA-310.1	1
Hardness	P,G	NONE	28 days	EPA-130.2	1
Chloride	P,G	NONE	28 days	EPA-325.2	1
Specific Conductance	P,G	NONE	N/A	Field	1
Nitrate	P,G	H2SO4 to pH<2	28 days	EPA-353.2	1
Nickel T&D	P,G	HNO3 to pH<2	28 days	SW-6010	0.05
Sulfate	P,G	HNO3 topH<2	6 months	EPA-375.4	0.02
Copper T&D	P,G	HNO3 to pH<2	28 days	SW-6010	1
Flouride	P,G	NONE	28 days	EPA-340.2	0.010
Arsenic T&D	P,G	HNO3 to pH<2	6 months	SW-6020	0.1
Barium T&D	P,G	HNO3 to pH<2	28 days	SW-6010	0.005
Cadmium T&D	P,G	HNO3 topH<2	6 months	SW-6020	0.010
Chromium T&D	P,G	HNO3 to pH<2	28 days	SW-6010	0.0005
Lead T&D	P,G	HNO3 to pH<2	6 months	SW-6020	0.020
Zinc T&D	P,G	HNO3 to pH<2	6 months	SW-6010	0.005
Chemical Oxgen Demand	P,G	HNO3 to pH<2	6 months	EPA-410.4	0.020
Mercury T&D	P,G	HNO3 to pH<2	6 months	EPA-7470A	10
	P,G		28 days		0.0002
	P,G		6 months		

(1) Containers consist of P - Polyethylene Plastic and G - Glass

(2) All samples will be maintained at 4°C

TRONOX HPP LANDFILLL GROUNDWATER MONITORING PLAN

PERMIT TABLE I. MONITORING PARAMETERS

VOLATILE ORGANIC COMPOUNDS	PQL (ppb)	VOLATILE ORGANIC COMPOUNDS	PQL (ppb)
Acetone	5.0	Cis-1,2-Dichloroethane	1.0
Acrylonitrile	5.0	Trans-1,2-Dichoroethene	1.0
Benzene	1.0	Methylene chloride	1.0
Bromochloromethane	1.0	1,2-Dichloropropane	1.0
Bromodichloromethane	1.0	Trans-1,3-Dichloropropene	1.0
Bromoform	1.0	Cis-1,3-Dichloropropene	1.0
Bromomethane	1.0	Ethylbenzene	1.0
2-Butanone	5.0	2-Hexanone	5.0
Carbon disulfide	1.0	Iodomethane	1.0
Carbon tetrachloride	1.0	4-Methyl-2-pentanone	5.0
Chlorobenzene	1.0	Methyl Tertiary Butyl Ether	2.0
Chloroethane	1.0	Styrene	1.0
Chloroform	1.0	1,1,1,2-Tetrachloroethane	1.0
Chloromethane	1.0	1,1,2,2- Tetrachloroethane	1.0
Dibromochloromethane	1.0	Tetrachloroethene	1.0
1,2-Dibromo-3-chloropropane	1.0	Toluene	1.0
1,2-Dibromoethane	1.0	1,1,1- Trichloroethane	1.0
Dibromomethane	1.0	1,1,2- Trichloroethane	1.0
1,2-Dichlorobenzene	1.0	Trichloroethene	1.0
1,4-Dichlorobenzene	1.0	Trichlorofluoromethane	1.0
Trans-1,4-dichloro-2-butene	5.0	1,2,3-Trichloropropane	1.0
1,1-Dichloroethane	1.0	Vinyl acetate	1.0
1,2-Dichloroethane	1.0	Vinyl chloride	1.0
1,1-Dichloroethene	1.0	Xylene	1.0

TRONOX HPP LANDFILLL GROUNDWATER MONITORING PLAN

PERMIT TABLE II. MONITORING PARAMETERS

ELEMENTS AND INDICATOR PARAMETERS	PQL (ppm)	ELEMENTS AND INDICATOR PARAMETERS	PQL (ppm)
Total Antimony	0.0020	Total Silver	0.0100
Total Arsenic	0.0020	Total Sodium	0.2
Total Barium	0.0100	Total Thallium	0.0020
Total Beryllium	0.0020	Total Vanadium	0.0100
Total Cadmium	0.0040	Total Zinc	0.0100
Total Chromium	0.0100	pH	0.1 (SU)
Total Calcium	0.08	Alkalinity	1
Total Cobalt	0.0100	Hardness	0.5
Total Copper	0.0100	Chloride	0.39
Total Iron	0.005	Specific Conductance	1
Total Lead	0.0020	Nitrate	0.06
Total Nickel	0.0110	Chemical Oxygen Demand (COD)	10
Total Magnesium	0.004	Turbidity	0.11 (NTU)
Total Manganese	0.0100	Ammonia	1
Total Mercury	0.0002	Sulfate	0.38
Total Potassium	0.39	Total dissolved solids	10
Total Selenium	0.035		

APPENDIX A

Monitoring Well Construction Documents

REPORT ON GROUNDWATER MONITORING WELL INSTALLATIONS
HPP LANDFILL
BALTIMORE, MARYLAND

by

Haley & Aldrich, Inc.
Silver Spring, Maryland

for

SCM Chemicals, Inc.
Baltimore, Maryland

File No. 65358-03
December 1992

HALEY & ALDRICH INC.

Geotechnical Engineers &
Environmental Consultants

9 December 1992
File No. 65358-03

SCM Chemicals, Inc.
3901 Fort Armistead Road
Baltimore, MD 21226

Attention: Mr. Barry Brouse

Subject: Report on Groundwater Monitoring Well Installations
HPP Landfill
Baltimore, Maryland

Gentlemen:

This report summarizes the groundwater monitoring well installation activities for the HPP Landfill in Baltimore, Maryland. This report was prepared in accordance with our proposal dated 5 August 1992 and your subsequent authorization.

Ten groundwater monitoring wells were installed by Hardin-Huber, Inc. of Baltimore, Maryland, labled M1 through M7, M9, M10, and M11 during the period 5 October through 29 October 1992. Monitoring well M8 is an existing well. The wells were drilled using two Mobile B80 rigs and a Mobile B57 rig.

Monitoring well locations were located in the field, and the drilling and well installation observed by a Haley & Aldrich geologist. Locations of the wells are near locations shown on the HPP Industrial Waste Landfill, Phase III Landfill drawings, sheets 32 and 33 of 36, entitled, "Monitoring Well Location Plan", dated 14 February 1992. Locations of the wells were coordinated in the field with Mr. Jerry Lin of Buchart-Horn to avoid current and proposed construction activities. Monitoring wells were installed in accordance with the drawing entitled, "Monitoring Well Details and Schedule", Sheet No. 34 of 36, dated 14 February 1992.

Monitoring well installation logs, prepared by Haley & Aldrich, are included in Appendix A. Daily Field Reports of the well installation activities, also prepared by Haley & Aldrich, are included in Appendix B. Ground surface elevations at monitoring well locations were interpolated based on ground surface elevation contours shown on the Monitoring Well Location Plan.

2170 Industrial Parkway
Silver Spring, MD 20904
Tel: 301/622-7821
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Offices
Cambridge, Massachusetts
San Diego, California
Denver, Colorado
Glastonbury, Connecticut
Scarborough, Maine
Bedford, New Hampshire
Rochester, New York

Printed on recycled paper.

In our opinion, the monitoring well installations were performed in compliance with the project specifications and drawings. Please contact us if you have any questions or require additional information.

Sincerely yours,
HALEY & ALDRICH, INC.

Brian H. Zelenko, P.E.
Senior Engineer

David A. Schoenwolf, P.E.
Vice President

BHZ:DAS:65358.L1

Enclosures:

Appendix A
Appendix B

APPENDIX A

Monitoring Well Installation Logs

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	1 of 4	M 1

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE LEGEND:
- NR = Sample Not Recovered
- SS = Standard Penetration Split Spoon Sample
- ST = Pushed Shelby Tube
- B = Disturbed Bag Sample
- LL = Liquid Limit
- PI = Plasticity Index
- AC = Auger Cutting

Start	Finish	Driller/Subcontractor	Drill Make & Model	Total Depth (ft)
Time: 12:30 pm Date: 10-17-92	Time: 3:20 pm Date: 10-20-92	Mark Fletcher Hardin Huber, Inc.	Mobile B-57	137.0

Water Level Observations Date	Time	Boring Depth(ft)	Casing Depth(ft)	Caved Depth(ft)	Water Depth(ft)
10-19-92	8:00 am	60.0	N/A	N/A	59.0
10-28-92	3:47 pm	137.0	136.0	N/A	43.8

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) +1	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
								45.0							
SS 1	1.5	0.8	3-4-3	7									Loose yellow-tan, gray-tan medium to fine SAND, little silt, moist		** Water level measured from top of PVC Riser w/stickup 1.8 ft
SS 2	1.5	1.0	3-4-4	8				41.0				4.0	Do.		4" ID PVC WELL INSTALLATION:
													SAND/FILL		
									5				Medium stiff gray, red-brown, brownish yellow silty CLAY, tr. f sand, tr. roots, mottled, moist		5-foot long steel 6" ID Well Cover w/locking cap set in concrete with stickup of 2.5 ft
SS 3	1.5	1.1	3-5-7	12									Do.		Portland Type I/II Cement Grout 2.5' - 116.0'
									10						
SS 4	1.5	0.5	4-4-7	11									Do.		
									15						
SS 5	1.5	1.5	6-8-11	19									Do.		
									20						
SS 6	1.5	1.0	5-6-11	17									Do., mottled reddish gray, red-brown, gray		
									25						
SS 7	1.5	1.5	5-16 -20	36									Do., hard, mottled grayish red, gray, yellow		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 1

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	2 of 4	M 1

Project Location	Logged
HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND	Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
								11.5				33.5	silty CLAY/ALLUVIAL		
SS 8	1.5	0.8	14-20 -30	50					35				Hard olive, tan-brown silty CLAY, trace fine iron-cemented concretions, trace fine sand, moist		
								8.0				37.0	silty CLAY/ALLUVIAL		
SS 9	1.5	1.5	14-24 -50	74					40				Hard reddish gray, gray silty CLAY, trace fine sand, mottled, moist		
SS 10	1.5	1.5	27-40 -60	100					45				Do., mottled red-brown, gray		
SS 11	1.5	1.5	25-40 -70	110					50				Do., mottled red-brown, gray		
SS 12	1.5	1.5	12-18 -40	58					55				Do., mottled red-brown, gray, greenish-yellow		
								-12.0				57.0	silty CLAY/ALLUVIAL		
SS 13	1.5	0.8	24-40 -57	97				-14.0	60			59.0	Hard grayish olive, tan-gray SILT & CLAY, little fine sand, moist SILT & CLAY/ALLUVIAL Very dense gray, tan f-m SAND, tr. silt, wet		
SS 14	1.3	0.8	35-65 -100/3	165 /9					65				Do., yellow-tan, gray-tan f SAND, little silt		
								-22.0				67.0	SAND/ALLUVIAL		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. **M 1**

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	3 of 4	M 1

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) +1	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 15	1.0	1.0	56-100/5	100/5					70				Hard grayish red, gray silty CLAY, little seams f sand, mottled, moist		
SS 16	0.1	0.1	100/1	100/1					75				Do.		
								32.0				77.0	silty CLAY/ALLUVIAL		
SS 17	0.4	0.4	100/5	100/5					80				Very dense gray, tan-brown fine to medium SAND, little silt, wet		
	0.4	0.3	100/5	100/5					85				Do., some silt		
SS 19	0.0	0.3	100/4	100/4									Do., trace silt		
								45.0	90			90.0	SAND/ALLUVIAL		
SS 20	1.3	1.0	40-80-100/4	180/10					95				Hard, brown, gray silty CLAY, tr. f sand, mottled, moist		
SS 21	1.5	0.8	37-59-53	112					100				Do., brown, red-brown, gray		
SS	1.5	1.5	32-54-73	127									Do., mottled grayish brown, gray, red-brown		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 1

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	4 of 4	M 1

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 23	0.9	0.9	49-100/5	100/5					110				Do.		
SS 24	0.9	0.9	39-100/5	100/5					115				Do.		
								-72.0				117.0	silty CLAY/ALLUVIAL		Bentonite Pellet Seal 116.0' - 119.0'
SS 25	0.4	0.4	100/5	100/5					120				Hard gray clayey SILT AND fine SAND, very moist		#00 Well Sand 119.0' - 121.0'
								-77.0				122.0	clayey SILT/SAND/ALLUVIAL		# 1 Well Sand 121.0' - 137.0'
SS 26	0.4	0.1	100/5	100/5					125				Very dense brown, gray-tan-brown fine to medium SAND, little silt, wet		Stainless Steel Centralizer @ 126.0'
SS 27	0.3	0.3	100/3	100/3									Do., gray, trace silt		
SS 28	0.3	0.1	100/3	100/3					130				Do., gray, gray-brown		0.020" slotted 4" ID PVC Well Screen 126.0' - 136.0"
SS 29	0.3	0.3	100/4	100/4									Do., gray, gray-brown		
SS 30	0.3	0.3	100/4	100/4					135				Do., light gray		Stainless Steel Centralizer @ 135.5'
SS 31	0.3	0.3	100/4	100/4				-92.0				137.0	Do., light gray SAND/ALLUVIAL		
													End of Exploration at 137.0'		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 1

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	1 of 6	M 2

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE LEGEND:
- NR = Sample Not Recovered
- SS = Standard Penetration Split Spoon Sample
- ST = Pushed Shelby Tube
- B = Disturbed Bag Sample
- LL = Liquid Limit
- PI = Plasticity Index
- AC = Auger Cutting

Start	Finish	Driller/Subcontractor	Drill Make & Model	Total Depth (ft)
Time: 8:35 am Date: 10-17-92	Time: 12:15 pm Date: 10-20-92	Steve Ulrich Hardin Huber, Inc.	Mobile B-80	191.5

Water Level Observations Date	Time	Boring Depth(ft)	Casing Depth(ft)	Caved Depth(ft)	Water Depth(ft)
10-17-92	8:49 am	10.0	N/A	N/A	9.0
10-27-92	8:54 am	192.0	189.6	N/A	60.0

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) +1	DEPTH (ft)	GRAPHICS SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 1	1.5	1.5	7-9-12	21				60.0				Dense tan-brown clayey SILT AND fine to medium SAND, trace fine gravel, moist		** Water level measured from top of PVC Riser w/stickup 1.8 ft
								57.0			3.0	clayey SILT/SAND/ALLUVIAL		4" ID PVC WELL INSTALLATION:
SS 2	1.5	1.0	4-6-7	13					5			Medium dense light tan, tan-brown fine to medium SAND, trace silt, moist		5-foot long steel 6" ID Well Cover w/locking cap set in Concrete with stickup of 2.4 ft
SS 3	1.5	1.2	5-6-8	14					10			Do., fine to coarse SAND, little fine gravel, wet		Portland Type I/II Cement Grout 2.6' - 173.0'
								48.0			12.0	SAND/ALLUVIAL		
SS 4	1.5	0.5	6-9-11	20					15			Very stiff gray, red-brown silty CLAY, trace fine sand, mottled, very moist		
SS 5	1.5	0.3	4-8-11	19					20			Do.		
SS 6	1.5	1.3	4-7-12	19					25			Do., gray, brown, red-brown		
SS 7	1.5	1.5	7-11-11	22								Do., red-brown, brown, gray		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 2

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	2 of 6	M 2

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±1	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 8	1.5	0.5	8-12-21	33					35				Do., hard, trace fine sand, mottled, moist		
								23.0				37.0	silty CLAY/ALLUVIAL		
SS 9	1.5	1.2	9-17-23	40					40				Hard gray, red-brown, trace green-yellow **CLAY & SILT**, trace to little fine to medium sand, mottled, moist		
								18.0				42.0	CLAY & SILT/ALLUVIAL		
SS 10	1.5	1.5	10-19-21	30					45				Hard gray, red-gray, brown silty CLAY, trace fine sand, moist		
SS 11	1.5	1.5	18-25-37	62					50				Do.		
SS 12	1.5	1.5	15-33-53	86					55				Do., brown, red-brown, gray		
SS 13	1.5	1.2	22-49-70	109					60				Do., gray, yellow-brown, red-brown		
SS 14	1.5	1.5	16-42-56	98					65				Do., gray, green, red-brown		

HALEY & ALDRICH INC.
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BORING NO. M 2

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	3 of 6	M 2

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 15	1.5	1.5	20-35-46	81					70				Hard gray, dark green, brown silty CLAY, trace fine sand, mottled, moist		
SS 16	1.5	1.5	19-34-53	87					75				Do.		
SS 17	1.5	1.5	25-23-29	52					80				Do.		
SS 18	1.5	1.5	18-27-32	59					85				Do.		
								27.0				87.0	silty CLAY/ALLUVIAL		
SS 19	1.5	0.7	16-33-54	87					90				Hard dark gray CLAY & SILT, trace fine sand, moist		
SS 20	1.5	1.2	19-37-63	100					95				Do., trace fine sand partings		
SS 21	1.5	0.5	26-28-40	68					100				Do., little fine sand, occasional fine sand and silt seams		
SS 22	1.5	0.9	28-29-56	85									Hard gray, brownish gray SILT & CLAY, little fine sand, moist		

HALEY & ALDRICH INC.
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BORING NO. M 2

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	4 of 6	M 2

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
								47.0				107.0	SILT/CLAY/ALLUVIAL		
SS 23	1.5	1.3	37-48-68	116					110				Very dense gray fine **SAND**, little silt, very moist		
SS 24	0.8	0.8	54-100/4	100/4					115				Do., some clayey silt		
								57.0				117.0	SAND/clayey silt/ALLUVIAL		
SS 25	1.5	1.5	25-33-67	100					120				Hard gray, red-gray, red-brown silty CLAY, trace fine sand, mottled, moist		
SS 26	1.5	1.5	21-45-73	118					125				Do., trace brown		
								67.0				127.0	silty CLAY/ALLUVIAL		
SS 27	1.5	1.5	22-42-48	86					130				Hard gray, tan-brown, SILT & CLAY, some fine sand, mottled, moist		
SS 28	1.5	1.5	19-25-36	61					135				Hard gray, brownish gray, brown CLAY & SILT, trace fine sand, little seams/layers of (fine sand and silt), moist to wet		
								77.0				137.0	SILT/CLAY/sand/ALLUVIAL		
SS 29	1.5	1.5	14-28-48	76					140				Very dense gray fine **SAND** AND **SILT**, wet		
								82.0				142.0	SAND/SILT/ALLUVIAL		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 2

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	5 of 6	M 2

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 30	1.5	1.5	26-47-83	130					145				Hard gray CLAY & SILT, trace fine sand, little seams of (silt and fine sand), moist		
SS 31	1.2	1.2	25-95-100/2	100/2					150				Hard gray clayey SILT, some fine sand, trace silty clay seams, moist		
								-92.0				152.0	SILT/clay/sand/ALLUVIAL		
SS 32	0.9	0.9	73-100/5	100/5					155				Very dense gray, tan-gray fine to medium SAND, trace silt, wet		
								-96.0				156.0	SAND/ALLUVIAL		
SS 33	1.2	1.2	34-70-100/2	100/2				-98.0				158.0	Hard light gray fine SAND AND clayey SILT, very moist SAND/clayey SILT/ALLUVIAL		
SS 34	0.4	0.4	100/5	100/5				-100.0	160			160.0	Hard, gray CLAY & SILT, trace fine sand, moist CLAY & SILT/ALLUVIAL		
SS 35	1.1	0.9	40-89-100/1	100/1				-102.0				162.0	Very dense gray fine SAND, some silt, very moist to wet SAND/silt/ALLUVIAL		
SS 36	0.7	0.6	75-100/2	100/2									Hard, gray SILT & CLAY, trace fine sand, moist		
SS 37	0.6	0.5	77-100/1	100/1					165				Do., clayey SILT, little fine sand		
SS 38	0.3	0.3	100/3	100/3									Hard, gray, brownish gray clayey SILT, little fine sand, moist		
SS 39	0.3	0.1	100/3	100/3					170				Do., trace fine sand		
SS 40	0.1	0.1	100/3	100/3					175				Do., gray, trace fine sand		Bentonite Pellet Seal 173.0' - 175.0' #00 Well Sand 175.0' - 177.0'
								-118.0				178.0	clayey SILT/ALLUVIAL		Stainless Steel Centralizer @ 179.0'

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 2

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	6 of 6	M 2

Project Location	Logged
HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND	Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 41	0.3	0.2	100/4	100/3									Very dense light tan-gray fine to medium SAND, trace silt, wet		# 1 Well Sand 177.0' - 192.0'
SS 42	0.7	0.0	98-100/2	100/2									No Recovery		
SS 43	0.8	0.5	105-100/4	100/4					185				Do., light gray, tan-gray		0.020" slotted 4" ID PVC Well Screen 179.6' - 189.6"
SS 44	0.5	0.5	200/6	200/6									Do., trace fine to 1" rounded quartz gravel, trace silty clay seams		Stainless Steel Centralizer @ 189.0'
									190				Do., little silt, trace fine to 1" gravel		
								-131.0				191.0	SAND/ALLUVIAL		
SS 45	0.5	0.5	200/6	200/6				-131.5				191.5	Hard light gray clayey SILT, moist clayey SILT/ALLUVIAL		
													End of Exploration at 191.5'		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 2

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	1 of 5	M 3

Project Location	Logged
HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND	Harvey Beaulieu

SAMPLE LEGEND:
- NR = Sample Not Recovered
- SS = Standard Penetration Split Spoon Sample
- ST = Pushed Shelby Tube
- B = Disturbed Bag Sample
- LL = Liquid Limit
- PI = Plasticity Index
- AC = Auger Cutting

Start	Finish	Driller/Subcontractor	Drill Make & Model	Total Depth (ft)
Time: 5:30 pm Date: 10-14-92	Time: 9:40 am Date: 10-17-92	Mark Fletcher Hardin Huber, Inc.	Mobile B-57 & B-80	175.0

Water Level Observations Date	Time	Boring Depth(ft)	Casing Depth(ft)	Caved Depth(ft)	Water Depth(ft)
10-15-92	7:45 am	20.0	N/A	N/A	18.5
10-27-92	9:48 am	175.0	170.0	N/A	52.9

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG. (ft)	SAMPLE REC. (ft) / CORE REC. (ft)	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) +1	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 1	0.8	0.8	5-4-6	10				56.0					Medium dense brown fine to medium **SAND**, some fine gravel, little clayey silt, moist		** Water level measured from top of PVC Riser w/stickup 1.8 ft
								53.0				3.0	SAND/FILL		
SS 2	1.5	1.5	3-6-7	13					5				Stiff yellow-brown **CLAY & SILT**, little fine sand, moist		4" ID PVC WELL INSTALLATION: 5-foot long steel 6" ID Well Cover w/locking cap set in Concrete with stickup of 2.5 ft
SS 3	1.5	1.5	4-7-12	19				47.0				9.0	Very stiff tan-gray **clayey SILT**, little fine sand, moist SILT/CLAY/ALLUVIAL		Portland Type I/II Cement Grout 2.5' - 150.0'
									10				Dense brown fine to medium **SAND**, trace silt, little clayey silt layers, moist		
SS 4	1.5	1.5	9-25-32	57					15				Very dense light brown to grayish-tan fine to medium **SAND**, trace silt, slightly moist		
SS 5	1.5	1.0	22-17-17	34				37.0 ▽				19.0	Do., wet SAND/ALLUVIAL		
									20				Hard, red-brown, tan-gray **silty CLAY**, some layers/seams of (clayey SILT, little fine sand), mottled, moist		
SS 6	1.5	0.7	7-10-11	21					25				Do., occasional iron-cemented nodules/seams		
SS 7	1.5	1.5	12-24-30	54									Hard, dark red-brown, trace yellow-green **silty CLAY**, little fine to medium sand, trace iron stains, moist		

HALEY & ALDRICH INC.
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BORING NO. M 3

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	2 of 5	M 3

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
								24.0				32.0			
SS 8	1.5	1.5	12-26-38	54					35				Hard, dark red-brown, yellow-green, gray CLAY & SILT, little fine friable iron-cemented pockets, trace fine to medium sand, moist		
SS 9	1.5	1.5	17-30-50	80					40				Do., gray, little fine sand, little silty clay seams, little layers of (fine to medium sand, trace silt)		
								14.0				42.0	CLAY & SILT/ALLUVIAL		
SS 10	1.5	1.0	17-26-31	57					45				Hard, gray, brownish gray silty CLAY, some fine to medium sand, little black lignite seams, moist		
								9.0				47.0	silty CLAY/sand/ALLUVIAL		
SS 11	1.5	1.5	13-21-32	53					50				Hard, gray, yellow-gray silty CLAY, waxy lustre, moist		
SS 12	1.5	1.0	18-34-60	94					55				Do., gray, trace brown, trace fine sand, trace lignite		
SS 13	1.5	1.5	17-28-34	62					60				Do., red-brown, gray, brown, trace fine sand		
SS 14	1.5	1.5	20-30-40	70					65				Do., gray, red-brown, trace spheroidal silica concretions up to 1 mm diameter		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 3

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	3 of 5	M 3

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. CORE LENG. (ft)	SAMPLE REC. CORE REC. (ft)	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LAB TESTS: LL	LAB TESTS: PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 15	1.5	1.5	22-30-45	75									Hard gray, grayish-red, trace green silty CLAY, trace fine sand, moist		
									70						
SS 16	1.5	1.5	18-42-45	87									Do.		
									75						
SS 17	1.5	1.5	14-26-30	56									Do., gray, red-brown		
									80						
SS 18	1.5	1.5	20-38-48	86									Do., gray, dark green trace fine sand partings		
									85						
								-31.0				87.0	silty CLAY/ALLUVIAL		
SS 19	1.5	1.5	21-48-80	128									Hard dark gray CLAY & SILT, trace fine sand interlayered with (SILT AND fine SAND) layers, very moist to moist		
									90						
SS 20	1.5	0.3	21-38-80	118									Hard gray, black SILT AND fine SAND, seams/partings interlayered with LIGNITE/PEAT seams/partings, very moist		
									95						
SS 21	1.5	1.0	24-46-81	127				-43.0				99.0	Hard dark gray, dark red-brown SILT & CLAY, some fine sand, moist SILT/CLAY/sand/ALLUVIAL		
									100				Hard, red-brown, gray silty CLAY, trace fine sand, moist		
SS 22	1.3	0.2	29-64-100/4	100/4									Do., gray, red-brown		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 3

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	4 of 5	M 3

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
								-51.0				107.0	silty CLAY/ALLUVIAL		
SS 23	0.9	0.6	31-100/5	100/5					110				Very dense, light gray fine **SAND AND SILT**, wet		
SS 24	1.5	0.8	27-31-96	127					115				Do., light gray to light brown		
								-61.0				117.0	SAND/SILT/ALLUVIAL		
SS 25	1.2	0.3	57-91-100/2	100/2					120				Hard, gray, brown silty **CLAY**, little fine to medium sand, moist		
SS 26	0.4	0.2	100/5	100/5					125				Do.		
SS 27	0.9	0.3	44-100/5	100/5					130				Do., gray, red-gray, red-brown, trace fine sand		
								-76.0				132.0	silty CLAY/ALLUVIAL		
SS 28	0.3	0.3	36-54-72	126					135				Very dense light gray fine **SAND AND SILT**, wet		
								-81.0				137.0	SAND/SILT/ALLUVIAL		
SS 29	1.3	1.3	27-42-59	101					140				Hard, red-brown, gray, dark green-brown **SILT & CLAY**, little fine sand, mottled, moist		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. **M 3**

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	5 of 5	M 3

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 30	1.2	1.2	21-39-38	77				-88.0				144.0	Hard, light gray clayey SILT, some fine sand, moist		
													SILT/sand/ALLUVIAL		
									145				Very dense, gray fine SAND AND SILT, wet		
								-91.0				147.0	SAND/SILT/ALLUVIAL		
SS 31	1.4	1.4	30-47-100/5	100/5									Hard, light gray SILT & CLAY, little fine sand, moist		
									150						Bentonite Pellet Seal 150.0' - 152.0'
															#00 Well Sand 152.0' - 154.0'
SS 32	0.7	0.7	150-100/2	100/2									Hard, light gray CLAY & SILT, little fine sand, occasional layers of (fine sand and silt), wet		
									155						Stainless Steel Centralizer @ 154.0'
								-101.0				157.0	CLAY/SILT/ALLUVIAL		
															# 1 Well Sand 154.0' - 175.0'
SS 33	0.5	0.1	400/6	400/6									Very dense, gray, gray-brown fine SAND, little silt, wet		
SS 34	0.5	N/R	135/6	135/6					160						
SS 35	0.4	0.1	600/5	600/5									Do., seam of silt & clay, one rounded 3/4" yellow-tan f sandstone fragment,		
SS 36	0.5	0.5	200/6	200/6					165				Do., fine to medium SAND, trace silt, wet to very moist		0.010" slotted 4" ID PVC Well Screen 160.0' - 170.0'
SS 37	0.5	0.5	280/6	280/6									Do., fine to medium SAND, trace silt, wet to very moist		
SS 38	0.2	0.2	100/2	100/2									Very dense, light gray, gray-brown fine to medium SAND, trace silt, wet		Stainless Steel Centralizer @ 169.0'
SS 39	0.3	0.3	100/3	100/3				-114.3	170			170.3	SAND/ALLUVIAL		
													Augered down to 175 ft. without sampling		
								-119.0	175			175.0			
													End of Exploration at 175.0'		

HALEY & ALDRICH INC.
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BORING NO. M 3

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	1 of 5	M 4

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE LEGEND:
- NR = Sample Not Recovered
- SS = Standard Penetration Split Spoon Sample
- ST = Pushed Shelby Tube
- B = Disturbed Bag Sample
- LL = Liquid Limit
- PI = Plasticity Index
- AC = Auger Cutting

Start	Finish	Driller/Subcontractor	Drill Make & Model	Total Depth (ft)
Time: 9:55 am Date: 10-12-92	Time: 3:45 pm Date: 10-14-92	Mark Fletcher Hardin Huber, Inc.	Mobile B-57 & B-80	163.3

Water Level Observations Date	Time	Boring Depth(ft)	Casing Depth(ft)	Caved Depth(ft)	Water Depth(ft)
10-12-92	10:30 am	10.0	N/A	N/A	9.5
10-27-92	10:15 am	163.0	160.0	N/A	41.8

SAMPLE TYPE	SAMP. ADV. CORE LENG. (ft)	SAMPLE REC. CORE REC. (ft)	SAMPLE BLOWS %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) +1	DEPTH(ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
								40.0							
SS 1	1.5	1.5	WOH-5-9	14									Stiff brown clayey SILT AND fine to medium SAND, trace roots, moist		** Water level measured from top of PVC Riser w/stickup 1.6 ft
								38.0				2.0	clayey SILT/SAND/POSSIBLE FILL		
SS 2	1.5	1.0	3-4-4	8					5				Loose, light grayish-brown fine to medium SAND, trace silt, moist		4" ID PVC WELL INSTALLATION: 5-foot long steel 6" ID Well Cover w/locking cap set in Concrete with stickup of 2.5 ft
S 3	1.5	1.2	26-30-63	93					10				Very dense, red-orange, orange-brown, gray medium to fine SAND, trace silt, little pockets/seams of silty clay, trace iron-cemented seams, very moist to wet		Portland Type I/II Cement Grout 2.5' - 141.0'
SS 4	1.5	0.9	9-15-21	36				26.0				14.0	SAND/ALLUVIAL		
									15				Hard, red-brown, gray silty CLAY, trace fine sand, mottled moist		
SS 5	1.5	0.8	20-33-41	74					20				Hard, gray, red-brown, trace yellow CLAY & SILT, trace fine sand moist		
SS 6	1.5	1.0	9-12-16	28				16.0				24.0	CLAY/SILT/ALLUVIAL		
									25				Dense, gray, olive-gray fine SAND, some silt, wet to very moist		
								13.0				27.0	SAND/silt/ALLUVIAL		
SS 7	1.5	1.1	15-21-25	46									Hard, gray, red-brown fine SAND AND CLAY & SILT, mottled, moist		

HALEY & ALDRICH INC.
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BORING NO. M 4

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	2 of 5	M 4

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG. (ft)	SAMPLE REC. (ft) / CORE REC. (ft)	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 8	1.1	0.4	29-51-100/1	100/1					35				Very dense, gray, black-gray, black fine to medium SAND, some silt & clay, little black lignite seams, very moist		
								3.0				37.0	SAND/silt/clay/ALLUVIAL		
SS 9	1.5	1.4	16-21-31	52					40				Hard, gray, dark red-brown, brown mottled silty CLAY, waxy lustre, moist		
SS 10	1.5	1.3	17-25-35	60					45				Do., trace yellow		
													Do.		
SS 11	1.5	0.8	9-23-28	51					50						
SS 12	1.5	0.9	29-40-50	90					55				Do., reddish-gray, gray, slightly moist to moist		
SS 13	1.5	1.5	12-30-35	65					60				Hard, red-gray, gray, red-brown, trace yellow silty CLAY, trace fine sand, mottled moist		
SS 14	1.5	0.8	31-51-72	123					65				Do.		

HALEY & ALDRICH INC.
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BORING NO. M 4

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	3 of 5	M 4

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 15	1.5	1.1	33-29-60	89					70				Do., red gray, gray, red-brown, trace yellow		
SS 16	1.5	1.1	44-49-96	145					75				Do.		
								37.0				77.0	silty CLAY/ALLUVIAL		
SS 17	1.5	1.3	30-43-60	103					80				Hard, red gray, gray, red-brown, trace yellow **CLAY & SILT**, trace fine sand, mottled, moist to slightly moist		
SS 18	1.5	1.3	26-36-40	76					85				Do.		
								47.0				87.0	CLAY & SILT/ALLUVIAL		
SS 19	1.5	1.4	23-35-77	112					90				Hard, gray fine **SAND** AND clayey **SILT**, moist		
SS 20	1.5	1.0	29-35-72	107					95				Do., fine **SAND**, little silt, AND layers of silty **CLAY** AND fine **SAND**, moist to wet		
								57.0				97.0	SAND/SILT/CLAY/ALLUVIAL		
SS 21	0.4	0.4	100/5	100/5					100				Very dense, light gray fine **SAND**, little to trace silt, wet		
SS 22	1.5	0.9	84-74-40	114									Do., tan-gray to gray fine to medium **SAND**, trace silt		
								62.0				102.0	SAND/ALLUVIAL		
SS 23	1.5	1.0	42-47-58	105									Hard, gray, reddish gray silty CLAY, moist		

HALEY & ALDRICH INC.
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BORING NO. **M 4**

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	4 of 5	M 4

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 24	1.5	1.5	29-39-51	90					110				Hard, gray, reddish gray, brown, trace green **CLAY & SILT**, trace fine sand, moist		
								-72.0				112.0	CLAY/SILT/ALLUVIAL		
SS 25	1.5	1.5	28-27-41	68					115				Hard, gray clayey **SILT**, some fine sand, moist to slightly moist		
SS 26	0.9	0.8	23-100/5	100/5					120				Hard, light gray fine **SAND AND clayey SILT**, trace silty clay seams, moist		
SS 27	1.5	0.9	25-35-50	85					125				Do., some layers of (clay & silt, some fine sand), very moist		
SS 28	0.7	0.7	35-100/2	100/2					130				Hard, light gray fine **SAND AND silty CLAY**, some layers of (fine SAND, little silt), wet to moist		
								-92.0				132.0	SAND/CLAY/SILT/ALLUVIAL		
SS 29	0.7	0.7	62-100/2	100/2					135				Hard, light gray CLAY & SILT, little fine sand, trace seams of (silt and fine sand), trace fine micro-crystalline pyrite concretions up to 1/4", moist		
SS 30	0.1	0.1	100/1	100/1					140				Do., pyrite concretions up to 1/2"		
								-102.0				142.0	CLAY & SILT/ALLUVIAL		

HALEY & ALDRICH INC.
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BORING NO. M 4

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	5 of 5	M 4

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 31	0.4	0.3	200/5	200/5									Very dense, light gray fine **SAND**, little silt, little silt & clay seams, wet		Bentonite Pellet Seal 141.0' - 144.5'
									145						
SS 32	0.4	0.4	200/5	200/5									Do.		#00 Well Sand 144.5' - 148.5'
SS 33	0.5	0.4	200/6	200/6									Very dense, tan fine **SAND**, little clayey silt, trace silty clay seams up to 1/4", wet		
									150						Stainless Steel Centralizer @ 150.0'
															# 1 Well Sand 148.5' - 163.0'
SS 34	0.4	0.1	200/5	200/5				-114.0				154.0	Do. SAND/silt/ALLUVIAL		
									155						0.020" slotted 4" ID PVC Well Screen 150.0' - 160.0'
SS 35	0.5	0.5	200/6	200/6									Very dense, light gray medium to fine **SAND**, trace silt, wet		
SS 36	0.4	0.4	200/5	200/5									Do.		
SS 37	0.5	0.3	132/6	132/6				-120.0	160			160.0	Do., little silt SAND/ALLUVIAL		Stainless Steel Centralizer @ 159.5'
SS 38	0.3	0.5	300/3	300/3									Hard, light gray clayey SILT, trace fine sand, moist		
SS 39	0.3	0.5	300/3	300/3				-123.2				163.2	Do., brown, tr. concretions clayey SILT/ALLUVIAL End of Exploration at 163.3'		

HALEY & ALDRICH INC.
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BORING NO. M 4

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	1 of 5	M 5

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE LEGEND:
- NR = Sample Not Recovered
- SS = Standard Penetration Split Spoon Sample
- ST = Pushed Shelby Tube
- B = Disturbed Bag Sample
- LL = Liquid Limit
- PI = Plasticity Index
- AC = Auger Cutting

Start	Finish	Driller/Subcontractor	Drill Make & Model	Total Depth (ft)
Time: 2:30 pm Date: 10-15-92	Time: 3:45 pm Date: 10-20-92	Bob Jordon Hardin Huber, Inc.	Mobile B-80	165.0

Water Level Observations Date	Time	Boring Depth(ft)	Casing Depth(ft)	Caved Depth(ft)	Water Depth(ft)
10-15-92	4:30 pm	15.0	N/A	N/A	14.0
10-28-92	9:22 am	165.0	160.0	N/A	45.1

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG. (ft)	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
								45.0							
SS 1	1.5	1.0	4-4-6	10									Medium dense, yellow-brown, brown fine to medium SAND, some silt, trace roots, moist		** Water level measured from top of PVC Riser w/stickup 2.1 ft
								42.0				3.0	SAND/silt/ALLUVIAL		
SS 2	1.5	0.7	4-5-10	15					5				Dense yellow-tan, tr. gray f-m SAND, little clayey silt, moist		4" ID PVC WELL INSTALLATION: 5-foot long steel 6" ID Well Cover w/locking cap set in Concrete with stickup of 2.8 ft
SS 3	1.5	0.3	3-3-5	8					10				Do.		Portland Type I/II Cement Grout 2.75' - 142.0'
SS 4	1.5	0.7	26-32-38	70					15				Very dense, brownish gray, light brown medium to fine SAND, trace silt, wet		
								27.0				18.0	SAND/ALLUVIAL		
SS 5	1.5	0.8	14-26-50	76					20				Hard, red-brown, gray silty CLAY, trace fine sand, mottled, moist		
SS 6	1.5	0.5	15-30-40	70					25				Do., trace yellowish-green		
SS 7	1.5	0.5	14-32-43	75									Do., trace yellowish-green		

HALEY & ALDRICH INC.
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BORING NO. M 5

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	2 of 5	M 5

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADJ. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 8	1.5	0.8	14-52-74	126					35				Hard, red-brown, gray, yellow silty CLAY, trace fine sand, mottled, moist		
SS 9	1.5	1.5	15-25-42	67					40				Do.		
SS 10	1.5	0.5	15-25-61	86					45				Do.		
SS 11	1.5	0.7	15-45-65	110					50				Do., gray, reddish gray, red-brown		
SS 12	1.5	1.5	25-48-52	100					55				Do., brown, gray, yellow-green, trace friable iron-cemented pockets		
SS 13	1.5	1.5	27-45-55	100					60				Do., gray, dark green, reddish gray		
SS 14	1.5	1.0	39-47-58	108					65				Do., light gray, reddish gray		

HALEY & ALDRICH INC.
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BORING NO. M 5

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	3 of 5	M 5

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT(%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 15	1.5	1.5	32-55-72	127									Hard, red-brown, green, gray silty CLAY, trace fine sand, mottled, moist		
									70						
SS 16	1.5	1.0	37-48-60	108									Do., gray, red-brown, trace green		
									75						
SS 17	1.5	1.5	40-56-65	121									Do., red-gray, gray, brown		
									80						
SS 18	1.5	1.5	46-59-70	129									Do., gray, brown, red-brown		
									85						
SS 19	1.5	1.3	52-75-100/3	100/3									Do., gray, reddish gray, trace brown		
									90						
SS 20	1.5	1.4	26-45-63	108									Do., gray, reddish gray, trace red-brown		
									95						
SS 21	0.9	0.9	66-100/5	100/5									Do., red-brown, gray		
									100						
SS 22	0.8	0.8	63-100/3	100/3									Hard, dark red-brown, gray, trace yellow silty CLAY, trace fine sand, mottled, moist		

HALEY & ALDRICH INC.
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BORING NO. M 5

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	4 of 5	M 5

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY / RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±1	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 23	0.8	0.8	70-100/2	100/2					110				Do., dark red-brown, gray, brown		
SS 24	1.5	1.1	66-76-100	176					115				Do., brown, red-brown, gray		
SS 25	1.5	1.3	25-40-50	90					120				Do., brown, yellow-brown, gray		
								77.0				122.0	silty CLAY/ALLUVIAL		
SS 26	0.7	0.6	28-100/2	100/2					125				Hard, gray CLAY & SILT, some fine sand, moist		
SS 27	0.2	0.2	100/2	100/2					130				Hard, gray fine SAND AND clayey SILT, moist		
SS 28	0.1	0.1	200/1	200/1					135				Hard, gray SILT & CLAY, little fine sand, moist		
SS 29	0.1	0.1	200/1	200/1					140				Hard, gray clayey SILT AND fine SAND, moist		

TEST BORING LOG

Project Number	Client/Project	Sheet No.	Boring No.
65358-03	SCM Chemicals - Americas GROUNDWATER MONITORING WELLS	5 of 5	M 5

Project Location: HAWKINS POINT PLANT LANDFILL, BALTIMORE, MARYLAND

Logged: Harvey Beaulieu

SAMPLE TYPE	SAMP. ADV. (ft) / CORE LENG.	SAMPLE REC. (ft) / CORE REC.	SAMPLE BLOWS / %CORE RECOVERY RQD	N" VALUE BLOWS/FOOT	LAB TESTS: MOISTURE CONTENT (%)	LL	PI	ELEV. (ft) ±	DEPTH (ft)	GRAPHICS	SAMPLE	STRATA DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	WELL	REMARKS
SS 30	0.1	0.1	200/1	200/1									Hard, gray, red-brown CLAY & SILT, some seams of (fine to medium SAND, little silt), very moist		Bentonite Pellet Seal 142.0' - 145.0'
									145						#00 Well Sand 145.0' - 147.0'
								-102.0				147.0	CLAY/SILT/sand/ALLUVIAL		
SS 31	0.9	0.7	230-200/5	200/5									Very dense, tan-gray fine to medium **SAND**, trace silt, wet		Stainless Steel Centralizer @ 149.0'
									150						# 1 Well Sand 147.0' - 165.0'
SS 32	0.7	0.6	500/6-300/1	300/1									Do., light brown, gray		
SS 33	0.6	0.5	400-200/1	200/1					155				Do., light brown, gray		0.020" slotted 4" ID PVC Well Screen 150.0' - 160.0'
SS 34	0.7	0.6	426-400/2	400/2									Do., light brown, gray		
SS 35	0.7	0.5	300-240/2	240/2				-115.7	160			160.7	Do., brown SAND/ALLUVIAL		Stainless Steel Centralizer @ 159.5'
													Augered down to 165 ft. without sampling		
								-120.0	165			165.0	End of Exploration at 165.0'		

HALEY & ALDRICH INC.
Silver Spring, Maryland

BORING NO. M 5

APPENDIX A

Daily Field Reports

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

CLIENT SCM

Report No. 1

CONTRACTOR HARDIN HUBER INC

Date 5 October 1992

Weather CLEAR Temp. 70°F Time on Job 7:45 am - 5:15 pm

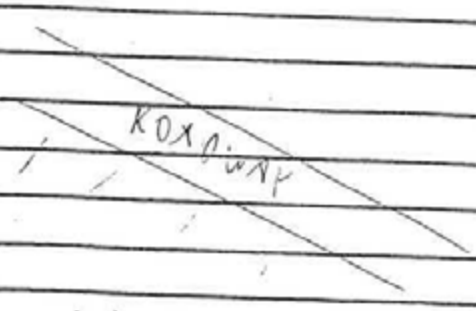
Page 1 of 1

Other time (travel, testing, report preparation) Tran 1.5 Ofc 0.75 - Hours 9.0

Mark Fletcher, Terry Myers, David Taylor 7:40 - Amwd
Bob Jordan, Marvin Stokely, Jay Corron 8:15 - 8:50

Chlorine Titanium Tetrachloride
Safety Mtg 8:25 - 8:50
Portable Toilet → Jerry Lynn

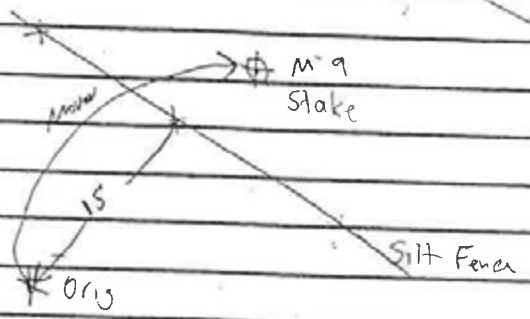
MW-9 I caused ½ hr delay by moving hole as below. Able to knock down silt fence



Mark Fletcher's Rig
B-57

9-10:20 Set up rig on M 9 location, twice after moving once as shown

10:20 - ±6:00 Drilled M9 to 85' depth, originally w/ 7⅞" Wing bit to depth 20'. Switched to smaller 2⅞" bit down HSA spun down to 20'



Bob Jordan's rig Mobile B 80
9:00 - 9:25 Got water for rig
9:30 - 10:20 Set up on M7 well hole
10:20 - ±6:00 Drilled M7 to depth 65'

Visitors, None

Harry Beaulieu
FIELD REPRESENTATIVE

Bill Fletcher
Haley & Aldrich, Inc.

H&A FOI OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

CLIENT SCM

Report No. 2

CONTRACTOR HARDIN HUBER, INC

Date 6 October 1992

Weather CLEAR

Temp. 65 Time on Job 8:00 AM – 8:00 pm

Page 1 of 1

Hours 11.5

Other time (travel, testing, report preparation) Travel 1.0 Ofc. None this day

Mark Fletcher - Mobile B57
6:30 - 4:50pm Continued M-9
below depth 85' to 140.7
4:50 - 6:00 Laid down rods
+ demobed from M9.
6:00 - 6:30 Mobed + set up on
M11
6:30 - 6:50 Drilled/SPT M11
w/ HSA to 10'. Will continue w/
rotary-wash drilling tomorrow

Bob Jordon Mobile B-80
6:30 - 4:20 Continued M7
below depth 65' to depth
128.8'
4:30 - 5:15 Flushed natural
clay-water slurry + displaced
w/ water
5:15 - 5:45 Pulled rods & wing bit
5:45 - 6:15 Assembled 123' of 4" PVC
casing + lowered to depth 120'.
6:15 - 7:45 Dumped 3 bags #2
sand down annulus. Sand
blocked up at depth 57'. Ran
in w/ drill rods to 127' + circulated
annulus. Blockage apparently
removed. 2* More bags sand
dumped down annulus. Another
blockage appeared at depth 66'.
Stopped for day @ 7:50pm "
(*Top of sand measured @ 116' prior
to dumping last 2 sand bags
which were the 4th & 5th bags)

Harvey Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOL OCT.72

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

Report No. 3

CLIENT SCM

Date 7 October 1992

CONTRACTOR HARDIN HUBER INC

Page 1 **of** 1

Weather Clear **Temp.** 68° **Time on Job** 7:00 am 7:13 pm **Hours** 11.75

Other time (travel, testing, report preparation) Travel 1.0 hr

Mark Fletcher's Rig Mobile B57 on M11
2-man crew today
8:15 Adaptor part broken w/
bit at depth 15' in M-11
9:28 Parts arrived Crew went back to rig
Drilled to 85'. Broke SPT
hammer @ ± 5:00 Radio'd
HHI for replacement hammer.
5:20 Hammer arrived @ site
5:30-7:00 Drilled M-11 to 95'
Stopped for day @ 7 pm

Bob Jordan Mobile B80 on Well M7 (3-man crew)
7:30 Crew Arrived + got water
7:45 Crew at rig. Measured caved depth in annulus
at 67'. 7' of fill inside well casing. Water level
at depth 27' in well casing and at surface
in annulus (Screen @ 110'-120')
Ran in w/ rods to 110' (top of casing). Washed
down to 120' w/ fluid coming out of well. Well then capped.
Continued jetting. No sucess w/ removing blockage @ 67'
8:30 Tried pulling well casing. It was movable (6")
Pulled rods out of annulus by 8:50 Bottom @ 119.5
8:52 Driller called HHI shop + requested 8" reamer bit
9:00 HHI directed further jetting @ 65-70'
10:30 Finished Jetting w/ chopping bit @ 65. New blockage @ 89'
Ran in w/ rods + chopping bit to jet from 89'-94'
11:30 Blockage at 70' w/ tape Tremie pipe arrived. Assembled Tremie (2" PVC) +
placed into annulus. Encountered blockage at 90'.
Washed + pushed tremie down to 117' @ 12:15
1:00-2:00 Ran AW Rods down tremie to 120' + washed
out bottom plug. Pumped natural clay/water slurry out of tremie
2:04 Pulled aw rods from tremie. Ran tape measure down.
Hit obstruction in tremie @ depth 94' (97 from top tremie)
2:04-3:20 Pushed tremie down to 119 + washed w/ rods inside tremie
to 120'. Pulled tremie up to 116, pulled out rods.
Top of SAND measured at depth 118 w/ tape in tremie.
3:20 Started SAND #2 Fill w/ Tremie @ 116 + Top of SAND @ 118 in
annulus
10:45 Barry Brouse visited requested status of 3rd & 4th rigs. Driller radio'd HHI shop, M. Willey agreed to meet B. Brouse
@ site 11:00 M. Willey arrived + suggested tremie pipe for installing sand + pellets for M7
#2 SAND up to 107.5' @ 4:19 pm
#00 SAND up to 105.5' @ 4:48 pm
Top of Pellets 103' @ 6:00 pm
Crew left site @ ± 6:20 pm

Harvey Beaulieu
FIELD REPRESENTATIVE

[signature]
Haley & Aldrich, Inc.

H & A FOR OCT. 73

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

Report No. 4

CLIENT SCM

Date 8 October 1992

CONTRACTOR HARDIN HUBER, INC

Page 1 of

Weather Clear Temp. 70° F Time on Job 7:10 AM - 5:50 PM Hours 10 hrs

Other time (travel, testing, report preparation) Travel 1

Mark Fletcher: Mobile B57	Bob Jordon Mobile B80	Driller Steve Ulrich B80 Rig
2-man crew continued SPT	7:10-9:45 3 man crew arrived +	7:53 Rig + 3-man crew arrived &
of M11 below 95' after	prepared to grout M7 from	got water
mechanic worked on rig	top of bentonite pellets @ depth 103' to	8:00- Set up rig @ M9 to ream hole
2:17 pm last SPT in M11 @	surface. Grouted well annulus.	8:00-2:40 Reamed M9 to 140.5'
125.2'	w/ bentonite up 95'-103' & 20	2:40-3:00 Thinned drill mud w/ water
2:25-3:10 Packed up rig +	sacks grout up to surface.	3:00-3:20 Pulled rods
got water	9:45-10:10 Disassembled eqpt @ site	3:20-3:50 Installed 4" PVC w/ screen @ 130-140'
3:25 - Rig On M6 location	10:12 Demobed from M-7 to get water	3:50 - 5 bags #2 SAND up to 127'
Drilled to 45' depth	10:45-11:20 Moved + set up on M10	5:10 1 bag #00 SAND up to 125
	11:25 Drilled M10 from 0' to	5:10 to Added pellets. Bridged at 74'
	65'?	#6:15 Pushed rods through bridge + measured
		top of bentonite @ 123'. Grouted
		hole w/ 16 sacks cement

8:30-8:50 Barry Brouse SCM conducted safety MTG @ M9 site for new HHI crewmen

Harvey Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H & A FOI OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

CLIENT SCM

Report No. 5 1

CONTRACTOR HARDIN-HUBER, INC

Date 9 OCTOBER 1992

Weather Rain Showers

Temp. 65°

Time on Job 8:00 AM 2:00 PM

Page 1 of 1

Hours 5.5

Other time (travel, testing, report preparation) Travel 2.0 Report Prep & Office Activity

Mark Fletcher Mobile B57
3 man crew continued SPT
sampling of M6 boring from
45' To 90' between
7am and 1:00pm in rain

Bob Jordan Mobile B-80
on M-10

Steve Ulrich Mobile B80
(Rig near M9, will move to M11 to set well

Both B-80 rigs were idle today due to impassable wet clay topped roadways around site resulting from rain continuing from previous night

Cherry Hill Construction did not operate any earthmoving equipment today due to the wet site conditions. Operators were released by Cherry Hill Sup't

Harry Beaulieu
FIELD REPRESENTATIVE

Rein Zehr
Haley & Aldrich, Inc.

H&A FOR OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 6

CLIENT SCM

Date 10 October 1992

CONTRACTOR HARDIN-HUBER INC.

Page ____ of ____

Weather Clear Temp. 75 Time on Job 7:00- ~~5:00pm~~ 4:30pm Hours 9.0

Other time (travel, testing, report preparation) Travel 1.5

Mark Fletcher Mobile B57
3-man crew continued SPT
sampling of M6 boring from
90' to finish depth of 140.4
between 7:00am & 3:40pm
3:40-4:00 Pulled rods while breaking
them down. Spoon came up empty
4:00 started sending spoon w/ new
trap down hole, but dropped
1 rod + spoon down hole
4:05- Fishing for rod + spoon

Bob Jordan Mobile B-80
on M-10

Steve Ulrich Mobile B80
(Rig near M9, will move to M11
to set well

Both B-80 rigs were idle today due to impassable
wet clay-topped roadways around site resulting
from rain the previous 2 days.

H. Beaulieu
FIELD REPRESENTATIVE

Zein Zeleb
Haley & Aldrich, Inc.

H&A FOS OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 7

CLIENT SCM

Date 12 October 1992

CONTRACTOR HARDIN-HUBER INC

Page 1 of 1

Weather Mostly sunny Temp. 69°F Time on Job 7:00 AM – 7:20 PM Hours 11.75

Other time (travel, testing, report preparation) Travel 1.5

Mark Fletcher	Steve Ulrich B80	Bob Jordan B80
Mobile B57	8:25 stuck	~~40~~? Continued drilling
	10:00 dozer starts moving	M10 to depth 120'
7:30 rig stuck	10:09 on M11 loc'n	
8:00 Operator en route to stuck rig	10:15 work truck on	
Pulled out last 8:20	M11 Loc'n	
8:50 stuck again bobcat pulled	2:00 Driller reported	
9:31 graded on loc'n M4	to this water that	
SPT M4 every 5' to	rig had slid off 6	
95'	loc'n & could not ~~slide~~	
	get back on	
	2:05 Called HNI shop.	
	Moving rig to another hole	
	2:40 Rig Underway to M6	
	3:06 Rig On M6 Loc'n	
	Start Settings	
	3:30 – 7:00 pm reamed	
	M6 to 120'	

Cherry Hill sent most of its operators home early in morning due to wet site conditions

The Cherry Hill and Burchart Horn trailers were moved across the site road today.

H. Beaulieu

FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOR OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 8

CLIENT SCM

Date 13 October 1992

CONTRACTOR HARDIN-HUBER INC.

Page ____ of ____

Weather Clear Temp. ____ Time on Job 7:00 pm - 7:15 pm Hours 11.75

Other time (travel, testing, report preparation)

Mark Fletcher	Steve Ulrich B80		Bob Jordon B80 Continued
Mobile B57	Continued reaming		drilling 1 SPT M10 below
7:00 Continued drilling below 95	M6 below 120' to depth		120', Mechanic worked on
M4. Start Continuous Sampling	8:145'		pump @ 10:00
@ 100'. Stopped after 100 & 102'	Installed 4" PVC well		SPT to 153.5'
Sampler when clay encountered @ 102'	to depth 141'		
5' sampling below starting @ 103.5'	w/ 10' screen		
Mechanic worked on clutch	finished grouting @		
@ 10:45 Finished @ 11:00	1:45 pm		
Drilled M4 to 146'			
	3:00 pm Rig on M11		
	Site		
	4:10 finished		
	working on Mud Buggy		
	after placing water tank		
	on it. Got equipment to		
	well site. Left site after		
	running 5' of augers into		
	ground		

~~Mark~~ George Claflin @ site for a few hours in the afternoon for briefing w/ H. Beaulieu.

H. Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOI OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 9

CLIENT SCM

Date 14 October 1992

CONTRACTOR HARDIN-HUBER, INC

Page 1 of 1

Weather CLEAR Temp. 75 Time on Job 7:00 am - 7:00 pm Hours 11.5

Other time (travel, testing, report preparation) Office 0.75 Travel 1.5

Mark Fletcher B-57	Steve Ulrich B-80 on M-11	Bob Jordon B-80
Continued SPT of M4	7:00 -	Continued SPT of M10 from
below depth 146	Spun hollow stem augers down	depth 153.5. Started Continuous
Spoons 146, 148.5	to 15' depth to get seal for mud	SPT @ 162'. Bottom of SPT
153.5, 155, 157, 159	pan	@ 170.4'. Drilled hole to 175'?
161, 163.	Reamed M-11 hole down to 129'	@ 2:09 pm
Finished M4 @ 3:45pm	Stopped for day w/ rods & bit	4" CSG down to 168.7'
@ 163.3'	down hole	Installed #1 Sand up to 156
Pulled out of hole & disassembled		#00 Sand up to 153'
tools		Bentonite Pellets up to 151'
Pulled off M4 @ 5:00		
Could not get on M5		
Moved rig to M3		
@ 5:30		
5:40 Setting mud pan		
Drilled/SPT M3 to		
depth 5'		

George Claflin on site this day

H. Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOR OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 10 T.

CLIENT SCM

Date 15 October 1992

CONTRACTOR HARDIN-HUBER INC.

Page ____ of ____

Weather CLEAR Temp. 80 Time on Job 8:00 am - 5:45 pm Hours 9.25

Other time (travel, testing, report preparation) Travel 1.75

Mark Fletcher B57	Steve Ulrich Set M11	Bob Jordan 1:80
Continued M3 SPT sampling	Well screen @ 126'	
below 5' to depth 105'	Grouted + Set sand	Grouted M10 w/ 36 sacks grout
Rig Maintenance 4:30-5:30	Finished grouting at 2:45pm	
	Topped off grout in M 6	
	& M 10	12:15 Filled rig off of M10
	Moved rig onto M4 @ 4:25pm	12:55 rig on M 5 Location
	+ started setting up and	1:30-2:30 Collected materials from
	Reamed hole	NNE shop
		2:30-7:00 SPT & 5pm auger
		down below mud pan in an effort
		to seal around it

Cherry Hill began cutting of wetlands mitigation area near M9 + M7

H. Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOI OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 11

CLIENT SCM

Date 16 OCTOBER 1992

CONTRACTOR HARDIN-HUBER, INC

Page ____ of ____

Weather Clear Temp. 80 Time on Job 7:40 am 7:10 pm Hours 11.0

Other time (travel, testing, report preparation) Travel

Mark Fletcher B57	Steve Ulrich B80	Bob Jordan B80
Continued SPT of M3	Reamed M4 to depth 163'	Continued SPT of M5
below depth 105'	@ 10:40	below depth
Started continuous spt	Installed 4" PVC well	
@ 158.5 Drilled to depth	w/ screen set from 150'-160	Spun augers down to 24' to
166.		remedy leak around augers below
		mud pan. Leak was an
	5:15 moved off M4	issue for most of the day
	5:35 rig set up on M2	
	Started setting up rig	
	5:45 left site	

Charley Hill Pans continued cut of wetlands mitigation area near M9 & M7

H. Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOR OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 12

CLIENT SCM

Date 17 October 1992

CONTRACTOR HARDIN-HUBER INC.

Page ____ of ____

Weather Clear breezy Temp. 65 Time on Job 7:15 AM - 5:15 PM Hours 9.5

Other time (travel, testing, report preparation) Travel 1.5

Mark Fletcher, B57	Steve Ulrich, B-80	Bob Jordon.
Continued continuous SPT of	Continued setting up on	Continued SPT of M5 below
M3 below depth 166'	M2.	depth.
9:40 am Finished drilling last span	8:35 Started drilling M2	~~Finished for day~~ Leakage around
to depth 170.3'	5:06 Left site after drilling	augers slowed progress. Driller packed
9:45-11:00 Broke down eqpt.	w/ 5' sampling to 90'	clay around outside of augers
12:16 rig on M1 site, Started		Finished for day @ depth 90'
Set up preparations		
12:30 Started drilling M1		
4:15 Left site w/		
M1 @ 55'		

H. Beaulieu

FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOR OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 13

CLIENT SCM

Date 19 October 1992

CONTRACTOR HARDIN-HUBER INC

Page 1 of

Weather Partly Cloudy windy Temp. ____ Time on Job 8:00am 6:45pm Hours 10.25

Other time (travel, testing, report preparation) 1.5

Mark Fletcher B57	Steve Ulrich B80	Bob Jordon. B80
Continued SPT of M1	Continued sampling M2 below	Continued SPT of M5
below depth 55'	depth 90'	below depth 90'
±9:45-3:15 Worked to	Started continuous sampling of	Drilled to 140'
recover spoon broken off after	M2 at depth 157' after	
driving the 68.5'-70' sample	driving the 153.5 spoon to 154.4'	
Shelby tube w/ teeth cut in it used to	1'69, ~~then~~ 175 last spoon	
successfully cut around spoon		
w/o circulating to recover it		
Drilled to 98.5'		

H. Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOS OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 14

CLIENT SCM

Date 20 October 1992

CONTRACTOR HARDIN-HUBER, INC.

Page ____ of ____

Weather Mostly Sunny Temp. 60 Time on Job 7:30am - 6:45pm Hours 10.75

Other time (travel, testing, report preparation) Travel 2.0

Mark Fletcher B57	Jeff Corram B 80	Bob Jordan B 80
Continued M1 below 98.5'	Continued M2 below depth 175'	Continued M5 below 140'
Started "Continuous" sampling	Continuous below 180'.	Continuous below 148.5'
below 123.5'. Last SPT	to last SPT @ 191'-191.5. @ 1215pm	to last SPT @ 160' @ 3:45pm
@ 136' @ 3:20 pm	4:00pm driller thinned out mud	Drilled hole to 165' + thinned
Took apart rods to drill	Drilled hole to 192'	mud.
eqpt Demobilized @ 4:30	2:30-2:45 ran in well PVC+10'	5:30 finished pulling rods Started
At 5:00 assisted grouting	Screen 179.6-189.6	in w/ well w/ Screen @ 150'-160'
of M2 using B57 pump		6:30 adding bentonite pellets
	1 vol 177	6:45 · Top of pellets @ 142'
	Mixed + pumped grout. Pump broke down	Crew Left site
	at 4:40. B57 rig assisted	

H. Beaulieu

FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOI OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL GROUNDWATER MONITORING WELLS

File No. 65358-03

Report No. 15

CLIENT SCM

Date 21 October 1992

CONTRACTOR HARDIN-HUBER, INC.

Page ____ of ____

Weather Clear to Partly Cloudy Temp. 60°F Time on Job 7:30-6:00 pm Hours 10.0

Other time (travel, testing, report preparation) Travel 1.5

Bob Jordan

7:00 - ±11:50 grouting M5

11:50 - 1:50 Demobe rig

2:00 Moved rig to well M3 site

3:00 Finished setting pan + started reaming M3. Drilled to 100'.

Steve Ulrich B80

Moved rig from well M2 to the M-1 site

±8:30 - ±3:45 reamed M-1 w/ 7 7/8" bit to depth 132. Thinned mud w/ water + came out of hole @ ±4:00

4:05-4:25 Installed M1 well. ~~Setting~~ screen down to 134.5' @ 4:25 (Requested 136') Driller intend w/ rods to get bottom of screen down to 134' Sand pack & pellets dropped down hole by driller prior to leaving site

Well Development 9:15-9:50 Developed M9 w/ compressed air. Stopped @ 9:50 by Cherry Hill request due to produced water inhibiting the impending pan fill operations in the wetlands remediation area. 9:50-10:15 Demobed tubing + compressor; 10:15-10:30 Steam Cleaned tubing. Moved to M-11 @ 10:40 10:48 started air flow into M11. Lunch 12:00-12:45

3:50 Stopped M-11 development for the day. Rate ± 30 gal/min

H. Beaulieu

FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOI OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

CLIENT SCM

Report No. 16 -

CONTRACTOR HARDIN HUBER, INC

Date 22 October 1992

Weather Clear

Temp. 75 Time on Job 8:00-5:50 pm

Page 1 of 1

Hours 9.25

Other time (travel, testing, report preparation) Travel 1.5

B80 Steve Ulrich

±7:00-9:15 Grouted M1 well riser w/ 16 sacks grout

9:15-9:46 Took apart equipment and moved rig to pond spillway area for decontamination. Rig sat on spillway for rest of the day. Driller spent part of day installing steel casing on M5, assisting w/ embedding grout supplier, and on steam cleaning rig.

B80 Bob Jordon: Continued reaming M-3 hole down to 175' finishing at ~~2:30~~ 1:49 pm

1:49-±2:30 Pulled rods & bit out of hole. Lost 1 rod & bit down hole when it slipped out of a slide plate.

2:30-5:30 HHI shop fabricated a fishing tool which driller used to successfully remove the rod & bit from the hole M3 after 1 failed attempt.

Well Development Activity: 2 air compressors on site today

M-11	±7:00-10:54	developed w/ air @ rate of ±20 gal. per min
M-10	9:53-±1:30	" " " " " ±40 gal. per min.
M-2	2:45-4:15	" " " " " ±50 gpm
M-4	5:30-	" " " " " ±20 gpm
M6	3:50-±6:30	" " " " " 15 gpm

Met w/ Barry Brouse in his office at SCM. He directed that G12 well be abandoned by HHI. Also directed that adapter caps be installed on the tops of the PVC well risers.

H. Beaulieu

FIELD REPRESENTATIVE

Brian Glaf

Haley & Aldrich, Inc.

H&A FOR OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

Report No. 17

CLIENT SCM

Date 23 October 1992

CONTRACTOR HARDIN HUBER INC

Page 1 of 1

Weather Clear Temp. 70 Time on Job 8:00 - 7:40 pm Hours 12.25

Other time (travel, testing, report preparation) Travel 1.5

B80 - Steve Ulrich · Rig no longer on site / Bob Jordan: ±7:00 - Reamed M3 down to 175' Flushed hole w/ water. Sand kept caving @ bottom. Mixed-pumped bentonite mud which stabilized hole

3:30 - Started into hole w/ well. Centralizer @ 151.0 & 169'. Screen 160'-170'

11 Sacks of # 1 Sand w/ top @ 154' Mud in bottom of screen slowed sand settling

2 sacks 00 Sand top @ 152 Top Pellets @ 150

Well Development Activity 2 Compressors on site today. One pulled off site @ ±10:00

±7:00 - ±9:00 M6 air developed

M4 - idle compressor set @ site until 1:00

12:00 Well developing crew arrived + took lunch

12:45 - 1:40 Moved compressor + tubing from M4 to M5 + set up for development

1:40 - 5:30 Air developed M5 w/ rate of ± 25 gal per minute

Installed M4 well cover, & M-2 well cover

Harvey Beaulieu

FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOL OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

Report No. 18

CLIENT SCM

Date 26 October 1992

CONTRACTOR HARDIN HUBER, INC

Page 1 of 1

Weather Clear Temp. 65 Time on Job 8:30 - 6:00 pm Hours 9.0

Other time (travel, testing, report preparation) Travel 1.5 Ofc 0.25

Bob Jordon B-80 Grouted well M3 from 07:30 - 1:00 using 37 sacks portland Type I/II

1:00 - 2:00 - Dissembled drilling equipment + Loaded mud pan

2 - 2:30 Moved to M2 + removed broken concrete + bentonite from around well casing + removed casing. Pumped 2 sacks portland type I/II to top off hole annulus which was 10' below GL = old top of grout. Replaced well cover

2:30 2:44 Moved rig to M3 hole + topped off grouting 2 sacks portland type I/II + placed well casing over hole.

Well Development Activity NONE Compressor @ M5 location sat idle as of 11:00 am → 6:00 pm

No Development activity today

G12 - Measured 45.6' below GL (47.9' from top of riser w/ 2.3' sticking)

2:44 - 3:25 Positioned rig + trucks around G-12 + set up abandoning equipment

3:25 - 5:45 Drove splitting tool down G12 riser + screen to bottom of G-12 well @ depth 45.6'. Pumped grout down rods to abandon well. (One 55 gallon batch) removed rods + shut down

Harvey Beaulieu

FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOR OCT.73

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

Report No. 19

CLIENT SCM

Date 27 October 1992

CONTRACTOR HARDIN HUBER INC

Page 1 of 1

Weather Mostly Sunny Temp. 65 Time on Job 7:00-5:00 Hours 9.5

Other time (travel, testing, report preparation) Travel 1.5 Office 0.25

B80 Rig Crew (Bobo Gordon driller) Topped off the grout in abandoned well G-12.
± 9:00- Crew Topped off grout of M1 which had settled to 6' below ground level
Rig then driven to spillway for decomming. B-80 rig demobed from site today.

Well Development Activity & Well Casing grouting activity
8:51 2-man crew arrived + started up air compressor to continue
developing M5 @ rate of ± 20 gal per min
10:50- Stopped M5 development after water had reached peak clarity.
Developed M9 from 11:50- 4:20 @ rate of ± 15 gpm

Installed sakrete around well casings wells M-1. M2. M3, M7 M-10 & M11

Harvey Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H & A 101 OCT.75

DAILY FIELD REPORT

PROJECT HPP LANDFILL WELL INSTALLATION

File No. 65358-03

Report No. 20

CLIENT SCM

Date 28 October 1992

CONTRACTOR HARDIN HUBER INC

Page 1 of 1

Weather CLOUDY Temp. 65 Time on Job 7:30 - 5:00 Hours 9.0

Other time (travel, testing, report preparation) Travel 1.5

WELL DEVELOPMENT ACTIVITY: 2-man crew moved compressor over to M7 from M9 8:10 - 10:55 Developed M7 at rate of ± 20 gal per min.

2nd Air compressor brought to site at ± 10:00
M1 well developed from 10:20 - 12:48 @ ± 10 gpm.

1st Compressor moved @ 11:15 to G-19 where crew torched off lock and steam cleaned air tubing w inserted it to bottom of G-19. Water development occurred from 11:47 to 1:20 pm

Compressor moved from M1 to M3 @ 1:08. Crew steam cleaned air line w/equipment at G-19 from 1:18 - 1:28. M3 well development started at 2:00 + continued through the afternoon. Flow rate of ± 1.5 gallons/minute resulted compared w/ 10 - 40 gpm for other wells on site. Turbidity remained high. Compressor fueled up by crew at 4:30 pm + left running to develop well into + possibly through the night.

Installed well cover on M9

2nd Air compressor left site @ 5:00

Harvey Beaulieu
FIELD REPRESENTATIVE

Haley & Aldrich, Inc.

H&A FOR OCT. 75

DAILY FIELD REPORT

PROJECT NPP LANDFILL

File No. 65358-03

Report No. 21

CLIENT SCM

Date 29 October 1992

CONTRACTOR HHI

Page ____ of ____

Weather Overcast Temp. 60°F Time on Job 7:30 AM 9:00 AM Hours 1.5

Other time (travel, testing, report preparation) Travel 1.5 Report 0.5

Well Development Activity

8:~~00~~ Crew restarted compressor to air-develop M-3. Red-tinged silty water resulted w/ flow of ± 2 gal/min.

~~AT~~ At 9:30 a side-shooting air tool was lowered down hole to blow out the screen & a flow of ± 7 gal/min ~~was~~ resulted. After ~ 2 hrs (at approx. 11:30) development was stopped when water developed had "cleared up" according to Mike @ site, as related by Kevin Huber in phone call to NB on 30 October @ 11:05 am.

H. Beaulieu
FIELD REPRESENTATIVE

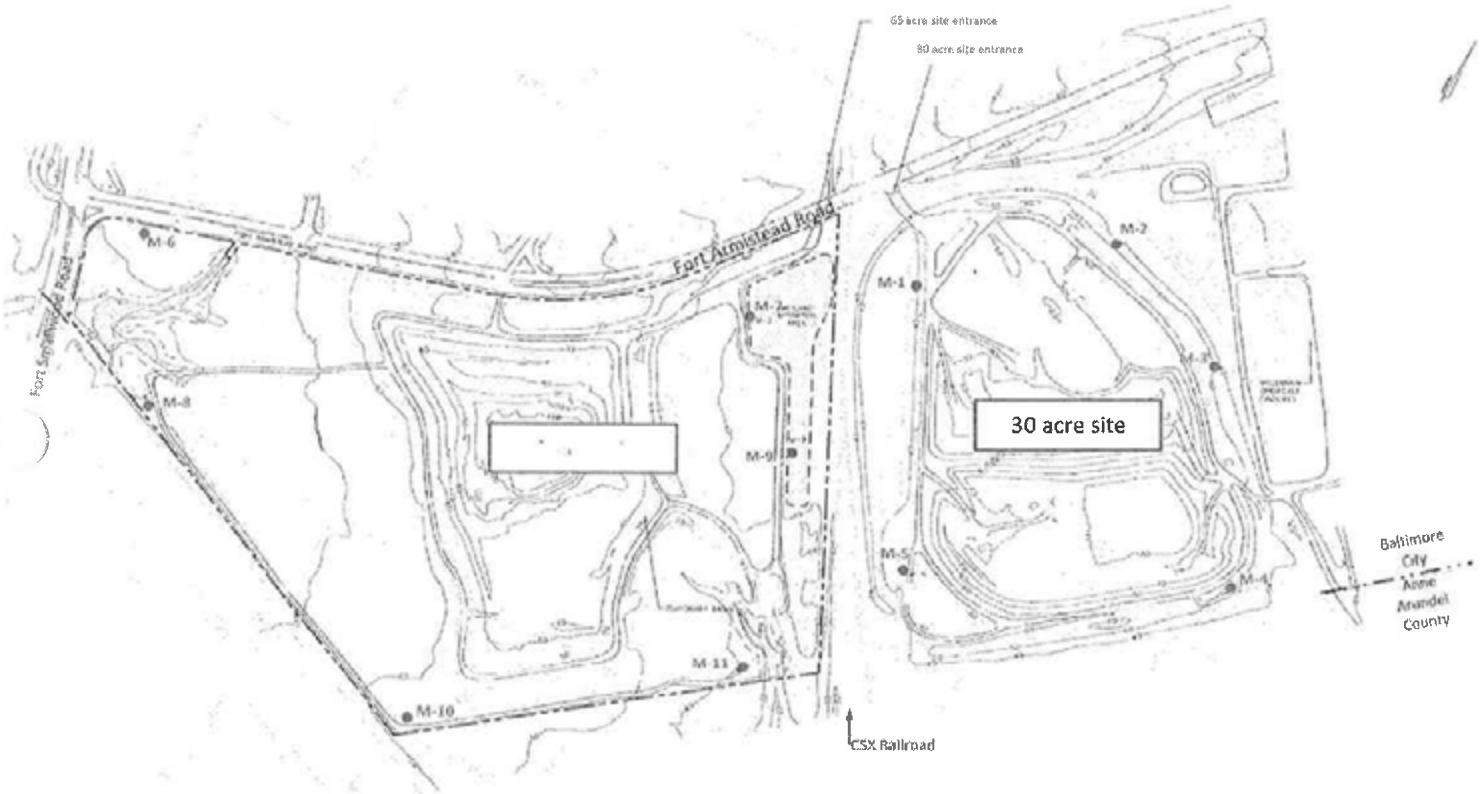
Haley & Aldrich, Inc.

H&A FOS OCT.73

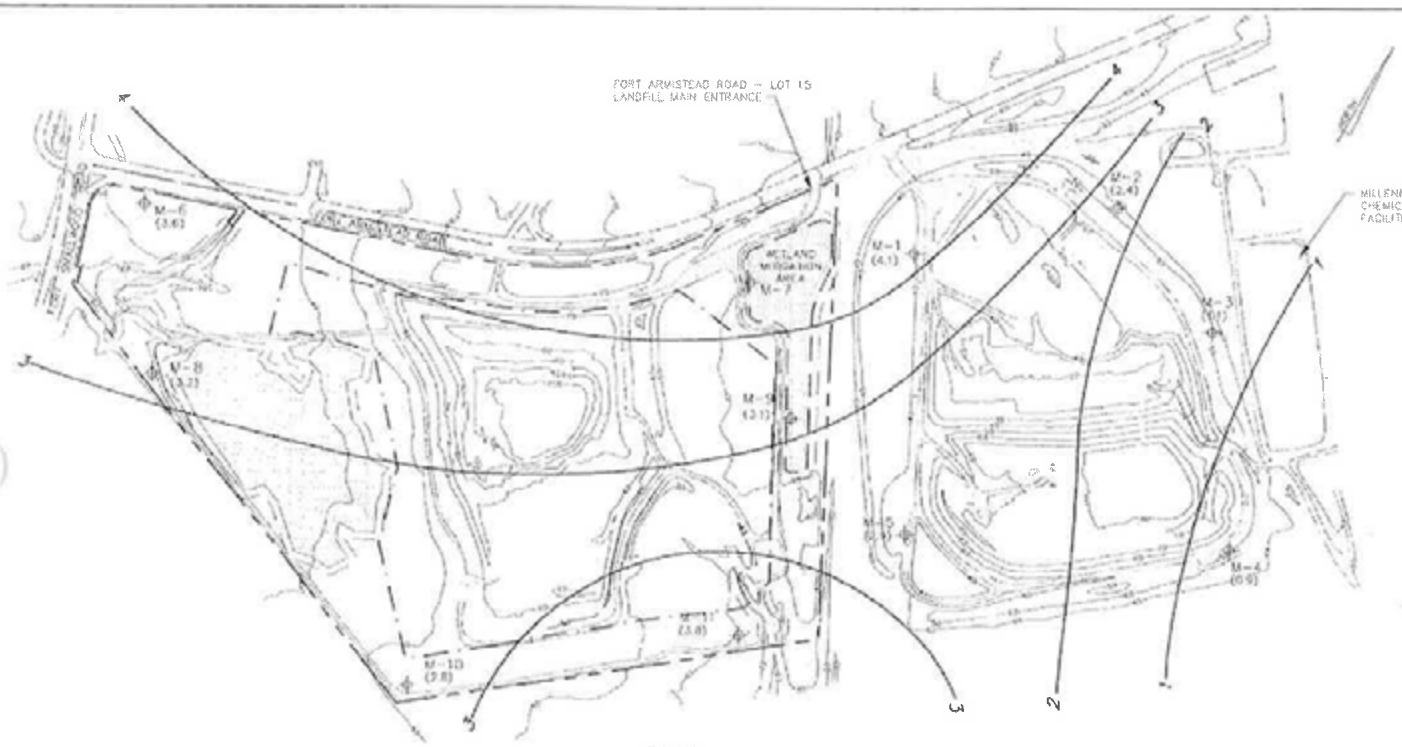
APPENDIX B

Monitoring Well Location Map

Groundwater Piezometric Contour Map



Monitoring Well Locations



NOTES:

1. MAXIMUM GROUNDWATER ELEVATION AT EACH MONITORING WELL WAS SELECTED FROM DATA OBTAINED BETWEEN JANUARY AND DECEMBER 2008 AND REPRESENTS GROUNDWATER ELEVATION OBSERVED IN JUNE 2008
2. GROUNDWATER ELEVATION DATA COLLECTED FROM MONITORING WELLS LOCATED AT HAWKINS POINT LANDFILL (M-1 THROUGH M-5) WERE USED AS A SUPPLEMENT TO DATA COLLECTED AT FORT ARMISTEAD ROAD – LOT 15 LANDFILL.

LEGEND

- PROPERTY BOUNDARY
- EXISTING BUILDING
- EXISTING ROAD
- EXISTING TREE LINE
- MINOR CONTOUR GRADE (FEET-MSL)
- MAJOR CONTOUR GRADE (FEET-MSL)
- M-10 MONITORING WELL LOCATION AND IDENTIFICATION (SEE NOTE 2)
- (3.0) GROUNDWATER ELEVATION IN FEET-MSL OBSERVED IN JUNE 2008 (SEE NOTE 1)
- 4 ELEVATED GROUNDWATER CONTOUR (FEET-MSL)

300 150 0 300
SCALE: 1" = 300'

CONTOUR MAP REPRESENTING ELEVATED GROUNDWATER CONDITION

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	JUNE 2011
PROJECT NO.	MT0058
DOCUMENT NO.	
FILE NO.	0508F0107-9
FIGURE NO.	7

APPENDIX C

MDE Well Specifications

State of Maryland
DEPARTMENT OF THE ENVIRONMENT
Hazardous and Solid Waste Management Administration
2500 Broening Highway
Baltimore, Maryland 21224

Specifications for the Design and Construction Of Groundwater Monitoring Wells At Solid Waste Disposal Facilities
updated 12/9/91

Wells are defined in COMAR 26.04.04.02.J as "...any hole made in the ground to explore for groundwater, to obtain or monitor groundwater, or to inject water into any underground formation from which groundwater may be produced." This definition includes monitoring wells, piezometers, and any exploratory boring which penetrates the groundwater table. The following general specifications pertain to monitoring wells being installed in the vicinity of sanitary landfills and other solid waste disposal facilities for the purpose of obtaining high-quality samples for chemical analysis. Please note that wells installed for other purposes, such as piezometers installed solely for water level monitoring, wells intended to detect floating gasoline, and wells at industrial and CERCLA sites are likely to have different specifications. In all cases, the design of a monitoring system must be approved in advance by the appropriate HSWMA project manager.

1. All wells must be installed by a Maryland-licensed well-driller in accordance with all pertinent State and local laws and regulations, and not until this Administration has approved the proposed location and design of each well. A permit to drill each well must be applied for and obtained from the local County Health Department for the county in which the well is to be located prior to well installation.

2. All monitoring well casings and screens must be constructed of 4" inner-diameter pipe composed of Schedule 40 Polyvinylchloride (PVC), Teflon (PFE), or stainless steel, joined using threaded couplings. No solvent-welded construction will be approved. No solvents, glues, or lubricants shall be used in the construction of the well, except as specifically approved by the Administration. No reduction fittings may be used in the construction of the well; "telescoped" screen construction is not acceptable. Connections between casing lengths and screen sections may not have protrusions or restricted diameters on the inside of the well casing which could cause a pump or bailer to become lodged in the well.

3. The screened interval of the monitoring well must consist of at least 10 feet of pre-constructed, commercially manufactured well screen of the same material and inner diameter as the main well casing. Slot size of the screen (generally 0.020") shall be

selected so that, with the gravel pack, it will preclude clogging and excessive turbidity in the well. The bottom of the screen must be capped.

4. The diameter of the boring into which the casing is set must exceed the diameter of the casing by at least four inches (4") (e.g., a four inch well must be installed in a hole at least eight inches in diameter), so that the gravel pack and grout may be properly placed in the annular space between the casing and the sides of the hole.

5. For wells set into bedrock, and for any well greater than 50 feet deep, at least three (3) centralizers must be installed to center the well casing in the annular space, with one at the screen and the others spaced evenly along the well casing. The centralizers shall be composed of the same material as the casing and screen, or other inert material approved by the Administration.

6. The annular space of all wells shall be packed with sterilized pea gravel or coarse sand of a size compatible with the selected screen slot size from the base of the well to a level three feet (3') above the top of the screen. The gravel or sand pack used must be selected so that it prevents fine-grained sediment in the screened formation from clogging the slots in the screen or causing excessive turbidity in the well, and it must have a permeability at least approximately equal to or higher than the permeability of the monitored formation. Two feet (2') of finer sand must be placed on top of the gravel or sand pack to prevent the migration of bentonite and/or other grout components vertically down into the gravel pack and screen. Two feet (2') of bentonite pellets must be placed above the fine sand, to prevent the entry of grout into the gravel pack, and to act as a long-term barrier to liquid which might seep down the formation/grout interface.

All materials used to construct the well, including the gravel pack, seal, and grout, must be clean, sterilized, new materials - cuttings may not be placed back in the hole, as this can cause cross-contamination of the well from shallower contaminated zones or surface contaminants. Also, the gravel and sand must be composed of quartz or a similar inert mineral; limestone, marble, shale or other rock chips containing soluble minerals may not be used. If in doubt as to the consistency of the proposed materials, submit a sample to the Administration's project manager. If any wastes, contaminated soils or contaminated liquids are produced during the drilling process, they must be disposed of properly. If the gravel pack is emplaced with auger flights or temporary casing still in the

hole, the augers or casing must be backed out by increments as the gravel pack is emplaced to insure that the gravel pack sets properly without bridging and without displacing the well casing when the casing or augers are extracted.

7. The annular space of all wells must be pressure-grouted with Portland cement or a Portland cement/10% bentonite slurry from the top of the pelletized bentonite seal to the surface. The grout must be installed by means of a tremie pipe inserted into the annular space of the well to a point just above the bentonite seal, and should not be installed until the two-foot (2') bentonite seal has had two (2) hours to hydrate. Under certain circumstances, a 100%-bentonite slurry or a >10% bentonite-enriched cement may be specified as the grouting material. If bentonite clay is the approved grouting material, the well must be developed **before** grouting, and the groundwater tested prior to bentonite use. A 100% bentonite slurry may not be used for grout where it will come into contact with groundwater having a pH below 5.0 or a Total Dissolved Solids concentration of greater than 1000 mg/l.

8. After the grout has set up, some additional grout may have to be added to replace grout volume lost due to shrinkage. Regardless of the type of grout used, the top three feet must be composed of Portland cement or an acceptable concrete. All wells must be provided with a means of protection from tampering, vandalism, and accidental damage. At a minimum, all wells must be provided with a steel outer casing with a diameter at least 2" greater than the main casing anchored three feet (3') into the cement grout, with a hinged, locking steel cap which allows access to the main casing inside only when open. Alternative protective devices may be proposed. It is recommended that any proposed method should not entail sliding parts which would require periodic lubrication, such as threaded steel pipe, as this can foul sampling equipment and coat the inside of the well rendering it useless for water quality sampling.

At the ground surface, a concrete form must be provided during grout installation for the construction of a square concrete pad at least 18"x18" centered around the well, which shall extend from three inches above to three inches below the undisturbed ground surface. The height of the protective casing shall be two feet (2') above the top of the cement pad plus or minus no more than two inches (2"). The top of the PVC casing inside must be provided with a removable cap that fits just under the locking protective steel cap, and be accessible for cap removal with normal tools. The Hazardous and Solid Waste Management Administration must be provided with such keys or other special devices required for access to the wells for

sampling. The Administration may approve other access control arrangements provided that access to the wells for sampling by Administration personnel on demand is assured.

High-traffic areas such as maintenance areas and parking lots may require special installations such as concrete posts set around the well to prevent damage by vehicles. Such barriers should be painted a highly visible color, and should be spaced so as to protect the well but still allow a vehicle to back up to it for sampling and repairs. Also, some installations such as gas stations may require ground-level or low-profile anti-vandalism caps; leak-proof metal caps are commercially available for these locations. These should be carefully marked so that inexperienced personnel do not mistake them for the fuel-fill ports of underground storage tanks. Also, low-profile caps are not recommended for most landfill applications, as they make relocating the well for sampling more difficult.

9. After the grout has thoroughly cured or set up, all wells must be developed to insure that a satisfactory hydraulic connection exists between the well and the monitored formation. Development must consist of alternating mechanical- and/or air-surging techniques with pumping, to remove fine materials that may remain in the well, gravel pack, and the formation nearest the well which would otherwise threaten sample quality. Jetting or other techniques may be employed where necessary to speed this process, particularly when the drilling method used to install the wells was the mud-rotary method, or a variant. Wells shall be developed so that the water produced has a measured turbidity of 10 NTUs (Nephelometric Turbidity Units) or less.

10. Following development, all wells must undergo a pump test of not less than one (1) hour in order to determine the yield of the well. Yield must be reported on the completion reports. If wells are developed using high-pressure air development techniques, the air compressors must be of the oilless variety and/or have sufficient carbon filtration to remove any chance that oil vapor will be introduced into the well.

11. All wells must be properly tagged, with the well construction permit number and monitoring well designation (e.g., MW-2D, etc.) clearly visible from the outside of the well, and flagged or otherwise made visible so that they can be located for sampling and avoided by on-site heavy equipment.

13. Well completion reports must be fully completed for each well installed, and a copy of the well completion reports forms submitted to the County Health Department must be forwarded to this Administration within thirty (30) days of well completion.

A project summary describing the installation procedure must accompany the copies of the completion reports, and must contain an accurate map depicting the precise location of all wells installed at the site in relation to known landmarks; a detailed description of the construction of the wells installed including casing, screen, gravel pack and grout intervals; the elevation of the top of the concrete pad installed at the base of the protective outer well casing; the top-of-casing elevation; and both the static and pumping water levels to the nearest one-hundredth of a foot.

14. The well driller or the supervising engineer or geologist must notify this Administration via telephone at least three (3) work days prior to initiation of drilling at any waste disposal site, so that representatives may be present to observe the well installation. Failure to notify HSWMA may result in rejection of the well or system as an acceptable monitoring point.

15. All regulatory requirements must be met concerning the application for, permitting of, construction of and completion of all monitoring wells. Wells not constructed in accordance with the regulations (COMAR 26.04.04 of the Annotated Code of Maryland) and these specifications will not be accepted by this Administration unless a variance was obtained prior to or during well construction. Also, drilling at waste disposal sites may generate contaminated soils or liquids which must be collected and disposed of in a safe and legal manner.

16. It is recognized that geologic conditions at a site may require that changes to these general specifications be made in order that the monitoring system installed is adequate for monitoring the intended geologic formations, while not creating an additional hazard to groundwater quality. The specific reason for installing the well - e.g., looking for "floaters" like gasoline, dissolved compounds like landfill leachate, or "sinkers" like some chlorinated solvents - will also control the specific design requirements of the well. Variances from the specifications described may be sought from the HSWMA project manager coordinating the well installation. Also, the Administration may require additional or more stringent construction specifications for any well where site conditions warrant it.

17. Any wells which are to be abandoned, and which are located at or near a solid waste disposal facility, must be abandoned so that the section of the regulations addressing abandonment is carefully followed. Casing must be removed, drilled out, or thoroughly split or pierced, and the entire well and gravel pack completely filled with Portland cement grout from the base of the

former boring to the ground surface.

18. Placement of wells through refuse should be avoided. If it is impossible to site an accessible well at a place which is not on fill and still adequately monitor the facility, then the boring must be drilled or reamed out to at least a twelve inch (12") diameter into the next confining layer below the waste or where no clay layers occur to a depth at least five feet below the lowest occurrence of waste, and a steel casing of at least an eight inch internal diameter (8" I.D.) grouted in place with Portland cement or a mixture of Portland cement and bentonite as discussed above. After the grout has cured, drilling may commence in the boring at the previous diameter inside the steel pipe. The annular space between the steel outer casing and the 4" main well casing is to be grouted normally upon completion of the drilling. **Construction details of wells to be placed through waste MUST be approved by this Administration in advance, and a variance obtained for this construction in the well construction permit.**

19. For sites not located in the Coastal Plain physiographic province, or which are located along the Fall Line where bedrock is encountered at shallow depths, if groundwater is found in a boring above the bedrock/saprolite interface, two wells must be installed at that location in near proximity to each other, although not in the same boring. One well is to be screened in the weathered zone above the bedrock as defined by auger refusal, and the other is to be screened in a productive bedrock zone. If water is not found above bedrock, then the first productive zone or zones encountered that cumulatively produce at least 1 gallon per minute should be screened.

For sites on the Coastal Plain, the occurrence of noncontinuous confining layers or clay lenses on the site may require the installation of similar well clusters. This is typically required where clays greater than one foot thick are observed within 50 feet of the ground surface, where a lower zone is thought to be uncontaminated but needs to be evaluated, or where a plume of mixed contaminants (e.g., "floaters" and "sinkers") might be separating into different levels of the aquifer. In some cases such clusters may have to consist of 3 or 4 wells, each screened at different levels. Each well in a cluster must be installed in an individual boring; multiple casing installation in one boring is not acceptable.

20. Except for wells installed at petroleum product distribution facilities (e.g., gas stations), no well should be set less than fifteen feet (15') into the saturated zone without consultation and approval by the HSWMA project manager. Significant confining

layers (e.g., sedimentary clays >1 foot thick, fire-clay below coal seams, etc.) should not be penetrated without similar approval. Also, wells generally should not be overdrilled to a depth greater than 5' below the elevation at which the screen is to be set, to avoid cross-contamination of deeper zones and averaging of hydraulic pressure across the open interval. When overdrilling is required, as in cases where a site is being investigated for the first time, the hole should be grouted with Portland cement up to the bottom of the selected screened interval and the grout allowed to fully cure before the screen is set. The well should also be developed with particular care to avoid residual cement contamination in subsequent water samples.

21. Unless the geological setting is well defined, continuous core-sampling (in rock) or split-spoon or Shelby-tube sampling (in sediments and soils) should be performed so that the correct location of the screen can be verified during drilling. The anticipated zone in which the screen should be set should be established and approved by the Administration prior to drilling. If conditions are not sufficiently well defined to permit absolute identification of the conditions to be encountered beforehand, then a protocol for choosing the proper zone should be established in advance. In the case of shallow monitoring wells, generally the first zone or zones which cumulatively yield 1 gallon per minute or more should be screened.

22. All monitoring wells must be accessible to 4-wheel drive vehicles. Any mounds of dirt, vegetation, etc., must be removed or bridged, and any stormwater control devices, fences or other necessary restrictions to access be constructed so that access to the wells is possible upon reasonable request without prior notice. All-weather access roads to the wells must be maintained in a serviceable condition.

23. These standards generally apply to the installation of piezometers installed strictly for water level exploration and monitoring; however, the following variances are typically allowed for piezometers:

a) Casing diameters less than 4";

b) Boring diameters less than 8";

c) Screened intervals less than 10'; and

d) Solvent-welded plastic casing above the water table.

These details should be discussed with and approved in advance by with the HSWMA project manager.

24. Where a conflict exists between these specifications and the more general well construction requirements of COMAR 26.04.04, a variance for the required construction may be obtained from the local County Health Department. Questions concerning this matter may be referred to the HSWMA project manager or facility inspector, or to the appropriate Division:

Solid Waste Enforcement Division.....(410)-631-3424

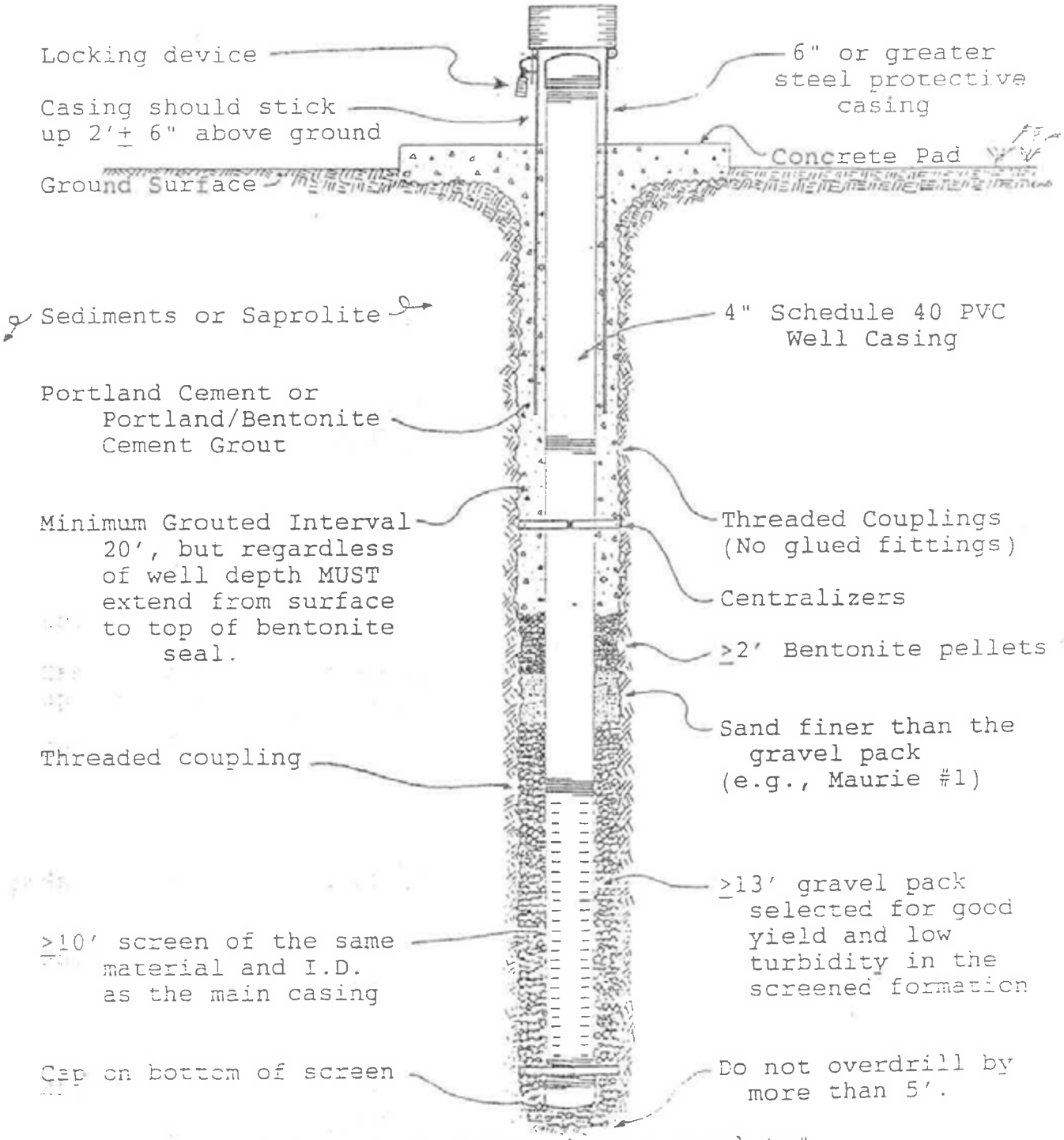
Solid Waste Facility Division.....(410)-631-3364

Project Manager...._____....(410)-___-_____

EMD:emd

State of Maryland
DEPARTMENT OF THE ENVIRONMENT
Hazardous and Solid Waste Management Administration

Typical Illustration of Minimum Specifications For Monitoring Well Construction



"≥" means "greater than or equal to".
Well Regulations, Minimum Specifications, and specific instructions by HSWMA supercede these general requirements.

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Sec. 26.04.04.16. Construction Standards — General

Latest version.

A. Sanitary Protection During Well Construction.

(1) During well construction, the permittee shall protect against pollution of the well and any water-bearing geologic formations by any cause, including surface water drainage.

(2) Whenever construction ceases before the well is grouted, the open annular space shall be covered by the permittee and the well shall be capped.

B. Water for Well Construction.

(1) Only water from a source approved by the Approving Authority in accordance with this section may be used in the construction and development of a well.

(2) Water used for construction of a well shall be taken from the best source available to the well driller.

(3) The best source, in order of preference, shall be:

(a) A public water supply system meeting the requirements of COMAR 26.04.01 for water quality;

(b) Any other potable water supply;

(c) A nonpotable well;

(d) A temporary well, constructed specifically for the purposes of obtaining water for the construction of the well.

(4) Water used for the construction or development of a well shall:

(a) Have a turbidity of not more than 25 standard units, except when the turbidity is due to the oxidation of dissolved iron or manganese;

(b) Be transported, when necessary, in tank trucks used only for the purpose of transporting drilling or potable water;

(c) Be treated with chlorine in amounts indicated in §B(5) of this regulation;

(d) Have a color of not more than 25 standard units; and

(e) Contain no objectionable odor.

(5) Chlorine treatment required in §B(4)(c) of this regulation, shall be as follows:

(a) For water from a public supply approved under COMAR 26.04.01, a chlorine compound shall be added to the water to produce a free chlorine residual of at least 1.0 mg/l when delivered at the drilling site;

(b) For water from any other potable water supply, the free chlorine residual of at least 3.0 mg/l in the water delivered at the drilling site;

(c) Water from a nonpotable well shall be dosed with chlorine to produce a minimum free chlorine residual of 50 mg/l.

C. Screening in More Than One Aquifer Prohibited. A well may not be screened in more than one aquifer.

D. Sealing-Off Strata. In order to preserve the quality of ground water, the Approving Authority may include a special condition in a well construction permit requiring that aquifers and other strata be sealed off.

E. Well Development. All wells shall be developed according to the following requirements:

(1) Well development means the process whereby a well is pumped, surged, bailed, airlifted, swabbed or jetted to remove any material that may be blocking the well screen or fractures within the borehole;

(2) Development shall continue until formation cuttings, drilling fluids, and additives are removed from the well;

(3) For wells in Hydrogeologic Areas 1 and 2, well development shall remove the fine sand, silt, and clay from the water-bearing zone surrounding the well screen;

(4) Any hydrofracturing shall be performed in accordance with Regulation .28 of this chapter; and

(5) Every well shall be developed in order to obtain the full yield of the well and a water quality that meets all of the following requirements:

(a) Contains less than 5 milligrams sand or larger sized particles per liter of water, where particles with a diameter between 0.0625 and 2.0 mm are considered to be sand; and

(b) Has a turbidity of less than 10 NTU (nephelometric turbidity unit) as determined by methods designated in 40 CFR §141.74(a)(1), except if the turbidity is due to the oxidation of dissolved iron or manganese naturally occurring in the water.

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Sec. 26.04.04.17. Construction StandardsCasing

Latest version.

A. Well Casing.

(1) Markings.

(a) Except as provided in §A(1)(b) of this regulation, all casing shall be marked by the manufacturer sufficiently to allow identification of the casing.

(b) Well casing for monitoring wells is exempt from displaying markings.

(c) The well driller shall provide, upon request, sufficient information to allow identification of casing used for monitoring wells.

(2) Plastic Well Casing.

(a) Plastic well casing shall be polyvinyl chloride, PVC, manufactured to meet the standards of the American Society of Testing and Materials (ASTM) Standard F-480.

(b) Plastic well casing shall be installed in accordance with the maximum depth limits specified:

Table 1

Depth Limit, In Feet, for Plastic Water Well Casing

PVC Cell Class 12454, PVC 1120, Type I

Diameter (inches)	SDR	SDR	SDR	SDR	SCH	SCH
	26	21	17	13.5	40	80
2	136	265	517	1085	708	2185

3					604	1730
4					400	1139
4.5					310	M
5					242	807
6					180	724
8					125	498
10					92	424
12					76	387
16					72	-

(c) In Hydrogeologic Areas 3, 4 ,and 5, plastic well casing may not be used for the main casing where caving conditions occur before casing placement.

(d) Plastic well casing 4 inches or less in diameter shall be a minimum of schedule 40.

(e) All plastic well casing greater than 4 inches in diameter shall be a minimum of SDR 26.

(3) Metal Well Casing.

(a) Metal well casing shall meet one of the following standards:

(i) ASTM standard A-53 or A-589;

(ii) American Petroleum Institute standard 5A or 5L; or

(iii) ASTM standard A-312, type 304 minimum, for stainless steel.

(b) Metal well casing of 4 inches or less, nominal size, shall be schedule 40 or better.

(c) Metal well casing greater than 4 inches, nominal size, shall have a minimum nominal wall thickness of 0.188 inches.

(d) The Approving Authority may require that Schedule 40 or Standard Schedule metal well casing be used where there is corrosive water, soil, or geology.

(e) Metal casing shall be new, prime pipe, being free of pits or breaks.

(4) Casing material is not permitted which will cause the delivered water to be toxic or violate State or federal primary drinking water standards in effect at the time the well is constructed.

(5) Other types and sizes of well casing may be approved by the Approving Authority for special applications, upon written request by the well driller.

B. Minimum Casing Length.

(1) In Hydrogeologic Areas 1 and 2, the casing shall extend to the top of or into the aquifer used.

(2) In Hydrogeologic Areas 3, 4, and 5, the casing shall extend through the weathered zone and be seated a minimum of 2 feet into bedrock.

(3) Less than 20 feet of casing may not be used in any area except as provided in Regulation .23 of this chapter.

(4) In Hydrogeologic Area 4, the minimum casing length is 40 feet.

C. Minimum Casing Diameter.

(1) Potable water supply wells shall have a minimum main casing diameter of 4 inches in all hydrogeologic areas of the State.

(2) In Hydrogeologic Areas 1 and 2, for potable water supply wells, the 4-inch minimum main casing diameter shall extend to, whichever comes first:

(a) A minimum of 250 feet; or

(b) The top of the aquifer used.

(3) Criteria for Variance for Telescoping Casing.

(a) The Approving Authority shall submit a report to the Department for approval prior to granting variances to §C(2) of this regulation for increasing or decreasing the minimum depth of the 4-inch minimum main casing diameter.

(b) The report shall contain at a minimum the following information:

(i) Area of county where variance is being considered;

(ii) Aquifer for which variance is being considered;

(iii) Discussion of current aquifer usage and predicted aquifer usage; and

(iv) Proposed variance wording.

(c) The report shall be incorporated in the county Master Water and Sewer Plan prior to implementation.

D. Well Casing Joints.

(1) Joints shall be watertight.

(2) Joints for metal casing may be either electrically welded or threaded.

(3) Joints for plastic well casing may be either threaded, solvent welded, or o-ring.

(4) Screws or other mechanical devices may only be used to join PVC well liner:

(i) For solvent welded joints used in liners;

(ii) With nonpenetrating stainless steel screws;

(iii) And per the recommendations of the pipe manufacturer to maintain their warranty.

E. Other Installation Requirements.

(1) Liners shall meet the standards for well casing under §§A and D of this regulation.

(2) Well casing may not be cut off or cut into below ground except to install a pitless unit.

(3) Well casing shall extend at least 8 inches above the finished grade.

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Sec. 26.04.04.18. Construction Standards — Screen

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A. Well Screens.

(1) All wells that obtain water from aquifers in Hydrogeologic Areas 1 and 2 shall be equipped with a screen that shall adequately prevent the entrance of formation material into the well during use.

(2) Well screens shall have sufficient structural strength to accomplish the purpose for which they are installed.

(3) Well screen openings shall provide, so far as is practical, the maximum amount of open area, consistent with strength of screen material and sediment grain size of the water-bearing formation to permit maximum transmission without clogging.

(4) Well screens, other than those made commercially, constructed by creating openings or slots in the casing, or liner, or both, by any mechanical contrivance are prohibited unless approved by the Approving Authority in a special permit condition.

(5) The well screen shall be provided with fittings necessary to seal the screen to the casing. If the screen diameter is smaller than the casing diameter, then extension of the screen blank section to at least 20 feet above the base of the main casing is required, or a packer or a reducer fitting shall be used.

(6) A fitting shall be provided to close the bottom of the screen.

B. Gravel-Packed Wells.

(1) Gravel, which is packed in the annular space, shall be water-washed, disinfected, and free from clay, silt, and organic material.

(2) Gravel pack may not connect aquifers.

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Sec. 26.04.04.19. Construction Standards — Grouting

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A. All wells shall be grouted in accordance with this regulation.

B. Time Limits.

(1) All wells shall be grouted as soon as possible but not later than 24 hours after the well casing has been set in place in Hydrogeological Areas 1 & 2.

(2) In Hydrogeological Areas 3, 4 & 5 all wells shall be grouted within 72 hours after the permanent casing has been set.

(3) After grouting is completed, there shall be a minimum curing time before drilling may be resumed of:

(a) 18 hours for Type I and Type II Portland cement; and

(b) 12 hours for Type III Portland cement.

C. Grouting Materials.

(1) Cement.

(a) The annular space may be filled with neat Portland or quick-setting cement in a ratio of not over 6 gallons of water per 94-pound sack of cement.

(b) Bentonite may be added to the neat cement grout in an amount not to exceed 6 pounds per 94-pound sack of cement. If bentonite is added to the neat cement grout, then additional water may be added at the ratio of 1 gallon of water per 2 pounds of

bentonite.

(2) Bentonite.

(a) Bentonite with a minimum solids content of 20 percent may be used to fill the annular space in accordance with the following:

(i) When mixed as a slurry, at 2 pounds bentonite per gallon of water; or

(ii) In chip or pellet form and if hydrated per the manufacturer specifications, when the annular space is less than 20 feet in depth.

(b) Bentonite may not be used for grouting where it will come into contact with ground water having a pH below 4.0 or a total dissolved solids content greater than 1,000 mg/l.

(3) Thermal Enhanced Bentonite Grout.

(a) Bentonite slurry shall be mixed per manufacturer specifications.

(b) The sand-bentonite ratio may not be greater than 250 pounds of sand per 50 pounds of bentonite.

(c) Sand shall be 000 well gravel that meets the following:

(i) 95 percent silica sand;

(ii) Have a uniformity coefficient not greater than 1.7; and

(iii) Have a particle size range of 0.60 mm to 0.15 mm.

(4) Thermally Enhanced Cementatious Grout:

(a) Shall be mixed per manufacturers specifications; and

(b) Have a permeability rating not less than 1×10^{-7}.

(5) Cement alone or bentonite alone may be required as a special condition in a well construction permit for any well.

(6) If rapid loss of grout material occurs during grout emplacement, coarse fill material may be used in the zone or zones in which the loss is occurring.

(7) Other grouting materials or mixtures may be authorized as a special condition in a well construction permit for any well after review and approval by the Department.

D. Standards for Grouting Unconfined Aquifer Wells in Hydrogeologic Areas 1 and 2.

For wells screened in an unconfined aquifer under this section, the annular space shall be grouted to a depth of at least 20 feet.

E. Standards for Grouting Confined Aquifer Wells in Hydrogeologic Area 2. Under this section:

(1) The depth of grouting may not be less than 30 feet;

(2) The annular space above the screen and below the grout shall be completely filled with clay, drill cuttings, or sand before grouting operations begin;

(3) For two part (lapped) telescoped wells, the drilling fluid may be used as fill material in the annular space if the drill fluid has a weight greater than 11 pounds per gallon;

(4) Drilling fluid less than 11 pounds per gallon may not be used as an acceptable fill material;

(5) For wells intended to have a yield greater than 5,000 gallons per day, the grout shall extend from a minimum of 5 feet into the confining bed, immediately above the aquifer being used, to the land surface; and

(6) For wells intended to have a yield of less than 5,000 gallons per day, the grout shall extend from a minimum of 5 feet into the first confining bed, which is at least 5 feet thick, to the land surface.

(7) Relative depths to confining layers are described in MGS, Open File Report No. 12-02-20, Maryland Coastal Plain Aquifer Information System: Hydrogeologic Framework, 2013, which is incorporated by reference.

F. Standards for Grouting Wells in Hydrogeologic Areas 3, 4, and 5.

(1) The annular space shall be grouted completely from the bottom of the casing to the land surface.

(2) The minimum depth of grout may not be less than 18 feet in Hydrogeologic Areas 3 and, and may not be less than 38 feet in Hydrogeologic Area 4 and 5.

(3) If caving conditions are experienced on wells with greater than 30 feet of casing, the annular space shall be grouted from the point where caving occurred or from a depth of 30 feet, whichever is greater, to the land surface.

G. If the annular space cannot be grouted in accordance with these regulations, the well shall be abandoned and sealed in accordance with this chapter.

H. Deviation from Grouting Standards.

(1) Deviation from the grouting standards given in §§D, E, and F of this regulation may be approved by the Approving Authority for unusual conditions that prevent conformance with those standards.

(2) The deviation from the grouting standard shall be requested on a form provided by the Approving Authority. The request shall be submitted to the Approving Authority within 5 days after the well is completed. The Approving Authority shall reject or approve the request within 5 business days.

I. Grout Height.

(1) For wells where a pump is not to be installed, the final grout height shall be at ground grade.

(2) For wells where a pump is to be installed, the final grout height shall be immediately below the pitless adapter or pitless unit.

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Sec. 26.04.04.23. Construction Standards and Special Requirements for Specific Types of Wells

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A. The following special requirements for specific types of wells based on the intended use of the well are as follows:

(1) Irrigation Wells.

(a) Wells in unconfined aquifers in Hydrogeologic Areas 1 and 2 used solely for irrigation shall have an annular space grouted to a minimum depth of 20 feet below land surface.

(b) All other irrigation wells shall meet the grouting requirements of Regulation .19 of this chapter.

(2) Monitoring Wells.

(a) The well driller shall submit to the Approving Authority the construction specifications that are proposed for a monitoring well as an attachment to the permit application.

(b) The Approving Authority may approve, as a special condition of a permit, special construction standards for wells installed for the purpose of monitoring ground water.

(c) If the Approving Authority does not approve special construction standards, then well construction shall comply with the provisions of this chapter.

(d) For an at-grade or below-grade well terminal, the well terminal shall be water tight

and enclosed in a well vault.

(3) Injection Wells.

(a) The well driller for an injection well shall submit to the Approving Authority the construction specifications that are proposed as an attachment to the permit application.

(b) The Approving Authority may not issue a permit to construct an injection well unless a State Discharge Permit has been issued by the Department.

(4) Geothermal Wells - Closed Loop.

(a) The pipe material, jointing, pressure testing, and anti-freeze solutions for a closed loop geothermal well shall conform to the standards of COMAR 09.15.05.

(b) The anti-freeze solution shall be environmentally safe.

(c) The borehole of a closed-loop geothermal well shall be grouted from the bottom of the borehole to the ground surface.

(d) The upper terminal of a closed-loop geothermal well may terminate below grade if:

(i) The well location is marked by a metal plate so that the location can be found by a metal detector; or

(ii) The manifold and horizontal lines are marked with detection tape.

(e) When the closed-loop geothermal well is terminated below grade, the well tag shall be attached to the flow center.

(f) If using copper as an exchange medium a maintenance agreement must be recorded in the County land records.

(5) Cathodic Protection Wells.

(a) The borehole of a cathodic protection well shall be grouted from the bottom of the borehole to the ground surface.

(b) The well driller shall submit to the Approving Authority the construction specifications that are proposed for a cathodic protection well as an attachment to the permit application.

(6) Dewatering Wells.The annular space of a dewatering shall be grouted to a depth of 5 feet below the static water level.

B. The following specific construction standards for specific wells, based on construction method, are as follows:

(1) Driven Wells.

(a) Driven wells may not be used for a potable water supply.

(b) In a driven well an oversize hole for grout, at least 4 inches greater in diameter than the casing, shall be constructed to a depth of at least 10 feet, and the annular space between this hole and the casing shall be grouted to land surface.

(c) The upper terminal of a driven well and pitless adapter or pitless unit installation shall be in accordance with this chapter.

(a) Bored, augered, and dug wells shall have a borehole with a minimum diameter of 6 inches larger than the outside diameter of the casing.

(b) The annular space shall be filled with grout to a depth of at least 30 feet below land surface, unless otherwise approved by the Approving Authority.

(c) The annular space below the grout shall be filled with a sand or gravel pack.

(d) Joints in the concrete casing shall be sealed with an impervious seal, such as cement and o-rings, to a depth of at least 20 feet.

(e) The casing shall extend to a depth of at least 2 feet below the lowest seasonal water table.

(f) The minimum depth of the casing shall be 20 feet.

(g) The well shall be protected with either:

(i) A precast, overlapping, steel-reinforced concrete cover; or

(ii) A metal cover at least 3/16 of an inch thick and fitted with a watertight gasket; and

(iii) Be at least 8 inches above grade.

(3) Jetted and Jetted-Driven Wells.

(a) Jetted and jetted-driven wells shall be grouted to a minimum depth of 20 feet. This will necessitate construction of an oversize hole for grout to this depth.

(b) Jetted and jetted-driven wells may not be used for potable water supplies.

(4) Horizontal Wells. The well driller shall submit plans with the Application for a Permit

to Drill that provide details on how the horizontal well is to be constructed and identify the materials to be used.

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APPENDIX D

Standard Procedures

1. Decontamination
2. Abandonment of Wells
3. Groundwater Sampling Procedures
4. Field Test Procedures

Standard Procedure 1

DECONTAMINATION

DECONTAMINATION OF FIELD EQUIPMENT

1.0 Purpose

This section documents the procedures that will be followed when decontaminating field equipment. The equipment may include split spoon soil samplers, bailers, drilling rigs, or any other type of reusable equipment used during field investigations.

When appropriate, decontamination will be performed as a quality assurance measure and safety precaution. Proper decontamination will be performed to minimize cross contamination between sampling locations or sampling intervals and transporting potentially contaminated materials off-site.

2.0 Equipment and Materials

- High-pressure steam cleaner
- Cleaning fluids: non-phosphatic soap and/or detergents, potable water
- Shovels and brushes
- Paper towels
- Disposable gloves
- Cleaning containers: plastic buckets, etc.

3.0 General

A. All decontamination will be performed under the assumption that the equipment is contaminated.

B. An adequate supply of all decontamination equipment and materials will be available on site.

4.0 Procedures

The following sections present the decontamination procedures that will be followed during the performance of all field tasks. If different or more extensive procedures are required, they will be pre-approved by the Millennium supervisor or designee.

4.1 Drilling Rig and Associated Equipment

A. All equipment associated with the selected drilling method coming in contact with potential contamination, both as part of subsurface equipment advancement and due to aboveground contact with drilling fluids, extracted soils, drill rig lubricants and fuels, etc., will be decontaminated prior to use of this equipment for soil boring advancement. At the discretion of the Millennium supervisor or designee, the entire drilling rig may be decontaminated due to foreign substances adhering two the rig as a result of operations, transplant from off-site, or travel between soil boring locations.

B. A high-pressure steam cleaner should be used to remove foreign material from inside and outside of drilling equipment that will not come into contact with test samples. Decontamination of sampling equipment (e.g., split-spoon samplers) is described in section 4.2.

C. The date, time, and decontamination procedure used will be recorded on the boring log or daily field report or in a field notebook.

4.2 Split-Spoon Sampler

To ensure that the potential for cross contamination is minimized during subsurface investigations, the split spoon sampler will be decontaminated between sampling intervals.

A. After collecting the split spoon sample, the sampler will be disassembled and decontaminated by first physically removing any adhering soil material from the sampler.

B. The sampler will be placed in a bucket containing a non-phosphatic soap solution (e.g., *Liquinox*) and scrubbed until visibly clean.

C. The sampler will then be thoroughly rinsed with potable water until all soap solution is removed.

D. The sampler will be reassembled.

4.3 Submersible Pump

This procedure will be employed to decontaminate the submersible pumps that are used in well purging and/or development operations.

A. After removing the pump from the well, all exterior surfaces (the housing and hose) will be wiped with clean paper towels and placed on clean plastic. If any extraneous material is present on the outside of the pump or hose, it will be removed using a stiff brush.

B. The pump will then be placed in a suitably sized container of non-phosphatic soap solution (e.g., *Liquinox*) and potable water. If possible, the pump will be turned on to circulate the solution through the pump.

C. The pump will then be placed in a suitably sized container of clean potable or distilled water and then thoroughly rinsed. The pump will be turned on until the internal portion of the pump and tubing is free of cleaning solution; otherwise, the pump will be hand-circulated around the container and clean water will be cascaded into the pump. The outside of the pump housing will also be thoroughly rinsed with potable or distilled water. The last rinse applied to the pump system will always be distilled water.

6.0 Special Notes

None

7.0 Applicable Standards and References

None

STANDARD PROCEDURE 2

ABANDONMENT OF WELLS

B. After the well is completed, the well owner is responsible for maintaining the upper terminal of the well at the proper height indicated in Regulation .07F(3).

C. After the well is completed, the well owner shall maintain the access port in a manner which prevents the entrance of water, dust, insects, or other foreign material and permits ready access for water level measurements.

D. The owner of an artesian well shall maintain and operate the valves installed by the well driller pursuant to Regulation .07M(5).

E. After the well is completed, the well owner is responsible for maintaining the identification tag attached to the well.

.11 Abandonment Standards.

A. In this regulation, the term "well" shall also include all test holes drilled in the exploration of coal, oil, and gas, or for gas storage, which penetrate into or through an aquifer, confined or unconfined.

B. "Abandon" means to permanently discontinue the use of a well. Any well shall be deemed abandoned when it is in such a state of disrepair that continued use for the purpose of obtaining ground water is impracticable, or when it has been permanently disconnected from any water supply system or irrigation system.

C. Objective. The objective of the standards described in this regulation is to restore as nearly as possible those subsurface conditions which existed before the well was constructed, taking into account changes, if any, which have occurred since the time of construction.

D. General Requirements.

(1) An abandoned well shall be filled and sealed in such a way that it will not:

(See page 278)

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geologic Area 1) shall be filled and se
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Material. The following standards sl
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and cement grout or concrete is us
uous operation;

(a) Act as a channel for the interchange of waters of undesirable quality with those whose quality is desirable; or

(b) Present a hazard to the safety and well-being of humans or animals.

(2) The Department or Approving Authority may require the well owner to have a well abandoned and sealed if it:

(a) Is causing or is a potential source of pollution of waters of the State;

(b) Is producing water that is polluted; or

(c) Does not have a certificate of potability, if required.

(3) Any well abandoned shall be sealed only by a well driller licensed by the Maryland State Board of Well Drillers or under the supervision of a master well driller or a representative of the Department or Approving Authority.

(4) Abandonment Approval. When the Department or Approving Authority has reason to believe on the basis of local conditions that abandonment of a well necessitates close supervision, it may require the submission of sealing plans and specifications for approval before abandonment operations.

(5) Observation Wells. Wells used for the investigation or management of ground water are not considered "abandoned" so long as they are maintained for this purpose. Wells without pumps shall be covered with a secure cap when measurements are not being made.

(6) Reports on the Abandonment of Wells. When a well is abandoned, the person abandoning it, or the owner, shall notify the Approving Authority of this action by completing an Abandoned Well Report form provided by the Approving Authority. This report shall be submitted not later than 30 days after abandonment of the well or test hole.

E. Materials for Filling and Sealing Wells.

(1) Sealing Materials.

(a) Concrete, Portland cement grout, sodium-base bentonite clay, or combinations of these materials may be used to seal a well.

(b) Used drilling muds are not to be used to seal a well.

(c) Concrete. Concrete may be used for filling the upper part of the well or water bearing formation, or plugging short sections of casing and filling large diameter wells.

(d) Portland cement grout is superior for sealing small openings, penetrating any annular space outside the casing, and for filling voids in the surrounding formation. Portland cement grout shall be composed of one bag of cement per 5 to 8 gallons of water. Two parts sand to one part cement may be added.

(e) Bentonite clay, when applied as a heavy mud-laden fluid under pressure, has most of the advantages of cement grout but under some conditions may be carried away into the surrounding formation. A bentonite clay mixture shall be composed of not less than 2 pounds of clay per gallon of water. Bentonite clay may not be used where it will come in contact with waters of a pH below 5.0 or total dissolved solids content greater than 1,000 mg/l or both.

(2) Fill Materials. Clay, silt, sand, gravel, crushed stone, mixtures of these materials, and sealing materials described in §D(1) may be used as a filler in sealing a well. In the abandonment of an unsuccessful well, the drill cuttings may be used as fill material. Material containing organic matter may not be used. The Department or Approving Authority may require that fill material be disinfected.

F. Procedures for Sealing Wells.

(1) Preliminary Work.

(a) Before filling the hole, the well should be investigated to determine its condition, details of construction, and if there are obstructions which will interfere with the process of filling and sealing.

(b) If there are any obstructions, they shall be removed, if possible, by cleaning the hole or by redrilling.

(c) The casing shall be removed. If sidewall cave-in is likely to occur, the casing shall be removed gradually as the well is filled.

(d) In drilled wells, if it is not possible to remove the casing, the casing may be ripped or perforated to assure that sealing material fills all annular spaces and voids.

(2) Filling and Sealing Wells.

(a) A dug well exceeding 24 inches in diameter shall be filled and sealed by placing fill material (excluding clay or silt) in the well to a level approximately 5 feet below the land surface, and placing a 3 foot plug of sealing material above the fill. The remainder of the well shall be back filled with soil material.

(b) For other than dug wells, a well shall be filled with sealing material or a combination of sealing material and fill material as described below:

(i) A well in unconsolidated material in an unconfined ground water zone (Hydrogeologic Area 1) shall be filled and sealed by placing fill material in the well to the level of the water table, and filling the remainder of the well with sealing material. If the water table is at a depth greater than 40 feet, a minimum of 40 feet of sealing material shall be required.

(ii) Well Penetrating Several Aquifers or Formations.

(aa) A well penetrating several aquifers or formations (Hydrogeologic Area 2) shall be filled and sealed in such a way as to prevent the vertical movement of water from one aquifer or formation to another.

(bb) If the casing has been removed, sealing material shall be placed opposite confining formations, and from the surface down to the first confining formation. Sand and other suitable fill material may be placed opposite the producing aquifer. The driller has the option to fill the entire well with sealing material.

(cc) If the casing has not been removed, the entire well shall be filled with sealing material.

(iii) Well Penetrating Creviced or Cavernous Rock. In Hydrogeologic Areas 3 and 4, coarse fill material may be used opposite the cavernous or creviced rock portions of the well. Sealing material shall extend from the top of the hard rock portion of the well or base of the casing, whichever is deeper, to the surface. The minimum depth of sealing material may not be less than 10 feet.

(iv) Well Penetrating Specific Aquifers—Local Conditions. If local conditions necessitate the sealing of specific aquifers or formations, the Department or Approving Authority may require that the annular space in the area of the specific aquifers or formations be sealed during abandonment of the well.

G. Placement of Material. The following standards shall be met in placing fill or sealing materials:

(1) The well shall be filled with the appropriate material placed from the bottom of the well upward;

(2) When Portland cement grout or concrete is used, it shall be placed in one continuous operation;

(3) Sealing material shall be placed in the interval or intervals to be sealed by methods that prevent free fall, dilution, and/or separation of aggregates from cementing materials;

(4) For artesian aquifers with a large hydraulic (pressure head), it may be necessary to control the head or flow while placing the sealing material. In these cases, the casing shall be ripped or perforated opposite the area to be sealed and the sealing material shall be forced under pressure into the surrounding formation.

.12 Enforcement.

A. Responsibilities. For the purposes of this regulation, the Approving Authority shall exercise enforcement authority over all water wells and the Department of Natural Resources shall exercise enforcement authority over wells to be used for other purposes.

B. Procedure Upon Violation. If the Department or the Approving Authority determines that there has been a violation of this chapter or of any permit requirement, in the construction of a well, it shall serve upon the alleged violator a written complaint specifying the nature and extent of the violation, and a written order specifying items to be corrected and time limits for correction.

C. Abandonment Upon Failure to Correct. If a person violating a requirement of this chapter cannot correct the violation, the Department or the Approving Authority may require abandonment and sealing of the well.

D. A person aggrieved by a final decision of the Approving Authority in a contested case has the right to have the decision reviewed in accordance with the provisions of the Administrative Procedure Act and other applicable statutes and regulations. All appeals shall be filed with the Director, Water Management Administration, within 30 days after notification of the final decision by the Approving Authority.

E. Service. Every complaint, order, notice of hearing, or other instrument issued by the Department or Approving Authority pursuant to this chapter shall:

(1) Be served on any person affected thereby personally, and proof of this service may be made in like manner as in the case of service of process in a civil action; this proof to be filed in the office of the Department or Approving Authority; or

Appendix D

Standard Procedures:

Section 3

Groundwater Sampling Procedures

STANDARD OPERATING PROCEDURE

Groundwater Monitoring Well Sampling Procedures	Microbac Laboratories, Inc., Baltimore Division SOP Field-008-09 Effective Date 03/20/2015 Page 1 of 12 Controlled Copy #

Prepared By _____ Date 3/19/15
Michael Gallion, Field Operations Manager

Approved By _____ Date 03/20/2015
Emily Deya, Quality Assurance Manager

Proprietary Statement:

This Standard Operating Procedure has been developed for the sole use of Microbac Laboratories, Inc., Baltimore Division and shall not be used by other organizations.

Distribution:

1. Master (Hardcopy) in secured SOP File
2. Controlled copies to appropriate personnel

Record of Reviews:

Reviewed By:	Date:	Reviewed By:	Date:

1. SCOPE:

This SOP describes the procedures to be used in obtaining a representative water sample from a monitoring well. It is a general guide to ensure sample integrity from point of collection, preservation, documentation, and transportation to the laboratory.

2. SUMMARY:

Prior to obtaining the sample, physical measurements (diameter, depth, well volume) of the well are determined. After proper flushing of the well, samples are collected, placed in the appropriate containers, preserved and stored. All field measurements are recorded. The samples are then transported to the laboratory.

3. APPARATUS AND EQUIPMENT:

Name	Description/Make/Model
Bailers	Poly and PVC
Filters	Nalgene disposable (0.45 micron) or Geotek High efficiency filters
Rope	Polypropylene and Nylon
Sample Containers	Plastic bottles - *250 mL, 500 mL, and* 1000mL wide mouth Glass bottles - 1000mL clear and amber narrow mouth, Teflon lined screw cap Glass vials - 40mL VOA vial with Teflon-lined septa Sterile containers for microbiological sampling - 4 oz. polypropylene screw top wide mouth with sodium thiosulfate
pH Meter	Capable of measuring pH between 0 and 14, to 0.01 units
Water Level Indicator	Solinst depth to water meter capable of measuring to 0.01 ft
Temperature and Specific Conductivity Meter	Meter capable of measuring conductivity between 0 and 200,000 micromhos/cm and temperature between 0 and 30°C
Dissolved Oxygen meter	Meter capable of measuring dis. oxygen between 0 and 20 mg
ORP meter	Meter capable of measuring oxidation-reduction potential within +/- 1600 for absolute mv or within +/- 1999.9 for relative mv
Tubing	Flexible tubing of sufficient size and strength to perform low-flow purging.
Strainer Head or other open ended weight	
Clips	To hold weight in place
Plastic sheeting	
Drum	55-gallon stainless steel drum
Bucket	5-gallon PVC bucket
Peristaltic Pump	Geotech, GeoPump 1
Flow Thru Cell	Apparatus designed to hold all probes for simultaneous field readings as water is pumped out of well and through cell
Vacuum Pump	Hand operated, PVC 36 cc / Nalge
Gloves	Disposable; Nitrile, Latex
Submersible Pump	Grundfos 2-inch submersible pump on a 200 ft. portable reel with 4 inch adapter

Control box	Grundfos control box with cable attachment
Portable Generator or other power source	

4. REAGENTS:

Name	Specification
Methanol	ACS Grade
Nitric Acid	Concentrated, Instra-Analyzed grade or equivalent
Soap (Alconox)	Liqui-nox, Phosphate Free or equivalent

4.1 Prepare a 10% dilute solution of Nitric Acid by diluting 10 parts of concentrated Nitric Acid with 90 parts deionized water. Using a 1000mL graduated cylinder, measure 3600mL of DI water and pour into a 1-gallon jug. Measure 400mL of nitric acid and slowly add the acid to the jug. Carefully pour the dilute acid solution into the bailer cleaner container. This solution is for cleaning purposes only (see section 7.3.1) and is prepared in quantities sufficient to fill the bailer cleaner container(s).

4.2 Prepare a 20% dilute solution of Methanol by diluting 20 parts of Methanol with 80 parts deionized water. Using a 1000mL graduated cylinder, measure 3200mL of DI water and pour into a 1-gallon jug. Measure 800mL of methanol and add this to the jug. Carefully pour the dilute alcohol solution into the bailer cleaner container. This solution is for cleaning purposes only (see section 7.3.1) and is prepared in quantities sufficient to fill the bailer cleaner container(s).

4.3 See SOP Field-014, "Field Determination of Residual Chlorine, pH, Temperature, Dissolved Oxygen, Carbon Dioxide, Specific Conductance, and Oxidation-Reduction Potential" for the apparatus, equipment and reagent requirements for field-test parameters.

4.4 See SOP Field-015, "Preparation of Sample Bottles" for reagents used for sample preservation.

5. SAMPLE REQUIREMENTS:

5.1 See SOP Field-014 for the sample requirements for field test parameters.

5.2 See SOP Field-015 for sample bottle size requirements and reagents used for sample preservation.

6. CALIBRATION:

6.1 See of SOP Field-014, for the equipment calibration procedures for field test parameters.

6.2 Low flow purging rate is calibrated by using a graduated measuring cup to get milliliters/minute.

6.3 Submersible pump flow rate is determined by using a graduated 5-gallon bucket.

7. PROCEDURE:

7.1 Setup to Sampling:

7.1.1 Locate the correct well.

7.1.2 Make any notations on the well report of unusual conditions, i.e. conditions of casing, cap, lock and grout.

7.1.3 Complete the following items on the field report:

a) Date and Time sampling started and completed

b) Weather conditions, *i.e. rain, snow, temperature, etc.*

c) The site location *and customer name.*

d) Well identification number and the well permit number

e) Diameter of the well casing

f) If using a bailer, note whether bailer is dedicated or has been cleaned. If using a pump, note whether pump is dedicated or is portable or note if using low-flow procedure.

7.1.4 If required by either Client protocol or MDE, skirt the well with plastic sheets prior to the commencement of sampling, to protect spills from reentering the ground surface and to prevent the bailer rope from contacting the ground.

7.1.5 Determining the volume of standing water in the well casing:

a) Remove the cap from the well casing.

b) Drop the line of the electronic water level indicator into the well and measure in hundredths of a foot from the top of the PVC casing to the surface of the water. Record this measurement (A) on the well report. (If the PVC casing is not easily accessible, the outer metal casing may be used and noted on the ground water monitoring report.)

c) Determine the depth to the well bottom using the same procedure, but measuring from the top of the PVC casing to the bottom of the well. Record this measurement (B) on the well report. This is not performed on wells being micropurged as it will stir up bottom sediment. Use client's background data if available.

d) Calculate the depth of standing water in the well and record this value on the well report.

$$S = B - A$$

A = Depth to water from top of PVC casing

B = Depth to bottom of well from top of PVC casing

S = Depth of standing water in the well (in feet)

7.1.6 Calculate the volume (in gallons) of water equivalent to one volume casing as follows:

S = Depth of standing water in the well (in feet)

D = Gallons of water per foot (GPF) based on the following diameters:
2" casing = 0.16 GPF
4" casing = 0.65 GPF
6" casing = 1.47 GPF

Q = Gallons per volume casing

Q = S x D

7.1.7 Flushing of the well (HAND BAIL METHOD):

a) After determining the volume of water in the well, calculate the total number of gallons to be removed by multiplying the gallons per volume casing (Q) by three. Remove three volume casings of water. Measure the amount of water removed using a 5-gallon bucket. Optionally, the number of bailings can be counted and multiplied by the bailer capacity for the total volume of water removed. Use a clean or dedicated PVC bailer and new polypropylene or nylon rope to bail the required amount of water from the well. During the bailing procedure neither the rope nor the bailer should be allowed to touch the ground.

b) The water that is purged from the well is emptied on the ground unless there is a site-specific requirement to contain all purge water in metal drums or unless there is the possibility of petroleum product contamination (note initial odor). **If purged water is to be contained, see section 7.1.7.e**

c) Prior to collection of the samples, a depth-to-water reading is taken to check for sufficient recharging of the well. If there is less than two (2) foot of standing water in the well, sample collection will be suspended until additional water is present in the well. **The time allowed for recharging of the well is not to exceed 24 hours**.

d) Once the three volume casings of water have been removed, a sample is collected and field readings of pH, Specific Conductance, and Temperature are performed and the values recorded on the field sheets and labeled as "sample reading". Any pertinent observations of color and/or odor are noted on the field sheet.

NOTE: If requested by the client, field readings for the above parameters are taken with each volume casing of water removed. All test values are recorded on the field sheets and labeled as "sample reading". Refer to the latest revision of SOP Field-014 for these test procedures.

NOTE: If sufficient water depth is present, the sample(s) may be collected using the PVC or a poly bailer. The sampling must occur within 24 hours of well purging. If this is not the case, the well must be purged again. Follow the procedures below for sample handling and preservation. Bottles are filled in the following order: volatiles, microbiological samples, organics, wet chemistry parameters and metals.

e) If the purge water must be contained, the following procedure is used:

i. If 55-gallon drums are available on site the purge water can just be contained in the drums for future disposal.

ii. If a petroleum odor is noticed from the first water purged from the well, and there are no drums on site for containment, the purge water must be run through an Activated Carbon Absorption Unit (ACAU). A 30-gallon drum with a stop valve at the bottom is used as the primary ACAU and a 5 gallon bucket with holes in the bottom is used as the secondary ACAU.

iii. Fill both the drum and the bucket 1/2 to 2/3 full of activated carbon.

iv. Pour the purge water into the primary ACAU (drum) allowing the water to flow through the activated carbon, out the bottom and through the secondary ACAU (PVC bucket) onto the ground.

v. If petroleum odor breakthrough is observed in the secondary unit, the primary unit carbon is contained for disposal. Fresh carbon is placed into the primary ACAU and the purging continues. The carbon is disposed of through an independent environmental contracting company.

NOTE: Some sites have leachate collection systems that all of the purge water may be dumped into in lieu of using drums or the ACAU.

7.1.8 Flushing of the well (SUBMERSIBLE PUMP METHOD – HIGH FLOW RATE)

a) After determining the volume of water in the well, the pump can then be dropped down the well to as close to the screen depth (if known) as possible using the distance markings on the pump tubing. For a two-inch well no attachments are necessary. For a four inch well, the four-inch adapter needs to be attached to the pump to aid in cooling the pump motor.

b) Connect the pump to the control box using the adapter. Connect the control box to a generator or alternate power source. Turn the control knob to slowly increase the flow through the pump until the desired flow rate is achieved. See the Grundfos manual for further operating instructions and troubleshooting.

c) Remove three volume casings of water. Calculate the total number of gallons to be removed by multiplying the gallons per volume casing (Q) by three. Measure the amount of water removed using a 5-gallon bucket. The water that is purged from the well is emptied on the ground unless there is

a site-specific requirement to contain all purge water in metal drums, run it through the ACAU, or dump it into the sites leachate system.

d) The pump should not be used on wells that have a history of going dry unless the flow can be reduced in order to get three volume casings out of the well without it going dry. This is to prevent the pump from running dry and being damaged.

e) During purging and prior to collection of the samples, a depth-to-water reading is taken to check for sufficient recharging of the well.

f) Once the three volume casings of water have been removed, a sample is collected and field readings of pH, Specific Conductance, and Temperature are performed and the values recorded on the field sheets and labeled as "sample reading". Any pertinent observations of color and/or odor are noted on the field sheet.

NOTE: If requested by the client, field readings for the above parameters are taken with each volume casing of water removed. All test values are recorded on the field sheets and labeled as "sample reading". Refer to the latest revision of SOP Field-014 for these test procedures.

NOTE: If the well to be sampled has a history of being contaminated, the portable pump should not be used due to decontamination problems. If the well to be sampled is a new well with no background data use caution before using the pump. A disposable bailer may be dropped down the well first for a preliminary water sample to check for contamination.

NOTE: Some site locations have submersible pumps permanently installed in the groundwater wells. All procedures are to be followed as stated above; however some pumps may not come with a flow controller, therefore if the well goes dry disconnect the power immediately and wait for the well to recharge before purging any more or sampling.

7.1.9 Low Flow sampling or micropurging

a) It is not necessary to determine the volume of water in the well for this method, as you will only be removing a relatively small amount regardless of well diameter or depth. However, before, during purging and prior to collection of the samples, a depth-to-water reading is taken to check for sufficient recharging of the well. Ideally the water level in the well should not drop or drop minimally indicating that all sample water is coming in through the well screen at an equal rate.

b) Using well data supplied by the client, measure enough tubing (with strainer head attached to the end as a weight) and drop it down to the screened portion of the well. Attach the other end to the peristaltic pump. A short section of tubing should connect the pump to the Flow Thru Cell with another short section for the discharge out of the Flow Thru Cell.

c) Start the pump to a slow and steady flow rate, generally around 100mL/min and as soon as possible measure the flow rate (usually after the Flow Thru Cell starts discharging). The ultimate flow rate should be around 500mL/minute and never exceed 1000mL/min.

d) As the Flow Thru Cell fills, start taking readings of pH, temperature, specific conductivity, dissolved oxygen, and oxidation reduction potential. The time between readings should be based on the size of the Flow Thru Cell and how long it takes to refill. (example: a 500mL Flow Thru Cell pumped at 250mL/min would refill in 2 minutes). Turbidity is also a good indicator of stabilization but may not be required at all sites.

e) Take readings every 2 to 5 minutes, depending on flow rate, until they become stable for 3 consecutive intervals. Recommended stabilization criteria are:

pH	+/- 0.1 units
Temp.	+/- 0.2 ° C
Conductivity	+/- 3% of reading
Dis. Oxygen	+/- 10%
ORP	+/- 10 mv

f) Once readings have stabilized, disconnect the Flow Thru Cell from the pump and collect the sample directly from the pump discharge. No additional sample readings are required. Note the approximate total volume of water removed from the well on the well sheet.

NOTE: A submersible pump may also be used for low flow purging and sampling as long as the flow rate criteria are met.

7.2 Sample Filtering and/or Preservation:

7.2.1 All sample bottles are to be new and prelabeled in the laboratory or by Field Operations Personnel with preservatives and filtration requirements indicated on each label.

7.2.2 If filtration is required, this is done by using a Nalgene disposable filtration apparatus containing a prefilter and a 0.45 micron membrane final filter. Filter appropriate volumes of sample and place in proper containers as required by the testing parameters. If necessary, replace the prefilter periodically.

7.2.3 All sample bottles are to be preserved with appropriate reagents. See Field-015 for preservative requirements.

7.2.4 After each sample bottle is filled and pertinent well information is recorded on the label, the sample is immediately cooled to 4° C on ice in coolers, which are used to transport the samples back to the laboratory.

7.2.5 Use clean filtration equipment for each well sampled.

7.3 Decontamination procedure (Performed at the laboratory):

7.3.1 (HAND BAILERS) After sampling, the rope used for bailing shall be discarded and the bailer stored until it can be thoroughly cleaned. For sites where periodic routine sampling is performed, dedicated bailers are kept in the specific well. For bailers that do not remain on site, the following cleaning procedures are used:

a) Dismantle the bailer.

b) Scrub the bailer with *a brush and* soapy water using laboratory grade detergent and rinse well with tap water followed by deionized water.

c) Rinse with a dilute Nitric Acid solution (10% solution) followed by deionized water.

d) Perform a final rinse with dilute Methanol (20% solution), followed by 2 final deionized water rinses. After air drying, each bailer is stored in a plastic sealed tube.

7.3.2 (SUBMERSIBLE PUMP) If the pump is going to be used on several wells at the same site, sampling is to be done in order of increasing contamination levels. Once the pump is finished being used it is brought back to the lab for a more thorough cleaning. The following cleaning procedure is used:

a) The pump should be cleaned as soon as possible after returning to the lab. A tarp is to be placed on the ground and the pump and tubing should be unreeled around the tarp, preferably the length that went down the well.

b) The outside of the tubing and pump is to be cleaned and scrubbed with a laboratory grade detergent (Alconox) and tap water solution followed by a Deionized water rinse.

c) The inside of the pump and tubing should be flushed with a minimum of 10 gallons of tap water followed by a Deionized water rinse of the outside of the pump.

d) The pump and reel should be left to dry and then covered with a plastic bag and placed in storage until next use.

7.3.3 (FLOW THRU CELL) Once the Flow Thru Cell has been drained, it and the attached tubing should be rinsed with deionized water between each well to clear out any sediment and well water and to rinse the probes off inside the Cell. New or dedicated tubing is used at each well. The strainer head is re-used at the end of the tubing at each well and must be rinsed with deionized water along with 10% Nitric Acid and/or 20 % Methanol depending on what the well is being tested for.

8. CALCULATION AND REPORTING:

8.1 Refer to SOP Field-014 for the calculation and reporting procedures for field test parameters.

9. QUALITY CONTROL:

9.1 When sampling is being performed for volatile organics analysis, trip blanks are used to monitor the possibility of cross contamination during transport between the site and the laboratory. One trip blank per cooler is used when transporting samples for volatile organics analysis (VOAs).

NOTE: All QC samples (field blanks, trip blanks, etc.) are sampled as per the client's request. These instructions are to be followed only if the client's contract requires QC samples.

9.2 Field blanks are used to monitor the possibility of contamination during sampling due to the surrounding environment and or conditions of sampling equipment. The following field blanks are collected when requested by the client:

9.3 One field blank per site when collecting samples for volatile organics analysis (VOA containers).

9.4 One filtered field blank per site when filtering samples.

9.5 Rinsate blank(s) when required by client or when deemed appropriate by Field Operations Manager.

9.6 All samples are to be transported to the laboratory packed in ice in coolers The temperature of the *sample*is recorded on the Chain-of-Custody upon receipt in the laboratory.

9.7 Sterile containers are periodically tested to ensure sterility - see SOP Field-003, "Collection of Samples for Microbiological Analysis".

9.8 Refer to SOP Field-014 for the quality control requirements for specific field test parameters.

10. RECORDS:

10.1 Documentation procedures concerning Chain-of-Custody and Work Order Receipt forms, Logbooks, Benchsheets, Calibration Review Checklists and Data Review Checklists, Report Sheets, Standards and Reagents Logbooks, Maintenance Logbooks, and Quality Control Charts can be found in SOP Gen-008, "Daily Laboratory Recordkeeping for Analysts". All applicable documentation procedures Gen-008 must be followed.

10.2

10.1.1 Refer to SOP Field-014 "Field Determination of Residual Chlorine, pH, Temperature, Dissolved Oxygen, Specific Conductance, Turbidity, and Oxidation-Reduction Potential" for all QC parameters, reagents, standards, etc that need to be recorded in the field notebook,

10.3 Additional documentation requirements specific to this procedure are:

10.2.1 Site monitoring information manuals are created for sites as needed or upon request. All manuals contain specific information regarding past sampling history, special QA/QC requirements, maps of the site, etc. The manuals are kept in the custody of the Field Operations Department Head.

10.2.2 All Field Operations personnel are to record all sampling observations in logbooks. This includes observations pertaining to the individual sampling sites as well as calibration data (e.g. pH meter calibration data).

10.2.3 The names, titles and affiliations of all persons present during sampling are to be recorded on the field sampling sheets.

10.2.4 Original field reports are filed with all the original paperwork associated with that job. Copies are submitted to the client with the final report of data.

10.2.5 Where appropriate, field data is entered into the LIMS system.

11. CORRECTIVE ACTION / TROUBLESHOOTING:

11.1 Refer to SOP Field-014 for the troubleshooting and corrective actions associated with field test procedures.

12. MAINTENANCE:

12.1 Refer to SOP Field-014for the maintenance requirements associated with field test procedures.

13. SAFETY PRECAUTIONS:

13.1 Nitrile and/or latex gloves are to be worn by the sampling technicians. Additional personal protective equipment is selected based on the site requirements and/or characteristics.

13.2 All Field Operations vehicles and/or personnel are to be equipped with communication equipment in the event of an emergency.

13.3 All coolers used for sample transport are to be kept closed and sealed with Microbac Laboratories, Inc. Chain-of-Custody Tape. This will help to ensure that the internal temperature of the cooler is maintained. A properly sealed cooler will aid in preventing the possibility of an accident if leakage occurs during transport.

13.4 This SOP may not address all hazards associated with this test procedure.

14. REFERENCES:

14.1 Handbook For Sampling and Sample Preservation of Water and Wastewater, USEPA, EPA-600/4-82-029, September 1982.

14.2 Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Office of Solid Waste and Emergency Response, USEPA, Wash.,DC, November 1986; Final Update I, July 1992.

14.3 Field Sampling Procedures Manual, New Jersey Department of Environmental Protection and Energy, May 1992.

14.4 Annual Book of ASTM Standards, American Society for Testing and Materials, Philadelphia, PA, ASTM Standards on Environmental Sampling, 1995.

14.5 Technical Guidance on Low Flow Purging and Sampling and Passive Sampling, The Nielsen Environmental Field School, 1999

14.6 SOP CHO-001, Laboratory Waste Management

14.7 SOP Field-003, "Collection of Samples for Microbiological Analysis"

14.8 SOP Field-014, "Field Determination of Residual Chlorine, pH, Temperature, Dissolved Oxygen, Carbon Dioxide, Specific Conductance, and Oxidation-Reduction Potential"

14.9 SOP Field-015, "Preparation of Sample Bottles"

14.10 SOP Gen-008, "Daily Laboratory Recordkeeping for Analysts"

14.11 SOP Gen-010, "Training Protocol"

15. POLLUTION PREVENTION:

15.1 Minimize reagent and standard proportion volume to the amount that will be consumed before expiration. All reagent volumes can be either scaled up or down to match use.

15.2 Samples and standards having a pH of <5 or >8 are hazardous and must be treated before being disposed of according to CHO-001, Laboratory Waste Management.

16. DEFINITIONS:

16.1 Volume Casing - the amount of standing water that exists in the monitoring well or piezometer.

16.2 Sample Reading - the field parameter or determination to be recorded and reported to the client on the Microbac Report of Analysis.

16.3 GPF - gallons per foot

16.4 MLs/min – milliliters per minute

16.5 ACAU - Activated Carbon Absorption Unit: used to treat purge water that is suspected to contain petroleum contaminants

16.6 MDE - Maryland Department of the Environment

17. REVISION HISTORY

Rev. No.	Changes from previous revision	Date
07	Updated QAO; Changed 'Gascoyne' to 'Microbac Laboratories, Inc.'; Added reference to CHO-001 to Sec. 14.	11/01/2010
08	Added note to Sec. 9 that QC samples may be utilized as per clients' request (CAR 289)	02/28/2011
09	*Updated SOP signatories*	*03/20/2015*

17.1 All changes from previous version are *italicized*

Appendix D

Standard Procedures:

Section 4

Field Test Procedures

STANDARD OPERATING PROCEDURE

Field Determination of Residual Chlorine, pH, Temperature, DO, Carbon Dioxide, Specific Conductance, Turbidity and ORP	Microbac Laboratories, Inc., Baltimore Division SOP Field-014-10 Effective Date 03/20/2015 Page 1 of 18 Controlled Copy #_____

Prepared By_____ Date 3/19/15
Michael Gallion, Field Services Manager

Approved By_____ Date 03/20/2015
Emily Deya, Quality Assurance Manager

Proprietary Statement:

This standard Operating Procedure has been developed for the sole use of Microbac Laboratories, Inc., Baltimore Division and shall not be used by any other organizations.

Distribution:

1. Master (Hardcopy) in secured SOP File.
2. Controlled copies to appropriate personnel.

Record of Reviews:

Reviewed By:	Date:	Reviewed By:	Date:

1. SCOPE:

This SOP describes the procedure to be followed for the field determinations of Residual Chlorine, pH Temperature, Dissolved Oxygen (DO), Carbon Dioxide, Specific Conductance, and Oxidation- Reduction Potential (ORP) in natural and treated waters. This SOP replaces the previous version of SOP Field- 014.

2. SUMMARY:

2.1 Residual chlorine, SM 4500 Cl G: Free chlorine reacts instantly with DPD (N, N- diethyl-p-phenylenediamine) to produce a red color. This is measured using a filter photometer calibrated in the wavelength range of 490 to 530 nm.

2.2 pH, SM 4500 H-B: The pH measurement is the determination of the activity of the hydrogen ions by potentiometric measurement using an indicating (glass) electrode and a reference electrode or a combination electrode.

2.3 Temperature SM 2550 B: Temperature measurements are made using the measurement capabilities of a pH Meter, Dissolved Oxygen Meter, or Conductivity Meter. The temperature measurement probe of each meter is verified quarterly against a precision thermometer certified traceable to the National Institute of Standard and Technology (NIST).

2.4 Dissolved Oxygen, EPA 360.1: Oxygen sensitive membrane electrodes are composed of two solid metal electrodes in contact with a supporting electrolyte separated from the test solution by a selective membrane. The current is directly proportional to the dissolved oxygen concentration.

2.5 Carbon Dioxide, SM 4500 CO_2 C: Free CO_2 reacts with sodium hydroxide to form Sodium bicarbonate. Completion of the reaction is indicated by the development of the pink color that is characteristic of phenolphthalien at pH 8.3.

2.6 Specific conductance, EPA 120.1: Conductivity is the numerical expression of an aqueous solutions ability to carry an electric current. The specific conductance of a sample is measured by use of a self contained conductivity meter, Wheatstone bridge type or equivalent.

2.7 Oxidation- Reduction Potential, ASTM 1498: The ORP (oxidation-reduction potential) of a solution is defined as the tendency of the solution to act as either an oxidizing or reducing agent and is measured by electromotive force developed between an inert indicator electrode and a reference electrode when immersed in the solution. The ORP of a solution is measured as a millivolt signal.

*2.8 Turbidity – **EPA 180.1**: This method is based on a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. The higher the intensity of scattered light, the higher the turbidity.*

3. INTERFERENCE'S:

3.1 Free / *Total* Chlorine:

3.1.1 High concentrations of monochloramine interfere with the free chlorine determination unless the reaction is stopped with arsenite or thioacetamide. In addition, the DPD methods are subject to interference by oxidized forms of manganese unless compensated for by a blank

3.1.2 Sample color and turbidity may interfere in all colorimetric procedures. *'Zero' each sample before adding DPD reagent.*

3.1.3 Because all methods for total chlorine depend on the stoichiometric production of iodine, waters containing iodine-reducing substances may not be analyzed accurately.

3.1.4 In all colorimetric procedures, compensate for a color and turbidity by using color and turbidity blanks.

3.1.5 Cold samples may form condensation on cell – Wipe with clean cloth before analysis. Sample may be slightly warmed to minimize condensation before analysis.

3.2 pH:

3.2.1 The Glass electrode, in general, is not subject to solution interferences from color, turbidity, colloidal matter, oxidants, reductants or high salinity.

3.2.2 Sodium error at pH levels greater than 10 can be reduced or eliminated by using a low sodium error electrode.

3.2.3 Coatings of oily material or particular matter can impair electrode response. These coatings can usually be removed by gentle wiping or detergent washing, followed by distilled water rinsing. An additional treatment with hydrochloric acid (1 + 9) may be necessary to remove any remaining film.

3.2.4 Temperature effects on the electrometric measurement of pH arise from two sources. The first is caused by the change in electrode output at various temperatures. This interference can be controlled with instruments having temperature compensation or by calibrating the electrode instrument system at the temperature of the samples. The second source is the change of the pH inherent in the sample at the various temperatures. This error is sample dependent and cannot be controlled; it should therefore be noted by reporting both the pH and temperature at the same time of analysis.

3.3 Dissolved Oxygen

3.3.1 Dissolved organic materials are not known to interfere in the output from dissolved oxygen probes.

3.3.2 Dissolved inorganic salts are a factor in the performance of dissolved oxygen probe.

3.3.3 Probes with membranes respond to partial pressure of oxygen, which in turn is a function of dissolved inorganic salts. Conversion factors for seawater and brackish water may be calculated from dissolved oxygen saturation versus salinity data. Conversation factors for specific inorganic salts may be developed experimentally.

3.4 Carbon Dioxide:

3.4.1 Cations and anions that quantitatively disturb the normal CO_2 carbonate equilibrium interfere with the determination. Metal ions that precipitate in alkaline solution, such as aluminum, chromium, copper, and iron, contribute to higher results. Ferrous ion should not exceed 1.0 mg/l. Positive errors also are caused by weak bases, such as ammonia or amines, and by salts of weak acids and strong bases such as borate, nitrite, phosphate, silicate, and sulfide. Such

substances should not exceed 5% of the CO_2 concentration. The titrimetric method for CO_2 is inapplicable to samples containing acid mine wastes and effluent from acid regenerated cation exchangers. Negative errors may be introduced by high total dissolved solids, such as those encountered in seawater, or by addition of excess indicator.

3.5 Conductivity:

3.5.1 Most problems in obtaining good data with conductivity monitoring equipment are related to electrode fouling and to inadequate sample circulation. Conductivities greater than 10 000 to 50 000 umho/cm or less than 10 umho/cm may be difficult to measure with usual measurement electronics and cell capacitance. Consult the instrument manufactures manual.

3.6 Turbidity:

3.6.1 The presence of floating debris and coarse sediments, which settle rapidly, will give low readings. Finely divided air bubble will give bias high results. The presence of true color, which is the color of water which is due to dissolved substances which absorb light, will cause turbidities to be low.

3.6.2 Cold samples may form condensation on cell – Wipe with clean cloth before analysis. Sample may be slightly warmed to minimize condensation before analysis.

4. APPARATUS AND EQUIPMENT:

Name	Description / Make / Model
Residual Chlorine: Colorimeter Cuvettes	 HACH, Pocket colorimeter for chlorine HACH, marked at 10ml volume
pH: pH Meter	 Meter capable of measuring pH between *1* and 14 *ATC probe calibrated quarterly against NIST thermometer*
Temperature: pH Meter Conductivity Meter DO Meter	 See specifications above See specifications below See specifications below
Dissolved Oxygen: DO Meter	 Meter capable of measuring dissolved oxygen from 0 to 20 mg/L.
Carbon Dioxide: Jars or beakers Graduated cylinders Burette and stand	 small, glass Class A, glass, 100ml Class A, glass, 25ml
Specific Conductance: Conductivity meter	 Meter capable of measuring conductivity between 0 and 200,000 micromhos/cm *with temperature compensation*
Oxidation Reduction Potential: pH Meter Beakers	 Capable of reading to ± 1400 millivolts Reference electrode and Oxidation-reduction indicator electrode (platinum) Polyethylene or glass.

Turbidity *Turbidity Meter* *Cuvets* *Wash Bottle* *Kimwipes*	*Thermo AQ3010* *Hach Sample Cell w/ Cap Cat. 2427606Deionized Water* *4.5" X 8.5"*

5. REAGENTS:

Name	Specification
Residual Chlorine:	
Free Chlorine Powder Pillows	HACH, Sodium phosphate dibasic, DPD Salt Carboxylate salt (for 10 ml sample)
Total Chlorine Powder Pillows	HACH, Sodium phosphate dibasic, Potassium iodide, DPD Salt, Organic Salt (for 10ml sample)
pH:	
pH 1 Buffer	*Commercially prepared, NIST traceable*
pH 4 Buffer	Commercially prepared, NIST traceable
pH 7 Buffer	Commercially prepared, NIST traceable
pH 10 Buffer	Commercially prepared, NIST traceable
pH 12.45 Buffer	Commercially prepared, NIST traceable
pH 7 Buffer	Commercially prepared, NIST traceable, Second source
Temperature:	See reagents needed for operation of meter used (pH Meter or Conductivity Meter)
Dissolved Oxygen:	
YSI O_2 Probe Solution	Commercially prepared
Carbon dioxide:	
Phenolphthalein indicator solution	Commercially prepared, 1% Solution
Sodium hydroxide solution	Commercially prepared, 0.02N
Specific Conductance:	
Conductivity calibration solutions	Laboratory prepared 0.01M KCl (1413umhos/cm) *or commercially prepared equivalent*
Oxidation Reduction Potential:	
Orion ORP Standard	Commercially prepared, NIST traceable
Turbidity:	
Standards	*Primary Standards* *0.2, 20, 100, 800 NTU*

All chemicals, reagents, and commercially prepared solutions must be labeled with chemical identification code upon receipt. Refer to the latest revision of SOP Gen-008, "Daily Laboratory Recordkeeping for Analysts" for entire documentation procedure. The storage and shelf life of all purchased chemicals, reagents, and prepared solutions are in accordinance with manufacturer's recommendations, unless specified otherwise in this SOP. All manipulations that are made to any of the chemicals, reagents, and commercially prepared solutions listed above, are described in the calibration and procedure section of this SOP.

6. SAMPLE REQUIREMENTS:

Matrix	Water
Volume Required	100 – 500 ml (See each individual procedure)
Container Type	Not Applicable, Samples are analyzed immediately upon collection.
Preservation	Not Applicable, Samples are analyzed immediately upon collection, no preservation required.
Sample Holding time/Storage	Not Applicable, Samples are analyzed immediately upon collection

NOTE: If any of the listed tests cannot be performed at time of sampling, collect enough sample to perform the test(s) at the laboratory. Collect a minimum of 1 Liter (plastic bottle, no headspace) and store the sample on ice. Transport the sample as soon as possible to the laboratory. Alert the sample control technician to process the sample to the appropriate lab department for immediate consideration.

7. PROCEDURE:

7.1 Residual Chlorine

7.1.1 Check all cuvettes with DI water to ensure consistent readings. Ensure that the cuvettes are placed in the colorimeter with the diamond on the cuvette facing the front of the colorimeter and the cover securely in place. Be sure that the cuvette is carefully wiped clean before placing into colorimeter.

7.1.1.1 Zero the meter with DI water and take reading on remaining cuvettes. All values must be 0.01 or 0.00. If not, clean cuvette and recheck. If failure persists, then replace with new cuvette.

7.1.1.2 Zero the meter by utilizing the factory zero cuvette. Insert the three check standard cuvettes (LCS) and take readings. All values must be within acceptance limits: see Table in section 9. *Record the values in the field log book.* If any check standards is not within the acceptance limit, clean the cuvette and recheck. If failure persists, stop the test; the meter may need professional maintenance or repair.

7.1.2 Collect enough sample for the equivalent of four readings (at least 50ml)

7.1.3 Zero the meter using 10ml DI water in a cuvette.

7.1.4 Rinse the cuvette with the sample prior to performing analysis. Pour an aliquot of sample into a cuvette to the 10ml line and read the background (uncolored) sample and record the reading. Then zero meter with this background sample.

7.1.5 Pour a fresh aliquot of sample into a cuvette to the 10ml line, add the contents of a powder pillow (either for free of total chlorine) and shake the cuvette gently for 20 seconds. Record the type of pillow used.

7.1.6 Read the sample in the colorimeter within 1 minute of adding the powder pillow for free chlorine, and within 3-6 minutes for total chlorine. Wipe the cuvette, place into the colorimeter, cover, press READ.

7.1.7 If the results is ≥ 0.02 mg/l, record, the results. If the readout is flashing, the sample concentration is greater than 2.2 mg/l; Switch meter to high range and use the 1 cm cell to find result up to 8 mg/l. If the meter reading is still flashing in high range, record as ≥8mg/L. *If the high range cell is not available, dilute the sample and reanalyze. Record the dilution prep and result in the field notebook. Calculate using the dilution factor to determine the actual result.*

7.1.8 If the result is < 0.02 mg/l, *report as <0.03 mg/l.*

7.2 pH:

7.2.1 Refer to the manufacturer's instruction manual for meter specific details on calibration, maintenance, and troubleshooting.

7.2.2 Switch the pH meter ON and allow it to warm up for at least five minutes.

7.2.3 Place electrode into pH 7 buffer and stir moderately until stable. (Readings will automatically be accepted by meter).

7.2.4 Remove electrode(s) from first buffer. Rinse with deionized water and gently remove excess water.

7.2.5 Place electrode(s) into second buffer (pH 4 buffer if pH sample is below 7 or pH 10 buffer if sample is above 7) and stir moderately until stable reading is obtained, then set the correct value (4 or 10).

7.2.6 Verify the meter calibration by analyzing a buffer solution (pH 7 second source or pH10) that was not used in the calibration. This solution should be from the second source. The reading should be within 0.1 pH units from the true value. If this reading is not acceptable, recalibrate the meter using fresh buffer solutions. If failure persists, stop test, the meter may need professional maintenance or repair.

7.2.7 Collect the sample and pour an aliquot of sample into a disposable container. Stir moderately with the electrode.

7.2.8 When possible the electrode may be placed directly into the waste stream for a direct reading from the source. One (1) readings is necessary if taken directly from the source

7.2.9 After a stable reading has been obtained, record the temperature and pH measurement.

7.2.10 After recording the temperature and pH of test sample, reanalyze the sample using a fresh aliquot. The pH measurements should agree within 0.1 pH units. Record the temperature and pH of duplicate test sample aliquot. If the second test result does not agree within 0.1 pH units reanalyze using additional aliquots of sample. Report the first result of a pair of readings that agree within 0.1 pH units.

7.2.11 Verify the meter calibration after the sample has been analyzed. Rinse the probe with DI water, and place into the same second source buffer solution used in the initial calibration. The reading should be within 0.1 pH units from the true value. If this reading is not

acceptable, the probe must be recalibrated and the sample reanalyzed. If this issue persists, make note in the field logbook and on the sample chain-of-custody that environmental fouling may have been caused due to sample matrix.

NOTE: If the sample pH reading is outside of the range of the buffers used for calibration, a calibration check must be performed with a higher or lower range buffer accordingly. Record this value. If the sample is still outside of the calibration range, the sample must be brought back to the lab for analysis.

7.3 Temperature:

7.3.1 The temperature of the samples is taken using the Conductivity Meter, pH Meter, or the DO Meter with a temperature probe. If possible, place the probe directly into the water source to be measured (i.e. waste stream or effluent). If this is not possible, collect the sample in 1-Liter plastic bottles and immediately takes the temperature. Allow approximately 30 seconds for the temperature to stabilize prior to recording the result. The temperature is recorded to within 0.1 degrees Celsius.

7.4 Dissolved Oxygen:

7.4.1 Refer to the manufacturer's instruction manual for meter specific details on calibration, maintenance and troubleshooting.

7.4.2 Inspect the probe and membrane. The membrane should be changed at least once a month or when it becomes damaged. Replace the O ring if it looks worn. (Depending on usage)

7.4.3 There should not be any air bubbles under the membrane.

7.4.4 Every time the meter is turned on it must be calibrated before taking measurements. Calibrations should be completed at a temperature which is as close as possible to the sample temperature.

7.4.4.1 Turn the instrument on. Wait for the readings to stabilize. This may take several minutes.

7.4.4.2 Routinely, measurements are taken on fresh water. If DO is measured on other than fresh water, consult with the Field Operations Manager for proper setting. (The salinity of sea water is approximately 35 ppt.)

7.4.4.3 Calibrate the DO probe according to manufacturer recommendations. The meter is now ready to use.

7.4.5 Place the probe in the sample. Readings are recorded directly from the display.

<u>NOTE</u>: The probe consumes the oxygen in the sample as it is being measured. The probe must either be continuously moved in the sample while taking a reading or the sample must be mechanically stirred. Care must be taken to ensure the dissolved oxygen content does not change due to vigorous motion of the probe or rapid stirring of the sample.

7.4.6 Rinse the probe with DI Water between each measurement.

7.5 Carbon Dioxide:

7.5.1 Free CO_2 must be measured as close to the time of collection as possible.

NOTE: High Temperatures (>30 degrees Celsius) will give unreliable results. If the sample temperature is >30 degrees Celsius, record the temperature and flag the results as estimated.

7.5.2 Carefully fill the burette with 0.02N Sodium Hydroxide Solution.

7.5.3 Measure the sample, using a graduated cylinder to record the volume. Pour the sample into a clean, small clear glass jar. Using a small volume (10-50ml) will make a more dramatic color change.

7.5.4 Add 2-4 drops of Phenolphthalien Indicator Solution to the sample; swirl gently to mix.

7.5.5 While gently swirling, titrate the sample with the NaOH Solution until the sample changes to a light pink color. The solution should remain pink for 15-20 seconds. Perform the titration over a white background (e.g. a sheet of white paper) to facilitate noting the color change.

7.5.6 Record the titrate volume and extract normality of the sodium hydroxide solution. Calculate the concentration of carbon dioxide using the following formula:

$$\text{mg } CO_2/L = \frac{A \times N \times 44{,}000}{\text{Volume of sample (ml)}}$$

Where:
A= ml of Titrant used
N= normality of NaOH

7.5.7 This procedure must be repeated at least 2 times. Average the readings.

7.5.7.1 For values greater than the reporting limit (8 to 10 mg/ L), calculate the range (high minus low). The difference between the highest and the lowest reading must be less or equal to 10 mg/L. If not, replace the outlier value with the third determination. If this still results in failure to meet the range criteria, repeat the entire test procedure using a freshly collected test sample.

7.5.7.2 Draw a single line through the outlier result that is not used in the average calculation. If the first two results are used, draw a line through result #3.

7.6 Specific Conductance:

7.6.1 Refer to the manufacturer's instruction manual for meter specific details on calibration, maintenance and troubleshooting.

7.6.2 Switch on the instrument and allow to warm up for at least 5 minutes.

7.6.3 Check the cell constant and the conductivity bridge. Analyze the conductivity test solution. The reading should be *(True Value) TV* ± 5% (1342-1484) umhos/cm. If the reading is not within the acceptance limits, reanalyze a fresh aliquot of test solution. If failure persists, stop test the meter may need professional maintenance or repair. Record all readings in the field logbook.

7.6.4 Collect the sample in a disposable container.

7.6.5 Immerse the clean conductivity cell and temperature-compensating probe into the sample.

7.6.6 Record the reading as umhos/cm. Multiply the reading by the appropriate factor associated with the range the reading was taken and multiplied by the cell constant. Report the final result using three significant figures. Record the temperature of the sample at the time of analysis.

7.7 Oxidation-Reduction Potential:

7.7.1 Refer to the manufacturer's instruction manual for meter specific details on calibration, maintenance, and troubleshooting.

7.7.2 Using a pH meter capable of reading in millivolts (mV), attach the oxidation-reduction (ORP) probe and calibrate using the manufacturer protocol and ORP standard. Switch the mode to relative mV and read standard. (Readings should be + 420 mV*) at 20°C. Refer to bottle / CoA for true value at specific temperatures.*

7.7.3 Collect the sample and pour and aliquot of sample into a disposable plastic container. Place the electrode(s) in the sample.

7.7.4 Stir moderately and record the mV reading once the reading has stabilized. Record the results to three significant figures. *Record Sample Temperature.*

7.8 Turbidity

7.8.1 Calibration

7.8.1.1 Turn on meter by pressing the ON/OFF. Allow meter to warm up and stablizie for 15 minutes prior to use.

7.8.1.2 Insert the CAL 1 standard (40 NTU) into the sample well, aligning the mark on the vial with the mark on the meter. Press down so the cuvetis fully seated. Cover the vial using the light shield

7.8.1.3 Press the READ/ENTER key. The meter will display the results

7.8.1.4 Repeat the calibration check for CAL 2 (10NTU), 3 (1NTU), and CAL 4 (0.2 NTU) calibration standards

7.8.1.5 If the displayed results are within 10% of the nominal NTU value of the standard or the precision criteria by the method, the calibration check passes and the meter is ready for measurement.

7.8.1.6 If the displayed results are not within the 10%, the standards are most likely degraded and new standards are to be utilized.

7.8.1.7 After successfully calibrating the CAL 4 standard (0.2 NTU), the meter will display "STby"

7.8.1.8 ***NOTE:*** *Pour standards and samples down the side of the cuvet to minimize air bubble formation. Do not mix samples.*

7.9 Sample analysis procedure

7.9.1 Pour 10 mls of sample in cuvet. Pour sample down the side of cuvet to minimize bubbles.

7.9.2 Wipe the outside of the cuvet thoroughly with kimwipes and place in the turbidity meter.

7.9.3 Insert the cuvet into the sample well, aligning the mark on the vial with the mark on the meter. Press down so the cuvet is fully seated. Cover the vial using the light shield

7.9.4 Pres the READ/ENTER key. The display will blink "-Rd-" several times and the measured reading appears

7.9.5 Record the result in the field logbook

7.9.6 Analyze QC sample before 1st reading and after each sampling event to ensure that the meter maintains calibration. If QC check fails, recalibrate meter and reanalyze samples from last acceptable QC check.

8. CALCULATION AND REPORTING:

8.1 Residual Chlorine:

8.1.1 If the result is $\geq$ 0.02 mg/l, record the result. If the readout is flashing, the sample concentration is greater than 2.2 mg/l; record this result as >2.2 mg/l. If the concentration is greater than 2.2 mg/l and a definitive result is required to be reported, switch meter to high range and use the 1cm cell and adapter to find result up to 5.0 mg/l. If the result is still blinking then dilute. Dilute the test sample 10 fold using the glassware in the test kit and perform the test on the diluted sample. Residual Chlorine equals readout times dilution factor.

8.1.2 If the result is < 0.02 mg/L, *report as <0.03 mg/L.*

8.2 pH:

8.2.1 This value is read directly from the meter. No calculations are necessary. Record to two decimal places.

8.3 Temperature:

8.3.1 This value is read directly from the meter. No calculations are necessary. Adjust the result for any correction factor associated with the specific meter/probe. Record to 0.1 degrees Celsius.

8.4 Dissolved Oxygen:

8.4.1 This value is read directly from the meter. No calculations are necessary. Record to two decimal places.

8.5 Carbon Dioxide:

8.5.1 Record the titrant volume and the exact normality of the sodium hydroxide solution. Calculate the concentration of carbon dioxide using the following formula:

$$\text{mg } CO_2 /L = \frac{A \times N \times 44{,}000}{\text{Volume of sample (ml)}}$$

Where:

A= ml of titrant used
N= normality of NaOH

8.5.2 This procedure must be repeated at least 2 times. Average the readings.

8.5.2.1 For values greater than the reporting limit (8 to 10 mg/l), calculate the range (high minus low). The differences between the highest and lowest reading must be less than or equal to 10 mg/l. If not, replace outlier value with the third determination. If this still results in failure to meet the range criteria, repeat the entire test procedure using a freshly collected test sample.

8.5.2.2 Draw a single line through the outlier result that is not used in the average calculation. If the first two results are used, draw the line through result #3. Record to one decimal place.

8.6 Specific Conductance:

8.6.1 Result x range factor x cell constant. Record the result to three significant figures.

8.7 Oxidation-Reduction Potential:

8.7.1 This result is read directly from the meter. No calculations are necessary. Record to three significant figures.

8.9 Turbidity:

8.9.1 Results are read directly from meter

9. QUALITY CONTROL:

QC PARAMETER	FREQUENCY	ACCEPTABLITY*						
		RESID. CL.	pH.	TEMP.	DO	CO_2	COND.	ORP
Method Blank	Each Batch	≤0.01 mg/L	NA	NA	NA	NA	*≤10 umhos/cm*	NA
Lab Control Sample	Each Batch	See HACH COA insert for acceptable limits	0.1 pH units	NA	NA	NA	100±5% (1342 to 1484)	≤5 mV *of TV*
Duplicate Samples net Difference	Each Batch	≤0.02	0.1 pH units	NA	NA	≤10mg/L	≤10%	≤10mV
BLIND QC SAMPLE	**QUARTERLY**	**AS SPECIFIED FOR EACH PARAMETER**						

Turbidity

QC Parameter	*Frequency*	*Acceptability**
Method Blank[2]	*Each Batch*	*<0.05 NTU*
Initial Cal. Verification (10 NTU)[1]	*Each Batch*	*95-105%*
0.2 NTU Standard	*Each Batch*	*90-110%*
1.0 NTU Standard	*Each Batch*	*90-110%*
40 NTU Standard[3]	*Each Batch*	*90-110%*
Duplicate Samples (RPD)	*10%*	*5%*
Blind QC Samples	*Quarterly*	*As Specified*
Trip Blank, Field Blank	*When Provided*	*NA*
Equipment Rinsate Blank	*When Provided*	*NA*

- Acceptance limits must be generated in the laboratory (See recordkeeping SOP for guidance). Laboratory generated limits are compared to the published reference method limits or the guidance limits listed in this SOP

- TABLE: The table limits should be used for guidance purposes; in general, laboratory generated limits should be narrower.

9.1 Demonstrate initial proficiency with each sample matrix by generating data of acceptable precision and accuracy (P&A) for target analytes in a clean matrix. Refer to the latest revision of SOP Gen-010

9.1.1 "Training Protocols" for the procedure for precision and Accuracy Statements and specific training and retraining requirements.

9.2 The effect of the matrix on method performance (precision, accuracy, and detection limit) needs to be documented by the analysis of QC samples including a method blank, sample duplicate, and a laboratory control sample (LCS), if applicable, in each analytical batch. See the chart above for frequency, acceptance limits, etc. Refer to the latest revision of SOP Gen-008, "Daily Laboratory Recordkeeping for Analysts" for procedures for calculating percent recoveries, duplicate RPD values, generating control limits, using control charts, data review checklist, etc.

9.3 Exceeding the Acceptance Limits (for each test):

9.3.1 If the Method Blank has a reportable level, the following action must be taken: Clean the equipment, probes, glassware – repeat the test

9.3.2 If the net difference for duplicate analysis exceeds acceptable limits, the following action must be taken:

9.3.2.1 Reanalyze an additional sample and compare the third result to the previous results. If the third result confirms one of the two previous results, report that initial result. If difference is still out of acceptance limits, review the procedure, clean the glassware, recalibrate the instrument, and analyze an LCS (if appropriate). Repeat the test on the sample.

9.3.3 If the LCS recovery is outside the limits of acceptability, the following actions must be taken: Reanalyze a fresh LCS. If still out of acceptance limits, review the procedure, clean glassware, and recalibrate the instrument, analyze a fresh LCS.

9.4 Quarterly:

9.4.1 Analyze a Quality Control Sample, if available, from an external source. If results are not satisfactory, the entire procedure should be reviewed, including instrument maintenance. Any corrective actions or maintenance must be verified by the satisfactory analysis of an LCS.

9.5 Proficiency Samples:

9.5.1 For drinking water, waste water and solid waste (where applicable) are analyzed routinely by designated Field Technicians performing the onsite analysis of pH, residual chlorine and conductivity.

10. RECORDS

10.1 Documentation procedures concerning Chain-of-Custody and Work Order Receipt forms, Logbooks, Benchsheets, Calibration Review Checklists, and Data Review Checklists, Report Sheets, Standards and Reagent Logbooks, Maintenance Logbooks, and Quality Control Charts can be found in the latest revision of SOP Gen-008, "Daily Laboratory Recordkeeping for Analysts". All applicable documentation procedures in the Recordkeeping SOP must be followed.

10.2 Additional documentation requirements specific to each procedure are as follows:

10.2.1.1 All calibrations, method blank data, LCS data, and test sample data must be recorded in the Field sample logbook. Exception: residual chlorine data may be recorded on the specifically designated worksheet.

10.3 Enter data in LIMS. Generate labels to label all stock and secondary containers.

10.4 Record reagents, standards used, start date, end date in field log books.

10.5 Record all site QC and recoveries in filed log books.

11. CORRECTIVE ACTION/TROUBLESHOOTING:

Problem	Corrective Action
Residual Chlorine:	
Error message on readout	See instruction book for explanations
LCS outside limits	Clean cuvette, re – zero meter, reread LCS
pH:	
pH meter instrument problems, unstable readings, etc.	See pH meter Operating Instructions, including electrode maintenance
LCS is out of control limits	Check expiration dates of buffer solution replace with fresh solution if needed and reanalyze LCS
Sample pH outside calibration range	NONE – Report result as estimate
Temperature:	
Temperature does not quickly stabilize	Clean Probe
Dissolved Oxygen:	See instruction book for error message and explanations
Carbon Dioxide:	
Duplicate analysis outside limits	Reanalyze sample
Specific Conductance:	
LCS is out of control limits	Check expiration dates of buffer solution; Replace with fresh solution if needed and reanalyze LCS.
Duplicate analysis outside limits	Reanalyze sample
Oxidation Reduction Potential:	
pH meter instrument problems, unstable readings, etc.	See pH meter Operating Instructions, including electrode maintenance.

12. MAINTENANCE:

Residual Chlorine

Name of equipment: HACH Pocket Colorimeter
Service contract vendor: N/A
Vendor Maintenance Frequency: As requested by laboratory
User Maintenance/ Frequency: None

pH

Name of equipment: pH meter
Service contract vendor: N/A
Vendor Maintenance Frequency: As requested by laboratory
User Maintenance/ Frequency: Daily check the level of the electrode filling Solution in the combination electrode, fill as necessary. When all analysis is complete, recap the filling hole of the combination electrode and store the electrode in 4M KCI solution (filling solution)

Calibration of the temperature feature of the pH meter must be performed quarterly. Refer to the latest revision of SOP for thermometer calibration Gen-002.

Temperature

Name of equipment:	Conductivity Meter
Service contract vendor:	N/A
Vendor Maintenance Frequency:	As requested by laboratory
User Maintenance/ Frequency:	Calibration of the temperature feature of the conductivity meter must be performed quarterly. Refer to the latest revision of SOP for thermometer calibration, Gen-002.

Name of equipment:	pH Meter
Service contract vendor:	N/A
Vendor Maintenance Frequency:	As requested by laboratory
User Maintenance/ Frequency:	Daily check the level of the electrode filling solution in the combination electrode, fill as necessary. When all analysis is complete, recap the filling hole of the combination electrode and store the electrode in 4M KCl solution (filling solution) Calibration of the temperature feature of the pH meter must be performed quarterly. Refer to the latest revision of SOP for thermometer calibration, Gen-002.

Name of equipment:	DO Meter
Service contract vendor:	N/A
Vendor Maintenance Frequency:	As requested by laboratory
User Maintenance/ Frequency:	Calibration of the temperature feature of the DO meter must be performed quarterly. Refer to the latest revision of SOP, Gen-002, "Calibration of Laboratory Thermometers, Balances, Bottle-Top Dispensers and Fixed Volume Pipetted".

Specific Conductance:

Name of equipment:	Conductivity Meter
Service contract vendor:	N/A
Vendor Maintenance Frequency:	As requested by laboratory
User Maintenance/ Frequency:	Check the resistivity of the meter at least annually. Determine call constant quarterly. Refer to the latest revision of SOP WetChem-005, "Specific Conductance of Water Samples Using Methods SM 2510B, EPA 120.1, and EPA 9050A".

Oxidation Reduction Potential

See pH meter maintenance

Turbidity

Follow all manufacturers instruction for cleaning and maintenance of the meter, cuvets and standards

13. SAFETY PRECAUTIONS:

13.1 Wear gloves.

13.2 Wear eye protection

13.3 Use caution with chemical solutions as some may be corrosive and/or toxic

13.4 This SOP may not address all hazards associated with this test procedure.

14. POLLUTION PREVENTION:

14.1 Minimize reagent and standard proportion volume to the amount that will be consumed before expiration. All reagent volumes can be either scaled up or down to match use.

14.2 Samples and standards having a pH of <5 or >8 are hazardous and must be treated before being disposed of according to procedures in the latest revision of the SOP for waste management.

15. REFERENCES:

15.1 Methods for Chemical Analysis of Water and Wastes, J.F. Kopp and G.D. McKee, USEPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, EPA-600/4-79-020, Revised March 1983. Methods, EPA 360.1, EPA 120.1

15.2 Standard Methods For the Examination of Water and Wastewater, L.S. Clesceri, et. Al, editors, American Public Health Assoc., American Water Works Assoc., Water Pollution Control Federation, 18th Edition 1992 Methods 4500 Cl-G, 4500 CO_2-C

15.3 Annual Book of ASTM Standards, American Society for Testing and Materials, Philadelphia PA, Published annually Method 1498

15.4 Latest revision of SOP Gen-008, "Daily Laboratory Recordkeeping for Analysts"

15.5 Latest revision of SOP Gen-002, "Calibration of Laboratory Thermometers, Balances, Bottle-Top Dispenser and Fixed Volume Pipettes"

15.6 Latest revision of SOP Gen-010, "Training Protocols"

15.7 Latest revision of SOP WetChem-005, "Specific Conductance of Water Samples Using Methods EPA 120.1 SM 2510B and EPA 9050A"

15.8 Latest revision of SOP CHO-001 "Laboratory Waste Management"

15.9 SM 4500 H-B, Standard Methods For The Examination of Water and Wastewater, L. S. Clesceri, et. al, editors, American Public Health Assoc., American Water Works Assoc., Water Pollution Control Federation, On-line.

15.10 SM 2550 B, *Standard Methods For The Examination of Water and Wastewater, L. S. Clesceri, et. al, editors, American Public Health Assoc., American Water Works Assoc., Water Pollution Control Federation, On-line.*

15.11 SM 4500 CO2-C, *Standard Methods For The Examination of Water and Wastewater, L. S. Clesceri, et. al, editors, American Public Health Assoc., American Water Works Assoc., Water Pollution Control Federation, On-line.*

15.12 *ASTM 1498, Standard Test Method for Oxidation-Reduction Potential of Water, ASTM International,*

15.13 *EPA 180.1 "Determination of Turbidity by Nephelometry", Rev. 2.0, August 1993*

16. REVISION HISTORY

Rev. No.	Changes	Date
09	Updated QAM and responsibilities for this SOP; Updated section 7.1.7 to include corrective action for high range residual chlorine reading; Updated QC table in section 9 to indicate that Res. Cl. Acceptability limits vary per batch received of HACH DPD Spec Check standards..	05/13/2013
10	*SOP amended to include turbidity measurement; Inclusion of post standardization checks; inclusion of action for sample analyzed outside of calibration range; Update references list.*	*03/20/2015*

*All changes to previous version are *italicized*.

APPENDIX E

Field Data and Chain of Custody Sheets

CHAIN-OF-CUSTODY PROCEDURES

1.0 Purpose

This SOP documents the chain-of-custody (COC) procedures that will be employed during all sampling activities.

2.0 Equipment and Materials

- Indelible ink ball-point pens
- Chain-of-custody records
- One-gallon size *Zip-Loc* (or equivalent) storage bags

3.0 General

A completed COC record must accompany every sample from the point of collection to delivery to the laboratory. A single COC record may accompany several samples as long as all the samples are contained in a single unit (e.g., cooler, box, etc.). All COCs will be kept in one-gallon *Zip-Loc* (or equivalent) bags to prevent damage from melting ice, broken samples, and bad weather. A copy of every completed COC record will be maintained by the Millennium supervisor or designee.

4.0 Procedures

4.1 Completion of COC Record

A. The COC record is initiated in the field by the sampler(s) immediately after a sample is collected.

B. The sample identification number of the sample will be recorded in the box labeled "Sample Identification".

C. Next, the appropriate sample matrix will be indicated by completing the box labeled "Sample Matrix" with the number that corresponds to the sample matrix type. Sample matrices are listed near the top of the COC record.

D. The number of containers that makes a complete sample will be recorded in the box labeled "No. of Containers".

E. If the sample is to be analyzed for metals, the box labeled "Metals" shall be completed to indicate whether the sample fractions for metals have been filtered. A "F" will be used to indicate that the metals were filtered and a "N" will indicate that

they were not filtered. Occasionally, some samples may require metal fractions to be filtered and not filtered (e.g., analyses for dissolved and total metals). In this case a "B" will be used to indicate that the sample contains both filtered and non-filtered fractions. If the sample does not require analyses for metals a single line will be drawn through this box.

F. The date and time (military) of sample collection will be recorded in the box labeled "Sampling Date/Time".

G. The requested analytical methods will be recorded in the diagonal spaces provided under the box labeled "Analyses". The preservatives added to the containers for each analytical method will be indicated by recording the letter in the box labeled "Preservatives" that corresponds to the preservative added. The preservatives and corresponding letters are listed near the top of the COC record. Finally, a check mark(s) will be made under each fraction for which a particular sample will be analyzed.

H. Any comments relating to the collected sample(s) can be recorded in the box labeled "Comments". These comments may indicate special handling or analytical instructions for the laboratory (e.g., compositing instructions) or may be used to indicate the location of sample collection.

I. Additional information required on the COC record includes the person the analytical reports should be sent to, client, site, project description, project number, names of all samplers involved in sample collection, where the samples are to be delivered, method of delivery, and airbill number (if applicable).

4.2 Transfer of Custody

A. The COC record must document the transfer of custody each time the sample(s) changes hands. The National Enforcement Investigations Center (NEIC) of the EPA defines custody as:

1. the sample is in your physical possession;

2. the sample is within view after being in your physical possession;

3. the sample was in your possession and then you locked it or sealed it to prevent tampering; and/or

4. the sample is placed in a designated secure place with limited access to authorized personnel only.

B. When transferring custody of samples, the person in custody (e.g., the sampler) must sign the box labeled "Relinquished By" and fill in the date and time (military time) the custody of the samples was relinquished. The person accepting custody of the samples must then sign the box labeled "Received By" and complete the date and time (military time) the custody of the samples was accepted.

C. The above procedures must be followed until the samples are delivered to the laboratory. In cases where a commercial courier (e.g., Federal Express) is used to deliver the samples, the person relinquishing custody to the courier should put the name of the courier in the "Received By" box and seal the COC inside the cooler. Most couriers have a policy against signing for custody of samples.

D. A copy of the COC will be retained before the samples are shipped and the remaining copies of the COC are delivered to the laboratory. The retained copy will then be immediately given to the QAO. One of the submitted copies will be returned by the laboratory with the final report.

5.0 Documentation

Chain-of-custody record

6.0 Special Notes

None

7.0 Applicable Standards and References

U.S. Environmental Protection Agency. NEIC Policies and Procedures. EPA-330/9-78-001-R. May 1978. (Revised February 1983.)

U.S. Environmental Protection Agency. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response. December 1986.

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TAT 14 days

Millennium Inorganic Chemicals

Michael Helminiak
3901 Fort Armistead Rd.
Baltimore, MD 21226-1899
Phone: 410-354-7706

Project Name: Hawkins Point-Reference #6

Project / PO Number: N/A
Tenatively Scheduled: 1/7/2019
Field Route ID: Jeff J. Duszynski

Client Sample ID: HPP-1
Lab Sample ID: 19A0777-01
Matrix: Ground Water
Type: Grab

Sampled Date & Time: 1/15/19 @ 1150

Analysis	Method	Field Results/Comments			Hold Time
Field_Conductivity	SM 2510 B-11	Field Instrument: Cond	Result: 90	Unit:	
Field_Depth_Water_Well	-	Field Instrument: DTW	Result: 42.15	Unit:	
Field_pH	SM 4500-H B-11	Field Instrument: pH	Result: 4.29	Unit:	
Temp_Fld	SM 2550 B-00	Field Instrument: Temp	Result: 13.5	Unit:	
Hg_Total	EPA 7470A				28.00 days
M_Ag_ICP	EPA 6010B				180.00 days
M_As_ICPMS	EPA 6020				180.00 days
M_Ba_ICP	EPA 6010B				180.00 days
M_Be_ICP	EPA 6010B				180.00 days
M_Ca_ICP	EPA 6010B				180.00 days
M_Cd_ICPMS	EPA 6020				180.00 days
M_Co_ICP	EPA 6010B				180.00 days
M_Cr_ICP	EPA 6010B				180.00 days
M_Cu_ICP	EPA 6010B				180.00 days
M_Fe_ICP	EPA 6010B				180.00 days
M_K_ICP	EPA 6010B				180.00 days
M_Mg_ICP	EPA 6010B				180.00 days
M_Mn_ICP	EPA 6010B				180.00 days
M_Mo_ICPMS	EPA 6020				180.00 days
M_Na_ICP	EPA 6010B				180.00 days
M_Ni_ICP	EPA 6010B				180.00 days
M_Pb_ICPMS	EPA 6020				180.00 days
M_Sb_ICPMS	EPA 6020				180.00 days
M_Se_ICPMS	EPA 6020				180.00 days
M_Tl_ICPMS	EPA 6020				180.00 days
M_V_ICP	EPA 6010B				180.00 days
M_Zn_ICP	EPA 6010B				180.00 days
8260_TCL	EPA 8260C				14.00 days
Alkalinity	SM 2320 B-11				14.00 days
Cl_IC	SW-846 9056A				28.00 days
COD_Total_LL	EPA 410.4				28.00 days
Hard_Titration	SM 2340 C-11				28.00 days
NH3_Seal	SM 4500-NH3 B+G-11				28.00 days
NO2_IC	SW-846 9056A				2.00 days

Reviewed By: RM
Date 1/17/19

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Project Name: Hawkins Point-Reference #6

Michael Helminiak
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Phone: 410-354-7706

Project / PO Number: N/A
Tenatively Scheduled: 1/7/2019
Field Route ID: Jeff J. Duszynski

NO3_IC	SW-846 9056A	2.00 days
SO4_IC	SW-846 9056A	28.00 days
TDS	SM 2540 C-11	7.00 days
Turbidity_50	EPA 180.1	2.00 days

Container(s)	Designator
V-40ml VOA Vial HCl to pH <2	A
V-40ml VOA Vial HCl to pH <2	B
H-½ Gallon Plastic Neat	C
B-1000ml Plastic H2SO4 to pH <2	D
A- 500ml Plastic HNO3 to pH <2	E
A- 500ml Plastic HNO3 to pH <2	F

Client Sample ID: HPP-2

Lab Sample ID: 19A0777-02

Matrix: Ground Water

Sampled Date & Time: 1/15/19@ 1040

Type: Grab

Analysis	Method	Field Results/Comments	Hold Time
Field_Conductivity	SM 2510 B-11	Field Instrument: COND Result: 69 Unit:	
Field_Depth_Water_Well	-	Field Instrument: DTW Result: 53.95 Unit:	
Field_pH	SM 4500-H B-11	Field Instrument: PH Result: 4.12 Unit:	
Temp_Fld	SM 2550 B-00	Field Instrument: Temp Result: 13.6 Unit:	
Hg_Total	EPA 7470A		28.00 days
M_Ag_ICP	EPA 6010B		180.00 days
M_As_ICPMS	EPA 6020		180.00 days
M_Ba_ICP	EPA 6010B		180.00 days
M_Be_ICP	EPA 6010B		180.00 days
M_Ca_ICP	EPA 6010B		180.00 days
M_Cd_ICPMS	EPA 6020		180.00 days
M_Co_ICP	EPA 6010B		180.00 days
M_Cr_ICP	EPA 6010B		180.00 days
M_Cu_ICP	EPA 6010B		180.00 days
M_Fe_ICP	EPA 6010B		180.00 days
M_K_ICP	EPA 6010B		180.00 days
M_Mg_ICP	EPA 6010B		180.00 days
M_Mn_ICP	EPA 6010B		180.00 days
M_Mo_ICPMS	EPA 6020		180.00 days
M_Na_ICP	EPA 6010B		180.00 days
M_Ni_ICP	EPA 6010B		180.00 days
M_Pb_ICPMS	EPA 6020		180.00 days
M_Sb_ICPMS	EPA 6020		180.00 days

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Project Name: Hawkins Point-Reference #6

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Phone: 410-354-7706

Project / PO Number: N/A
Tenatively Scheduled: 1/7/2019
Field Route ID: Jeff J. Duszynski

M_Se_ICPMS	EPA 6020	180.00 days
M_Tl_ICPMS	EPA 6020	180.00 days
M_V_ICP	EPA 6010B	180.00 days
M_Zn_ICP	EPA 6010B	180.00 days
8260 TCL	EPA 8260C	14.00 days
Alkalinity	SM 2320 B-11	14.00 days
Cl_IC	SW-846 9056A	28.00 days
COD_Total_LL	EPA 410.4	28.00 days
Hard_Titration	SM 2340 C-11	28.00 days
NH3_Seal	SM 4500-NH3 B+G-11	28.00 days
NO2_IC	SW-846 9056A	2.00 days
NO3_IC	SW-846 9056A	2.00 days
SO4_IC	SW-846 9056A	28.00 days
TDS	SM 2540 C-11	7.00 days
Turbidity_50	EPA 180.1	2.00 days

Container(s)	Designator
V-40ml VOA Vial HCl to pH <2	A
V-40ml VOA Vial HCl to pH <2	B
H-½ Gallon Plastic Neat	C
B-1000ml Plastic H2SO4 to pH <2	D
A- 500ml Plastic HNO3 to pH <2	E
A- 500ml Plastic HNO3 to pH <2	F

Client Sample ID: HPP-3

Lab Sample ID: 19A0777-03

Matrix: Ground Water

Sampled Date & Time: 1/15/19 @ 1305

Type: Grab

Analysis	Method	Field Results/Comments	Hold Time
Field_Conductivity	SM 2510 B-11	Field Instrument: COND Result: 103 Unit:	
Field_Depth_Water_Well	-	Field Instrument: DTW Result: 56.05 Unit:	
Field_pH	SM 4500-H B-11	Field Instrument: PH Result: 5.58 Unit:	
Temp_Fld	SM 2550 B-00	Field Instrument: Temp Result: 14.1 Unit:	
Hg_Total	EPA 7470A		28.00 days
M_Ag_ICP	EPA 6010B		180.00 days
M_As_ICPMS	EPA 6020		180.00 days
M_Ba_ICP	EPA 6010B		180.00 days
M_Be_ICP	EPA 6010B		180.00 days
M_Ca_ICP	EPA 6010B		180.00 days
M_Cd_ICPMS	EPA 6020		180.00 days
M_Co_ICP	EPA 6010B		180.00 days

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Project Name: Hawkins Point-Reference #6

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Project / PO Number: N/A
Tenatively Scheduled: 1/7/2019
Field Route ID: Jeff J. Duszynski

M_Cr_ICP	EPA 6010B	180.00 days
M_Cu_ICP	EPA 6010B	180.00 days
M_Fe_ICP	EPA 6010B	180.00 days
M_K_ICP	EPA 6010B	180.00 days
M_Mg_ICP	EPA 6010B	180.00 days
M_Mn_ICP	EPA 6010B	180.00 days
M_Mo_ICPMS	EPA 6020	180.00 days
M_Na_ICP	EPA 6010B	180.00 days
M_Ni_ICP	EPA 6010B	180.00 days
M_Pb_ICPMS	EPA 6020	180.00 days
M_Sb_ICPMS	EPA 6020	180.00 days
M_Se_ICPMS	EPA 6020	180.00 days
M_Tl_ICPMS	EPA 6020	180.00 days
M_V_ICP	EPA 6010B	180.00 days
M_Zn_ICP	EPA 6010B	180.00 days
8260 TCL	EPA 8260C	14.00 days
Alkalinity	SM 2320 B-11	14.00 days
Cl_IC	SW-846 9056A	28.00 days
COD_Total_LL	EPA 410.4	28.00 days
Hard_Titration	SM 2340 C-11	28.00 days
NH3_Seal	SM 4500-NH3 B+G-11	28.00 days
NO2_IC	SW-846 9056A	2.00 days
NO3_IC	SW-846 9056A	2.00 days
SO4_IC	SW-846 9056A	28.00 days
TDS	SM 2540 C-11	7.00 days
Turbidity_50	EPA 180.1	2.00 days

Container(s)	Designator
V-40ml VOA Vial HCl to pH <2	A
V-40ml VOA Vial HCl to pH <2	B
H-½ Gallon Plastic Neat	C
B-1000ml Plastic H2SO4 to pH <2	D
A- 500ml Plastic HNO3 to pH <2	E
A- 500ml Plastic HNO3 to pH <2	F

Client Sample ID: HPP-4

Lab Sample ID: 19A0777-04

Matrix: Ground Water

Type: Grab

Sampled Date & Time: 1/16/19 @ 0930

Analysis	Method	Field Results/Comments	Hold Time
Field_Conductivity	SM 2510 B-11	Field Instrument: COND Result: 45 Unit:	
Field_Depth_Water_Well	-	Field Instrument: DTW Result: 40.20 Unit:	

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Project Name: Hawkins Point-Reference #6

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Project / PO Number: N/A
Tenatively Scheduled: 1/7/2019
Field Route ID: Jeff J. Duszynski

Field Instrument: pH Result: 435 Unit:
Field Instrument: Temp Result: 12.1 Unit:

Field_pH	SM 4500-H B-11	
Temp_Fld	SM 2550 B-00	
Hg_Total	EPA 7470A	28.00 days
M_Ag_ICP	EPA 6010B	180.00 days
M_As_ICPMS	EPA 6020	180.00 days
M_Ba_ICP	EPA 6010B	180.00 days
M_Be_ICP	EPA 6010B	180.00 days
M_Ca_ICP	EPA 6010B	180.00 days
M_Cd_ICPMS	EPA 6020	180.00 days
M_Co_ICP	EPA 6010B	180.00 days
M_Cr_ICP	EPA 6010B	180.00 days
M_Cu_ICP	EPA 6010B	180.00 days
M_Fe_ICP	EPA 6010B	180.00 days
M_K_ICP	EPA 6010B	180.00 days
M_Mg_ICP	EPA 6010B	180.00 days
M_Mn_ICP	EPA 6010B	180.00 days
M_Mo_ICPMS	EPA 6020	180.00 days
M_Na_ICP	EPA 6010B	180.00 days
M_Ni_ICP	EPA 6010B	180.00 days
M_Pb_ICPMS	EPA 6020	180.00 days
M_Sb_ICPMS	EPA 6020	180.00 days
M_Se_ICPMS	EPA 6020	180.00 days
M_Tl_ICPMS	EPA 6020	180.00 days
M_V_ICP	EPA 6010B	180.00 days
M_Zn_ICP	EPA 6010B	180.00 days
8260 TCL	EPA 8260C	14.00 days
Alkalinity	SM 2320 B-11	14.00 days
Cl_IC	SW-846 9056A	28.00 days
COD_Total_LL	EPA 410.4	28.00 days
Hard_Titration	SM 2340 C-11	28.00 days
NH3_Seal	SM 4500-NH3 B+G-11	28.00 days
NO2_IC	SW-846 9056A	2.00 days
NO3_IC	SW-846 9056A	2.00 days
SO4_IC	SW-846 9056A	28.00 days
TDS	SM 2540 C-11	7.00 days
Turbidity_50	EPA 180.1	2.00 days

Container(s)	Designator
V-40ml VOA Vial HCl to pH <2	A
V-40ml VOA Vial HCl to pH <2	B
H-½ Gallon Plastic Neat	C
B-1000ml Plastic H2SO4 to pH <2	D
A- 500ml Plastic HNO3 to pH <2	E
A- 500ml Plastic HNO3 to pH <2	F

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Phone: 410-354-7706

Project Name: Hawkins Point-Reference #6

Project / PO Number: N/A
Tenatively Scheduled: 1/7/2019
Field Route ID: Jeff J. Duszynski

Client Sample ID: HPP-5
Lab Sample ID: 19A0777-05
Matrix: Ground Water
Type: Grab

Sampled Date & Time: 1/15/19 @ 1430

Analysis	Method	Field Results/Comments	Hold Time
Field_Conductivity	SM 2510 B-11	Field Instrument: Cond Result: 51 Unit:	
Field_Depth_Water_Well	-	Field Instrument: DTW Result: 42.60 Unit:	
Field_pH	SM 4500-H B-11	Field Instrument: PH Result: 4.16 Unit:	
Temp_Fld	SM 2550 B-00	Field Instrument: Temp Result: 13.7 Unit:	
Hg_Total	EPA 7470A		28.00 days
M_Ag_ICP	EPA 6010B		180.00 days
M_As_ICPMS	EPA 6020		180.00 days
M_Ba_ICP	EPA 6010B		180.00 days
M_Be_ICP	EPA 6010B		180.00 days
M_Ca_ICP	EPA 6010B		180.00 days
M_Cd_ICPMS	EPA 6020		180.00 days
M_Co_ICP	EPA 6010B		180.00 days
M_Cr_ICP	EPA 6010B		180.00 days
M_Cu_ICP	EPA 6010B		180.00 days
M_Fe_ICP	EPA 6010B		180.00 days
M_K_ICP	EPA 6010B		180.00 days
M_Mg_ICP	EPA 6010B		180.00 days
M_Mn_ICP	EPA 6010B		180.00 days
M_Mo_ICPMS	EPA 6020		180.00 days
M_Na_ICP	EPA 6010B		180.00 days
M_Ni_ICP	EPA 6010B		180.00 days
M_Pb_ICPMS	EPA 6020		180.00 days
M_Sb_ICPMS	EPA 6020		180.00 days
M_Se_ICPMS	EPA 6020		180.00 days
M_Tl_ICPMS	EPA 6020		180.00 days
M_V_ICP	EPA 6010B		180.00 days
M_Zn_ICP	EPA 6010B		180.00 days
8260 TCL	EPA 8260C		14.00 days
Alkalinity	SM 2320 B-11		14.00 days
Cl_IC	SW-846 9056A		28.00 days
COD_Total_LL	EPA 410.4		28.00 days
Hard_Titration	SM 2340 C-11		28.00 days
NH3_Seal	SM 4500-NH3 B+G-11		28.00 days
NO2_IC	SW-846 9056A		2.00 days

APPENDIX F

Drinking Water Maximum Concentration Limits

SECTION 4

DRINKING WATER REGULATIONS

REGULATED DRINKING WATER CONTAMINANTS[1]

	PARAMETER REGULATED	MCL/ [SMCL][2] mg/L	MCLG[2] mg/L	METHODS[3,4]	ACCEPTANCE LIMITS
INORGANICS	Alkalinity[5]	-	-	D1067-92B, 2320B, I-1030-85	
	Asbestos	7MF/L > 10μm	7MF/L > 10μm	100.1, 100.2	[illegible]
	Residual Disinfectant[6] Chlorine Chloramines Chlorine Dioxide	(MRDL)[6] 4 (as Cl_2) 4 (as Cl_2) 0.8 (as ClO_2)	(MRDLG)[6] 4 (as Cl_2) 4 (as Cl_2) 0.8 (as ClO_2)	 4500-Cl D, F, G and H 4500-Cl D, E, F, G and I 4500-ClO_2 C, D, E	
	Cyanide	0.2	0.2	335.4, D2036-91B, D2036-91A, 4500-CN C, G, E and F, I-3300-85	±25%
	Fluoride[7]	4.0 [2.0]	-	300.0, D4327-91, D1179-93B, 4110B, 4500F B, D, C and E, Technicon 380-75WE and 129-71W	±10%
	Nitrate (as N)	10	10	353.2, 300.0, D4327-91, D3867-90A&B 4110B, 4500-NO_3 F, D and E, Waters B-1011, ATI 601	±25%
	Nitrite (as N)	1	1	353.2, 300.0, D4327-91, D3867-90A&B 4110B, 4500-NO_2 F & E, 4500-NO_3 B Waters B-1011	±25%
	Nitrate/Nitrite (as N)	10	10	-	
	o-Phosphate[5]	-	-	365.1, 300.0, D515-88A, D4327-91, 4500-P F, 4500-P E, 4110 B, I-1601-85, I-2601-90, I-2598-85	
	Turbidity	Treatment		180.1, 2130B, G LI Method 2	
RADIOCHEMICALS	Adjusted Gross Alpha	15 pCi/L	zero	900.0, 302, 7110 B, C	±50%
	Beta Particle Emitters	4 mr ede/yr	zero	900.0, 302, 7110 B	±30%
	radioactive Cesium	-	-	901.0, 901.1, 7500-Cs B, 7120, D 2459-72, D 3649-91	±50%
	radioactive Iodine	-	-	901.1 902.0,7500-I B, C, D, 7120, D 3649-91, D 4785-88	±50%
	radioactive Strontium 89, 90	-	-	905.0, 303, 7500-Sr B	±30%
	tritium	-	-	906.0, 306, 7500-3H B, D 4107-91	±20%
	gamma emitters	-	-	901.1, 902.0, 901.0, 7120, 7500-Cs B, 7500-I B, D3649-91, D 4785-88	
	Radium-226	20 pCi/L	zero	903.0, 903.1, 7500-Ra C 304,305, 7500-Ra B, D3454-91, D2460-90	±50%
	Radium-228	20 pCi/L	zero	904.0, 7500-Ra D	±50%
	Uranium	0.02	zero	908.0, 908.1 7500-U B, 7500-U C, D2907-91, D3972-90, D5174-91	±50%
MICRO	Total Coliform	100/100mL 5% positive samples/mo[11]	zero	TCR (9221A,B,D, 9222A,B,C, E*Colite 9223, Colisure, --ColiBlue24) SWTR (9221A,B,C, 9222A,B,C, 9223)	
	E. coli	§141.21(f) (6&7)	zero	Colilert, Colisure, EC-MUG Nutrient Agar-MUG[11]	
	Fecal Coliform	§141.21(f)(5) §141.74(a)(1)	zero	TCR (9221E Part 1) SWTR (9221E Part 1&2, 9222D)	

	PARAMETER REGULATED	MCL/ [SMCL][2] mg/L	MCLG[2] mg/L	METHODS[3,4]	ACCEPTANCE LIMITS
VOLATIL ORGANIC COMPOUNDS	Benzene	0.005	zero	502.2, 524.2	±20/40%[8]
	Carbon tetrachloride	0.005	zero	502.2, 524.2, 551.1	±20/40%[8]
	Chlorobenzene	0.1	0.1	502.2, 524.2	±20/40%[8]
	p-Dichlorobenzene	0.075 [0.005]	0.075	502.2, 524.2	±20/40%[8]
	o-Dichlorobenzene	0.6	0.6	502.2, 524.2	±20/40%[8]
	1,2-Dichloroethane	0.005	zero	502.2, 524.2	±20/40%[8]
	1,1-Dichloroethylene	0.007	0.007	502.2, 524.2	±20/40%[8]
	c-1,2-Dichloroethylene	0.07	0.07	502.2, 524.2	±20/40%[8]
	t-1,2-Dichloroethylene	0.1	0.1	502.2, 524.2	±20/40%[8]
	Dichloromethane	0.005	zero	502.2, 524.2	±20/40%[8]
	1,2-Dichloropropane	0.005	zero	502.2, 524.2	±20/40%[8]
	Ethyl benzene	0.7	0.7	502.2, 524.2	±20/40%[8]
	Styrene	0.1	0.1	502.2, 524.2	±20/40%[8]
	Tetrachloroethylene	0.005	zero	502.2, 524.2, 551.1	±20/40%[8]
	Toluene	1	1	502.2, 524.2	±20/40%[8]
	1,2,4-Trichlorobenzene	0.07	0.07	502.2, 524.2	±20/40%[8]
	1,1,1-Trichloroethane	0.2	0.2	502.2, 524.2, 551.1	±20/40%[8]
	1,1,2-Trichloroethane	0.005	0.003	502.2, 524.2, 551.1	±20/40%[8]
	Trichloroethylene	0.005	zero	502.2, 524.2, 551.1	±20/40%[8]
	Vinyl chloride	0.002	zero	502.2, 524.2	±20/40%[8]
	Xylenes(Total)	10	10	502.2, 524.2	±20/40%[8]
DBPs	Trihalomethanes (total)[9]	0.08		502.2, 524.2, 551.1	95% CI[11]
	Haloacetic Acid 5 (HAA5) (total)[9,10]	0.06		552.1, 552.2 SM 6251B	95% CI[11]
	Bromate[9,11]	0.010	zero	300.1	95% CI[11]
	Chlorite[9,11]	1.0	0.8	1300.0, 300.1	95% CI[11]

	PARAMETER REGULATED	MCL/ [SMCL][1] mg/L	MCLG[2] mg/L	METHODS[3,4]	ACCEPTANCE LIMITS
SYNTHETIC ORGANIC CONTAMINANTS	Alachlor	0.002	zero	505, 507, 508.1, 525.2, 551.1	±45%
	Atrazine	0.003	0.003	505, 507, 508.1, 525.2, 551.1	±45%
	Carbofuran	0.04	0.04	531.1, 6610	±45%
	Chlordane	0.002	zero	505, 508, 508.1, 525.2	±45%
	2,4-D (as acid salts and esters)	0.07	0.07	515.1, 515.2, 555, 515.3, D5317-93	±50%
	Dalapon	0.2	0.2	515.1, 552.1, 552.2, 515.3	2SD
	Dibromochloropropane	0.0002	zero	504.1, 551.1	±40%
	Dinoseb	0.007	0.007	515.1, 515.2, 555, 515.3	2SD
	Diquat	0.02	0.02	549.2	2SD
	Endothall	0.1	0.1	548.1	2SD
	Endrin	0.002	0.002	505, 508, 508.1, 525.2, 551.1	±30%
	Ethylenedibromide(EDB)	0.00005	zero	504.1, 551.1	±40%
	Glyphosate	0.7	0.7	547, 6651	2SD
	Heptachlor	0.0004	zero	505, 508, 508.1, 525.2, 551.1	±45%
	Heptachlor epoxide	0.0002	zero	505, 508, 508.1, 525.2, 551.1	±45%
	Lindane	0.0002	0.0002	505, 508, 508.1, 525.2, 551.1	±45%
	Methoxychlor	0.04	0.04	505, 508, 508.1, 525.2, 551.1	±45%
	Oxamyl (Vydate)	0.2	0.2	531.1, 6610	2SD
	Pentachlorophenol	0.001	zero	515.1, 515.2, 525.2, 555, 515.3, D5317-93	±50%
	Picloram	0.5	0.5	515.1, 515.2, 555, 515.3, D5317-93	2SD
	Simazine	0.004	0.004	505, 507, 508.1, 525.2, 5551.1	2SD
	Toxaphene	0.003	zero	505, 508, 525.2, 508.1	±45%
	2,4,5-TP(Silvex)	0.05	0.05	515.1, 515.2, 555, 515.3, D5317-93	±50%
	Hexachlorobenzene	0.001	zero	505, 508, 508.1, 525.2, 551.1	2SD
	Hexachlorocyclopentadiene	0.05	0.05	505, 508, 508.1, 525.2, 551.1	2SD
	Benzo(a)pyrene	0.0002	zero	550, 550.1, 525.2	2SD
	PCBs (as Aroclors) (as decachlorobiphenyl)	0.0005	zero	505, 508, 508.1, 525.2 508A	0-200%
	2,3,7,8-TCDD(Dioxin)	$3x10^{-8}$	zero	1613	2SD
	Acrylamide	Treatment	zero		
	Epichlorohydrin	Treatment	zero		
	Di(2-ethylhexyl)adipate	0.4	0.4	506, 525.2	2SD
	Di(2-ethylhexyl)phthalate	0.006	zero	506, 525.2	2SD

	PARAMETER REGULATED	MCL/ [SMCL][1] mg/L	MCLG[2] mg/L	METHODS[3,4]	ACCEPTANCE LIMITS
METALS	Aluminum[7]	[0.05-0.2]	-	200.7,200.8,200.9,3120B,3113B,3111D	
	Antimony	0.006	0.006	200.8, 200.9, D-3697-92, 3113-B	±15%
	Arsenic	0.05	-	200.7, 200.8, 200.9, D-2972-93C, 3120B, 3113B, 3114B, D-2972-93B	
	Barium	2	2	200.7, 200.8, 3120B, 3111D, 3113B	±15%
	Beryllium	0.004	0.004	200.7, 200.8, 200.9, D-3645-93B, 3120B, 3113B	±15%
	Cadmium	0.005	0.005	200.7, 200.8, 200.9, 3113B	±20%
	Calcium	-	-	200.7, D511-93A, D511-93B, 3500-Ca D, 3111B, 3120B	
	Chromium	0.1	0.1	200.7, 200.8, 200.9, 3120B, 3113B	±15%
	Copper[5,7]	1.3/90%[5] [1.0]	1.3	200.7, 200.8, 200.9, D1688-95C, D1688-95A, 3113B, 3111B, 3120B	±10%
	Iron[7]	[0.3]	-	200.7, 200.9, 3120B, 3111B, 3113B	
	Lead[5]	0.015/90%[5]	zero	200.8, 200.9, D3559-95D, 3113B	±30%
	Magnesium[14]	-	-	200.7, D 511-93 A,B, 3111B, 3120 B, 3500-Mg E	
	Manganese[7]	[0.05]	-	200.7, 200.8, 200.9, 3120B, 3113B, 3111B	
	Mercury	0.002	0.002	245.1, 245.2, 200.8, D3223-91, 3112B	±30%
	Selenium	0.05	0.05	200.8, 200.9, D3859-93A, D3859-93B, 3114B, 3113B	±20%
	Silica[7]	-	-	200.7, D859-95, 4500-Si D,E,& F, 3120B, I-1700-85, I-2700-85	
	Silver[7]	[0.1]		200.7, 200.8, 200.9, 3120B, 3111B, 3113B, I-3720-85	
	Sodium	20	-	200.7, 3111B, 3120B	
	Thallium	0.002	0.0005	200.8, 200.9	±30%
	Zinc[7]	[5.0]	-	200.7, 200.8, 3120B, 3111B	

1 - This method table is a convenient reference only; for details see the specific rule.
2 - MCL=maximum contaminant level; SMCL=secondary maximum contaminant level; MCLG=maximum contaminant level goal
3 - Secondary contaminants may be analyzed using the recommended methods and do not have to be analyzed in a certified laboratory; primary, unregulated (monitoring only) and state discretionary contaminants must be analyzed using approved methods in laboratories certified by the States.
4 - For method references, see 59 FR 62456, December 5, 1994 and Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October, 1994.
5 - Lead and Copper Rule - promulgated 6-7-91; lead and copper levels are Action Levels
6 - M-DBP Rule- MRDL=maximum residual disinfectant level; MRDLG=maximum residual disinfectant level goal
7 - Secondary Maximum Contaminant Level - non-enforceable federal guideline
8 - PE Acceptance Limits for VOCs are ±20% at ≥10µg/L and ±40% at <10µg/L.
9 - M-DBP Rule - promulgated 12-16-98
10 - Includes 5 HAAs - monochloro, dichloro, trichloro, bromo, and dibromo acetic acids.
11 - For plants that use ozone to disinfect
12 - For plants that use chlorine dioxide to disinfect
13 - Laboratories must achieve quantitative results within the acceptance limits on 80% of the analytes included in the PT sample. Acceptance is defined as within the 95% confidence interval around the mean of the PT study data.
14 - M-DPR Rule allows Mg to be used as a surrogate for TOC.

APPENDIX F
Closure and Post-Closure Plan

Prepared for:

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CLOSURE AND POST-CLOSURE CARE PLAN

APPENDIX G OF APPLICATION FOR AN INDUSTRIAL SOLID WASTE FACILITY: PHASE III REPORT

Hawkins Point Plant Industrial Waste Landfill Baltimore, Maryland

Prepared by

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1. INTRODUCTION

1.1 Terms of Reference

The purpose of this Closure and Post-Closure Care Plan (plan) is to address the requirements for landfill closure and post-closure care for the Hawkins Point Plant Industrial Landfill (HPP Landfill) in Baltimore, Maryland. The landfill is owned and operated by HPP Landfill, LLC. In this report, the requirements of the Code of Maryland (COMAR), Title 26, Subtitle 04, Section 07 (Solid Waste Management), subsections 21 and 22 (i.e., Closure and Post-Closure Care Monitoring and Maintenance) are addressed. This plan is Appendix G of the *"Application for an Industrial Waste Facility: Phase III Report"* (Phase III Report). This report was prepared by Alexandra Ambrosino and was reviewed by Thomas B. Ramsey P.E., both of Geosyntec Consultants (Geosyntec) in accordance with the internal peer review policy of the firm.

1.2 Regulatory Requirements and Closure Plan Organization

This plan has been prepared to meet the State of Maryland and Federal requirements regarding closure and post-closure care for industrial landfills, as defined in COMAR Sections 26.04.07.21 and 22 and in 40 CFR Parts 258.60 and 258.61. The required content of closure plans is presented in COMAR 26.04.07.21. The Closure Plan contents and the location where the requirements are addressed in this plan are as follows:

- in the remainder of Section 1, definitions and an overview of closure and post-closure care activities for HPP Landfill are presented;
- the methods, procedures, and processes that will be used to close HPP Landfill are described in Section 2;
- a description of the final cover system components is presented in Section 3;
- closure and post-closure cost estimates are presented in Section 4; and
- a post-closure care plan is presented in Section 5.

1.3 Definitions

After development and filling of the landfill disposal cells, the cells will be closed and the landfill will enter into a period of post-closure care. The following definitions are used throughout this plan in relation to closure and post-closure care. These definitions are consistent with the definitions presented in COMAR 26.04.07.21 and .22, but they have been clarified to describe activities that will be performed for closure and post-closure care of HPP Landfill.

- "*Closure*" is defined as cessation of waste disposal operations at HPP Landfill. The landfill owner, HPP Landfill, does not anticipate implementing closure activities during the operating life of HPP Landfill.

- "*Final Closure"* is defined as construction of the final cover system of the entire landfill area, revegetation of all disturbed areas, and development of post-closure use features (if any).
- "*Final Cover System*" refers to the grading layer plus the closure cap (described below).
- "*Grading Layer*" is defined as the 2-ft thick soil layer placed over the final waste lift no later than 90 days following completion of that final lift as required under COMAR 26.04.07.10(F). This layer may include 1-ft of intermediate cover soil and 1-ft of final cover soil. Construction of this layer before construction of the closure cap (described below) constitutes *"Partial Closure"*.
- *"Closure Cap"* refers to the cap that will be constructed over the grading layer (which is described above in this section). The closure cap for HPP Landfill will consist of two feet of soil cover with vegetation.
- "*Post-Closure Care*" is defined as the maintenance and monitoring activities that will be performed during the post-closure care period (i.e., not less than 5 years). Post-closure care includes all activities that will be performed following closure, such as: operation of the leachate and stormwater management systems; long-term maintenance; and environmental monitoring.

In this plan, the term "Drawings" refers to the drawing package entitled, *"HPP Industrial Waste Landfill, Phase III – Landfill Design* Drawings*, Baltimore, Maryland,"* dated 1992 and prepared by Oosterbaan Associates, which is included as Appendix A of the Phase III Report.

1.4 Overview of Closure and Post-Closure Care Activities

1.4.1 Introduction

The HPP Landfill will be closed according to the closure requirements of COMAR 26.04.07.21. In this section, an overview is presented of the activities that will be performed for closure and post-closure care, and references are provided for the location in this report where the activities are described in more detail.

1.4.2 Required Submittals and Notifications

HPP Landfill, LLC will make several submittals and notifications to alert the Maryland Department of the Environment (MDE) to describe its intentions for closure and post-closure care to MDE and the public. These submittals and notifications are identified below.

- This plan has been prepared in accordance with COMAR 26.04.07.21 and 40 CFR Part 258.60 and is being submitted as part of the application for a permit.

- Written notification of HPP Landfill's intent to close the site will be provided to MDE at least 180 days before the date of final receipt of waste. As described in the Phase III report, HPP Landfill has not established a closure date, as the amount of waste generated for disposal at the plant is highly variable.
- HPP Landfill LLC will not commence closure of the landfill until the closure design is approved by MDE. When HPP Landfill, LLC submits its notification of intent to close the site, a closure schedule and revised Closure and Post-Closure Plan will also be submitted to MDE. Once the closure permit has been issued, the Closure and Post-Closure Plan will be executed as described in the terms of the permit.
- A copy of this plan will be maintained at the facility at all times during facility operation and throughout the post-closure care period.
- After closure construction activities are completed, a certification of closure will be provided to MDE. The certification will state that the closure was completed in conformance with the requirements of the closure plan.
- A notification in the deed to the HPP Landfill property will be made at the time of closure. The notification will indicate that the land has been used as a solid waste disposal site and that the use of the land is restricted.
- The contact for final closure activities will be the Landfill Foreman for the HPP Landfill, whose responsibilities and duties are described in Section 3 of the Operation Plan (Appendix D of the Phase III Report).

1.4.3 Closure Construction Activities

The closure of HPP Landfill includes several activities that are intended to minimize the need for further maintenance of the landfill and minimize the potential for escape of solid waste or leachate. These features are briefly described in the following paragraphs.

Final Cover System. HPP Landfill, LLC will construct a final cover system over all waste disposal areas after the landfill has been filled to the final permitted grades or capacity is exhausted. The final cover system, shown on Figure 1 of this Closure and Post-Closure Plan, will comply with the requirements of COMAR 26.04.07.21E. The 2-ft grading layer will be installed after the disposal areas reach final grades and may include 1-ft of intermediate cover soil and 1-ft of final cover soil. Construction of the closure cap will commence no later than 24 months after completion of the final lift of waste for the entire landfill and will be completed within one year, during which time the stormwater management system, which is already constructed and functioning, will be checked for needed maintenance.

Stormwater Management System. The stormwater management features for HPP Landfill are already in place and will be used for both sediment control and stormwater management. After closure (i.e., after all surfaces have been seeded and stabilized), the system will be used only for stormwater management. The stormwater management system is described in the 1992 Phase III Report prepared by Oosterbaan and is in Appendix B.

1.4.4 Post-Closure Care, Maintenance, and Monitoring

After closure, HPP Landfill, LLC will provide post-closure care, maintenance, and monitoring in accordance with the requirements of COMAR 26.04.07.22 and 40 CFR Part 258.61. In general, this will include: (i) operating the landfill to manage leachate and stormwater; (ii) monitoring ground water and surface water at the site; (iii) maintaining the leachate management and stormwater management systems; and (iv) in the event of a problem, notifying the proper authorities of the problem and addressing the problem. The plan for providing post-closure operation, maintenance, and monitoring is presented in Section 5 of this plan.

2. METHODS, PROCEDURES, AND PROCESSES FOR LANDFILL CLOSURE

2.1 Introduction

In this Section, the methods, procedures, and processes that will be employed to close HPP Landfill are presented. The methods, procedures, and processes described in this section have been selected to meet the performance requirements of COMAR 26.04.07.21, which are:

- minimize the need for further maintenance of the landfill; and
- minimize the post-closure escape of solid waste or leachate to surface water, ground water, or the atmosphere.

In the following sections, descriptions are provided of the methods, procedures, and processes that will be used to minimize the post-closure escape of solid waste (Section 2.2) and leachate (Section 2.3) to surface water, ground water, and the atmosphere. Also, the need for long-term maintenance of the landfill is addressed (Section 2.4).

2.2 Containment of Solid Waste

The design of HPP Landfill provides for containment of solid waste throughout the entire period of landfill operation, closure, and post-closure care and minimizes the possibility for release of solid waste to the environment. Design features that will provide for containment of solid waste through the closure and post-closure period include the liner system, the perimeter berm, the grading layer, and the closure cover. These features are described below.

- *Landfill Liner System.* The landfill liner system is designed to contain and to prevent a release of solid waste (including any liquid wastes that may exist in the landfill) to the environment. As shown in Appendix A of the Phase III Report, the liner system extends beneath all areas that will receive solid waste. The design and the Operation Plan (provided in Appendix D of the Phase III Report) also includes monitoring of the landfill during operation to identify problems with the liner system. Using these techniques, the landfill will be effective in containing solid waste throughout the post-closure period.

- *Perimeter Berm.* The landfill is designed to have a perimeter berm to provide containment of solid waste. The berm is designed to provide stability to the landfill and to contain waste within the landfill cells. The landfill liner completely covers all the areas within the perimeter berm.

- *Grading Layer.* The County will install the final grading layer in areas where solid waste operations have permanently ceased. In these areas, the grading layer provides

containment of waste and limits the release of landfill gas and the potential for excessive soil erosion, which could cause exposure and possibly a release of solid waste.

- *Closure Cap.* A closure cap as shown on in Figure 1 of this plan will be installed on top of the grading layer for waste enclosure.

2.3 Containment of Leachate

The design of HPP Landfill provides for containment of leachate throughout the landfill operation, closure, and post-closure care period and minimizes the possibility for release of leachate from the landfill to the environment. Design features that will provide for containment of leachate throughout the closure and post-closure period include: (i) the landfill liner and leachate collection system; (ii) the leachate removal and transmission system; (iii) leachate treatment procedures; and (iv) the final cover system. These features are described below.

- *Liner and Leachate Collection System.* The liner system and leachate collection system will provide containment of leachate throughout the post-closure care period. The existing liner system cross sections are illustrated in Appendix A of the Phase III Report. In addition to the liner system, all landfill cells have a leachate collection system above the liner. As described in the 1992 Phase III permit application by Oosterbaan in Appendix B, the leachate collection system is designed to route leachate from within the disposal areas to the leachate collection manhole at the perimeter of the landfill while maintaining a hydraulic head less than 12 inches on top of the liner.

- *Leachate Removal and Transmission System.* Leachate will drain by gravity from the disposal area to a leachate collection manhole located at the perimeter of the landfill. The leachate removal system, which relies on a series of gravity drains and pumps, will be operated throughout the post-closure period to remove leachate from the leachate collection manholes and transfer it to the on-site wastewater treatment plant.

- *Leachate Treatment System.* Throughout the post-closure period, leachate that is removed from the landfill will be treated on-site, where it will be treated to remove contaminants and then discharged in accordance with the facility discharge permit.

- *Final Cover System.* A final cover system will be constructed over all areas of the landfill that receive solid waste. The final cover system will reduce the amount of infiltration that enters the landfill, thereby minimizing the amount of leachate that is generated during the post-closure period. The final cover system will also prevent the release of leachate from the landfill sideslopes in leachate ‘break-outs’.

2.4 Landfill Gas

The types of waste disposed at HPP Landfill have little potential for the development of landfill gas. Therefore, no landfill gas system has been proposed for the landfill. If at some point during closure or post-closure, landfill gas issues develop, HPP Landfill will prepare a design for landfill gas venting and submit it to MDE for approval.

2.5 Long-Term Landfill Maintenance

The closure system has been designed to minimize maintenance throughout the post-closure period. Features of the design that minimize maintenance include:

- drainage terraces to limit the length of stormwater sheet flow off of the final cover slopes and thus limit erosion of the final cover soils;
- relatively flat drainage channels to route drainage off the final cover at low, non-erosive velocities;
- gravity drainage of leachate from the landfill to reduce the need for repair, replacement, or maintenance of leachate removal pumps; and
- durable, hearty grasses for the cover that limit stormwater runoff and thus minimize erosion of the topsoil and vegetative support soil layers.

3. DESCRIPTION OF FINAL CLOSURE SYSTEM COMPONENTS

3.1 Introduction

In this section, the final cover and stormwater management components of the closure system are described. The leachate management system, which will be operated during the post-closure period, is not considered a closure system component because it operates before final closure occurs.

3.2 Grading Layer and Final Cover Material

In preparation for construction of the closure cap, the final grading layer (2-ft thick, including intermediate and final cover soil) will provide smooth grades for construction of the closure cap, locally repair any damage caused by erosion of intermediate cover, and provide proper stormwater drainage for the closure cap. Soils that will be used for the final grading soil layer will be obtained either from stockpiled on-site soils or off-site borrow areas.

During final grading of the landfill final cover, some areas may require grading of waste or filling with additional waste in order provide smooth slopes, to allow construction of cover access roads, or to provide proper drainage of cover terraces. If such grading is required, HPP Landfill will excavate the waste, or place new waste following the procedures described in the Operation Plan and will identify areas of the disposal area to receive the waste. As described in the Operation Plan, all relocated or newly placed waste will be covered with 0.5 ft of daily cover soil before the end of the day that it is relocated and then covered with the required intermediate and final cover soil layers.

3.3 Closure Cap

The closure cap will consist of 2-ft of cover soil (1.5-ft thick final cover soil layer and a 6-in thick topsoil layer). A cross section of the closure cap is shown on Figure 1. At the time of final closure, final cover terrace drainage features will be constructed using the closure cover soils.

3.4 Stormwater Management System

At closure, the stormwater management system will be modified to meet the goals of post-closure care. During operation of the landfill, the system will have the duel purposes of: (i) managing stormwater; and (ii) minimizing erosion and off-site sedimentation. After closure, the primary purpose of the system will shift from erosion and sediment control (because all surfaces will be stabilized with vegetation) to stormwater management (i.e., conveyance of stormwater in a non-erosive manner to the adjacent water bodies). To modify the stormwater management system for long-term post-closure use, any sediment dewatering devices will be removed from the ponds, the sediment will be cleaned from the ponds, and all disturbed areas of the landfill will be stabilized with vegetation.

4. COST ESTIMATES

4.1 Introduction

In this section, cost estimates are presented for HPP Landfill final closure system construction and post-closure care.

4.2 Closure Construction Cost Estimate

Estimates of capital closure costs for the landfill final cover system (i.e., closure cover) are included in Table 1. The closure cost estimates include the construction of the final cover system for the landfill, removal of equipment, and modification of the stormwater pond to stormwater control. As shown on Table 1, the estimated cost in 2019 dollars is $ 1,296,120 for final closure.

4.3 Post-Closure Care Cost Estimate

An estimate of the post-closure cost for maintenance of the closure system for the landfill is presented in Table 2. The post-closure cost estimate includes the cost of:

- environmental quality monitoring (i.e., sampling and analysis of ground water, surface water);
- inspections of the final cover system, stormwater management system, leachate collection system, and perimeter road;
- leachate removal, storage and hauling; and
- maintenance of the above-referenced systems.

As shown on Table 2, the estimated cost of post-closure care in 2019 dollars is $405,091p. The estimate is based on a post-closure care period of 5 years as required by MDE Solid Waste permit.

5. POST-CLOSURE CARE

5.1 Regulatory Requirements

This plan addresses the requirements of COMAR 26.04.07.22. As required by COMAR 26.04.07.22 and 40 CFR Part 258.61, maintenance will be performed for the HPP Landfill. A description of the different maintenance procedures is presented below. An inspection schedule for post-closure maintenance is presented in Table 3. In addition, groundwater, stormwater, and leachate will be monitored as described in Section 5.4. In this section, operation, maintenance, and monitoring of the landfill throughout the post-closure care period are described.

5.2 Post-Closure Operation

During the post-closure care period, leachate will continue to be generated at the landfill. Accordingly, the leachate management system will be operated, maintained, and monitored routinely as described in the Operation Plan (i.e., Appendix D of the Phase III Report). Other features of the landfill will only be maintained and monitored. Operation of the leachate management system will be performed according to the procedures described in the Operation Plan until such time that leachate is either not produced or is produced in limited quantities or with limited concentrations such that it is not harmful to human health or the environment. At that time, HPP Landfill, LLC will, upon MDE's approval, cease operation of the leachate and landfill gas management systems.

5.3 Post-Closure Maintenance and Inspection

5.3.1 Access Control and Road System

Access will be controlled throughout the post-closure period by monitoring the perimeter security features (i.e., fences and lockable gates) and access roads. On-site access roads and perimeter roads of the closed landfill will be maintained in a passable condition during the post-closure period. These roads will be inspected semi-annually during environmental monitoring activities for conditions that would prevent passage of vehicles (such as ruts, ponded water, washouts, gullies, ice or other frozen precipitation, or obstacles). If needed, repairs will be made to keep the roads passable.

5.3.2 Vegetation

Vegetation will be maintained in a condition that will minimize erosion of soils on and off the landfill and will help screen the site from public view. During the post-closure period, maintenance will consist of inspections on a semi-annual basis during environmental monitoring events and after major storm events (i.e., 24-hour, 10-year storm return frequency, which is more than 5.1 inches in 24-hours) to identify locations of excessive erosion or washouts. If required, the identified areas will be regraded to repair damage to the final cover soils, including areas of

surface settlement or erosion and cracking of the cover soils, and/or revegetated as discussed below:

- *Surface Settlement.* If settlement is observed during routine inspections of the cover, then the need for maintenance or repairs of the settled areas will be evaluated. Repairs will be needed if water is noted to be ponding in the area, resulting in distress to the vegetation or erosion problems. Repairs will consist of either filling the depressions or, if the depressions are significant, excavating to the geomembrane, filling back to the grading layer grades beneath the geomembrane, and reconstructing the cover system over the area.
- *Erosion or Cracking of Cover.* If the cover soils are noted to be eroded or cracking, then such areas will be repaired by filling erosion features or cracks, seeding, and fertilizing the new soils to establish vegetation in the new soil.

During landscaping inspections, on-site slopes will be inspected for stability. The inspector will attempt to identify any signs of sloughing of the slope surface, bulging at the toes of slopes, tension cracks at the tops of slopes, and other conditions that may indicate slope instability. If areas of instability are identified, MDE will be notified and appropriate remedial measures will be implemented.

5.3.3 Stormwater Management System

The stormwater management system will be maintained to control run-on and runoff at the landfill. Run-on control will be provided by the perimeter berm, and the runoff will be prevented by the series of drainage terraces and channels in the final cover and around the perimeter of the landfill. The system will be maintained in a condition that allows continuous control of surface water at the site. During the post-closure period, all drainage channels, culverts, and stormwater basins will be inspected semi-annually during environmental monitoring events and after major storm events (i.e., 24-hour, 10-year or greater storm return frequency) for conditions that would restrict flow, such as washouts, excessive sediment build-up, or dislodged rip rap.

Washouts, excessive erosion, and gullies will be repaired by regrading the areas, revegetating, or applying rip-rap. Channels having excessive deposits of sediment (i.e., 8 in. in depth or greater) will be cleaned. Dislodged rip-rap will be replaced as necessary.

5.3.4 Leachate Removal and Transmission System

The components of the leachate removal and transmission system will be routinely inspected and maintained during the post-closure period to ensure that the system functions properly and that leachate is not released to the environment. Inspections of the leachate removal and transmission system (i.e., leachate pumps, manholes, and leachate transmission lines) will be performed semi-annually to check for malfunctioning pumps, broken lines, malfunctioning meters and valves,

and damaged leachate manholes. In addition, the electrical controls for the leachate transmission system will be checked to ensure that they are functioning properly.

Leachate will be sampled at the frequency and for the constituents required to maintain compliance with the on-site wastewater treatment permit. After an appropriate length of time during the post-closure period, if the chemical constituents in the leachate do not exceed the parameters concentrations identified in the permit for HPP Landfill, then the County will make a demonstration to MDE that the leachate collection system is no longer needed and will be taken out of service. However, the leachate collection system will be left in place in the event that these features are needed at a future date.

5.3.5 Environmental Monitoring System

All components of the environmental monitoring system (including groundwater monitoring wells and stormwater monitoring locations) will be inspected during each sampling event. The components will be inspected for damage and will be repaired or replaced, if necessary. Environmental monitoring is addressed in the Environmental Monitoring Plan (EMP) in Appendix K of the Phase III Report.

5.3.8 Miscellaneous Site Activities

Maintenance of other site features will be performed during the post-closure period on a routine basis, as described below.

- The site perimeter fence will be inspected semi-annually for breaks in the fence and to ensure that the gates are working properly. The fence and gates will be repaired as needed to provide continuous access control around the entire site.
- The administrative building will be inspected annually and maintained as necessary. Note that at the end of the post-closure period, the administrative building may be removed from the site.

In addition:

- standing water will not be allowed to accumulate on the landfill;
- open burning will not be performed on the landfill;
- no activity that has not been approved in advance by MDE will be performed at the landfill; and
- access to the landfill will be limited to only those persons who are engaged in approved post-closure activities.

5.4 Post-Closure Monitoring

5.4.1 Introduction

In this section, post-closure care activities are described, including groundwater, stormwater, and leachate monitoring. The sampling and analysis for environmental monitoring services will be performed by HPP Landfill, LLC or a retained contractor. In the following sections, brief descriptions are provided of the specific monitoring procedures that are required by COMAR or relevant permit conditions.

5.4.2 Groundwater Monitoring

Groundwater will be monitored throughout the post-closure care period, as specified in the permit and in the EMP (Appendix K of the Phase III Report). The site-specific groundwater monitoring requirements will be reviewed periodically during the post-closure period.

- All monitoring wells will be maintained and protected.
- Abandonment and replacement of monitoring wells due to construction activities will be performed in accordance with the provisions of COMAR 26.04.04.11.

5.4.3 Stormwater Monitoring

Surface water will be monitored to evaluate compliance with the requirements of the General NPDES Stormwater Discharge Permit for the site and with specific permit conditions.

5.4.5 Leachate Monitoring

Leachate will be monitored as required by COMAR 26.04.07.22. The specific post-closure leachate monitoring procedures are described below:

- The leachate monitoring system is designed to measure the rate and quantity of leachate flow and is designed to allow sampling of the leachate; such measurements and samples will be made during the post-closure care period.
- Leachate will be monitored at the frequency and analytical requirements as required to maintain compliance with the on-site wastewater treatment permit. Leachate monitoring will be performed throughout the post-closure period in accordance with the approved plan.
- Test methods used will conform to methods described in the most recent edition of the EPA Publication "Methods of Chemical Analysis for Water and Wastes" or of "Standard

Methods for Examination of Water and Wastewater" published by the American Water Works Association.

5.5 Post-Closure Use

The HPP Landfill site will be used in the future for idle grassed and forested land or for equipment and materials storage.

5.6 Duration of Post-Closure Care

In this section, the general requirements for post-closure care are defined, including specific post-closure care activities and the duration of the post-closure care period. The requirements of COMAR 26.04.07.22 and relevant permit conditions are anticipated to include the following:

- the duration of post-closure care will be 5 years after the completion of closure;
- the Department may remove required elements of the post-closure care plan if it determines that they are no longer needed to protect human health and the environment;
- at any time during the post-closure period, the Department may reduce the length of post-closure care if it determines that such care is not needed to protect human health and the environment;
- prior to the end of post-closure care, the Department may extend the post-closure care period if it determines that an extended period is necessary to protect human health and the environment; and
- the Department will require actions to mitigate threats to human health and the environment if evidence exists of a contaminant release that could significantly threaten human health or the environment.

Based on these requirements, a performance-based approach will be applied to the duration of post-closure care at HPP Landfill. In general, this will consist of implementing the following approach:

- First, the requirements of the Post-Closure Care Plan (i.e., as described in Sections 5.1 through 5.5 of this Plan) will be implemented beginning at the completion of closure.
- At any time after the first year of post-closure care, an evaluation will be made of the need to continue post-closure care for each of the four components of post-closure

care (i.e., leachate management, groundwater monitoring, and final cover system). The approach for evaluating the need for continued post-closure care is outlined in Table 4. Depending on the outcome of the evaluation, the post-closure care plan may be revised so that it better reflects the actual threat of the landfill to human health and the environment.

- If changes are made to the post-closure care plan as a result of the evaluation of the need for continued post-closure care, then a demonstration will be made to MDE that the changes are reasonable based on the available information and the evaluations. No changes in post-closure care will be made before MDE formally approves such changes to the Closure and Post-Closure Care Plan.

- Additional evaluations of the need for continued post-closure care may be performed when additional data exist that could result in a different outcome of the evaluation. This includes evaluation outcomes that could indicate the need for a longer post-closure period or additional elements of the post-closure plan.

5.7 Facility Contact

The HPP Landfill facility contact will be determined at the time of closure and provided to MDE.

TABLES

Geosyntec consultants

TABLE 1

CLOSURE COST ESTIMATE

Hawkins Point Plant Industrial Landfill
Baltimore, Maryland

Total Disposal Area: 23.0

Item	Quantity	Units	Unit Cost	Percent of Area	Cost Per Acre	Total Cost
Construction documents	1	each	$ 40,000.00	--	$ 1,739.13	$ 40,000.00
Performance and payment bonds	1	each	$ 25,000.00	--	$ 1,086.96	$ 25,000.00
Mobilization: Earthwork Contractor	1	each	$ 60,000.00	--	$ 2,608.70	$ 60,000.00
Erosion and sediment control	1	acre	$ 2,500.00	100%	$ 2,500.00	$ 57,500.00
Slope preparation	1	acre	$ 2,500.00	100%	$ 2,500.00	$ 57,500.00
Grading Layer (12 inches)	1613	cy	$ 5.00	100%	$ 8,066.67	$ 185,530.00
CQA/surveying - earthwork & soil cap	1	acre	$ 4,500.00	100%	$ 4,500.00	$ 103,500.00
Final cover soil (18 inches)	2420	cy	$ 5.00	100%	$ 12,100.00	$ 278,300.00
Topsoil (6 inches)	807	cy	$ 13.00	100%	$ 10,491.00	$ 241,290.00
Vegetation and seeding	1	acre	$ 2,500.00	100%	$ 2,500.00	$ 57,500.00
Drainage control structures	1	each	$ 75,000.00	--	$ 3,260.87	$ 75,000.00
Stormwater features (riprap, erosion mat, gabions, etc.)	1	acre	$ 5,000.00	100%	$ 5,000.00	$ 115,000.00
				Average Closure Cap Cost Per Acre:	**$ 56,353.32**	
				Total Estimated Closure Cost:		**$ 1,296,120**

NOTES: 1. Assumes on-site stockpiled soils are used.

TABLE 2

POST-CLOSURE CARE COST ESTIMATE

Hawkins Point Plant Industrial Landfill
Baltimore, Maryland

Current Year	**2019**
Post-Closure Care Period (years):	**5**
Total Area of Landfill	**23.0**

Item	Units	Unit Cost	Average Annual Quantity	Annual Cost
Final cover repair (equipment and labor)	hour	$ 150	80	$ 12,000
General labor and inspections	hour	$ 50	80	$ 4,000
Seeding and fertilizing cap	acre	$ 1,800	2	$ 3,600
Mowing	acre	$ 60	23	$ 1,380
Stormwater management maintenance	annual	$ 2,500	1	$ 2,500
Fencing and security repairs	annual	$ 500	1	$ 500
Road maintenance	annual	$ 1,500	1	$ 1,500
Utilities	monthly	$ 50	12	$ 600
Groundwater sampling and analytical	semi-annual	$ 900	10	$ 9,000
Surface water sampling and analytical	semi-annual	$ 750	2	$ 1,500
Groundwater analytical statistics and report	annual	$ 7,500	1	$ 7,500
Surface water report	annual	$ 5,000	1	$ 5,000
Total leachate collection area (acres)	23.0			
Initial generation rate (gallons per acre-day)	70			
Final generation rate (gallons per acre-day)	25			
Total leachate generated (gallons)	1,993,813			
Leachate disposal cost	gallons	$ 0.05	398,763	$ 19,938
Leachate sampling and analysis	semi-annual	$ 750	2	$ 1,500
Leachate system repairs	annual	$ 3,000	1	$ 3,000
MDE annual reporting	annual	$ 7,500	1	$ 7,500
			Gross Annual Cost:	**$81,018**
			Total Gross Post-Closure Care Cost:	**$405,091**

TABLE 3

POST-CLOSURE MAINTENANCE INSPECTION SCHEDULE

HPP Industrial Waste Landfill
Baltimore, Maryland

Item	Inspection Frequency
Access Roads	Semi-annually
Vegetation and Erosion	Semi-annually and after major storm events[1]
Stormwater Management System	Semi-annually and after major storm events[1]
Equipment	Semi-annually
Leachate Collection System	Semi-annually
Leachate Removal and Transmission System	Semi-annually
Environmental Monitoring Systems	Semi-annually (during monitoring events)
Security Fence and Signs	Semi-annually
Buildings	Yearly

Notes:

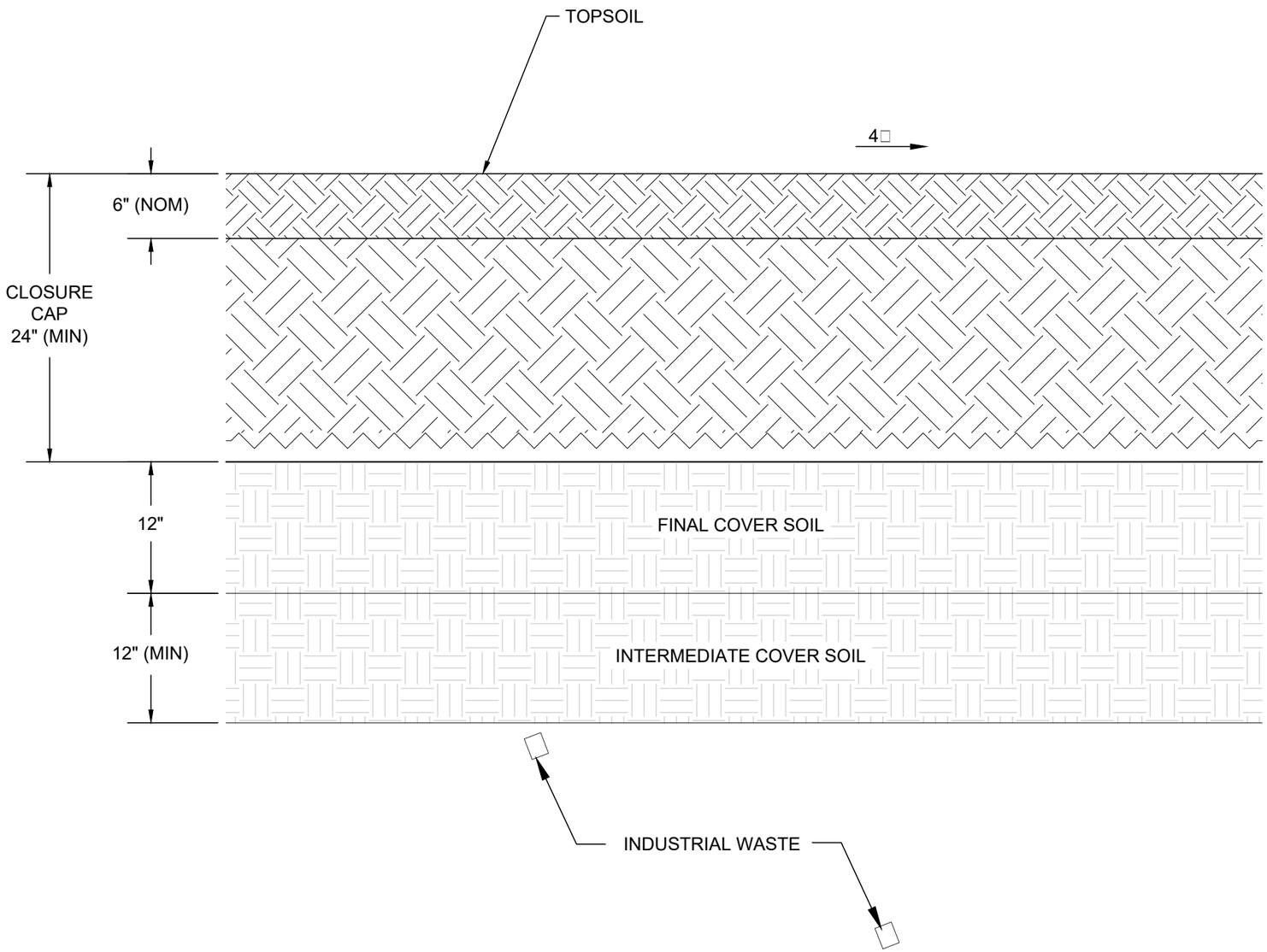
1. A "major storm event" is defined as a 24-hour, 2-year return frequency storm, which for Baltimore, MD is greater than 5.1 inches over a 24-hour period.

TABLE 4
APPROACH FOR EVALUATING NEED FOR CONTINUED POST-CLOSURE CARE

HPP Industrial Waste Landfill
Baltimore, Maryland

Component of Post-Closure Care (PCC)	Purpose of PCC Component	Criteria for Demonstrating that PCC of Component is no Longer Necessary	Demonstration Approach
Leachate Management System (LMS)	Contain and treat leachate to prevent adverse impacts of leachate to surface water and ground water.	No risk of impacts from uncontrolled releases of leachate. In addition, operation of LMS must not be necessary to maintain geotechnical stability.	Show that uncontrolled releases of leachate of current quality and quantity will not violate water quality standards in receiving surface-water or groundwater. Also, show that geotechnical stability is not affected.
Groundwater Monitoring System	Verify that there are no unacceptable impacts to groundwater from leachate migration from site.	Status of leachate is such that potential impacts to groundwater are acceptable (i.e., time required for impacts to have been detected has passed).	Confirm that ground-water monitoring has been performed at least as long as the time required for impacts for hypothetical leachate release to have been detected at compliance location.
Cover System	Control of one or more of the following: • Infiltration (i.e., generation of leachate); • Direct exposure to waste; and/or • Geotechnical stability.	Loss of, or changes to, cover integrity must not adversely affect any of the purposes listed. Long-term condition of cover must be compatible with end-use obligations for the site.	Evaluate effect of cover integrity on all other aspects of PCC and end-use. Ensure compatibility between cover maintenance program and requirements for cover from other PCC components.

FIGURE



FINAL CLOSURE CROSS-SECTION
HAWKINS POINT INDUSTRIAL LANDFILL

BALTIMORE, MD

Geosyntec consultants

FIGURE 1

PROJECT NO: MEM1653 | OCTOBER 2019

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APPENDIX G
Oosterbaan 1992 Permit Drawings

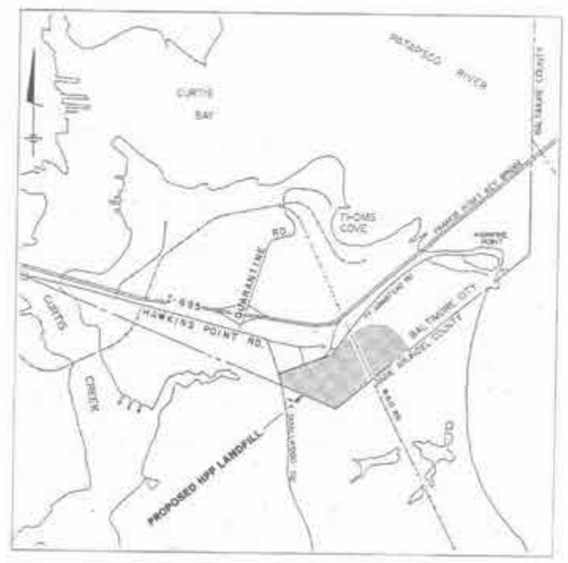
SCM CHEMICALS, INC
BALTIMORE, MARYLAND

HPP INDUSTRIAL WASTE LANDFILL

PHASE III - LANDFILL DESIGN DRAWINGS

LIST OF DRAWINGS

COVER SHEET
1. SITE PLAN – 30 Ac. Site
2. SITE PLAN – 65 Ac. Site
3. WETLANDS – 30 Ac. Site
4. WETLANDS – 65 Ac. Site
5. EXISTING WATERSHED – 30 Ac. Site
6. EXISTING WATERSHED – 65 Ac. Site
7. SCHEMATIC LANDFILL DEVELOPMENT PLAN – 30 Ac. Site
8. SCHEMATIC LANDFILL DEVELOPMENT PLAN – 65 Ac. Site
9. SCHEMATIC LANDFILL DEVELOPMENT SECTIONS
10. FINAL GRADING PLAN – 30 Ac. Site
11. FINAL GRADING PLAN – 65 Ac. Site
12. CROSS SECTION LOCATION PLAN – 30 Ac. Site
13. CROSS SECTION LOCATION PLAN – 65 Ac. Site
14. LANDFILL SECTIONS – 30 Ac. Site
15. LANDFILL SECTIONS – 65 Ac. Site
16. LANDFILL SECTIONS – 65 Ac. Site
17. LANDFILL EXCAVATION FLOOR GRADING PLAN – 30 Ac. Site
18. LANDFILL EXCAVATION FLOOR GRADING PLAN – 65 Ac. Site
19. CLAY LINER DETAILS, SECTIONS, & SPECIFICATIONS
20. LEACHATE COLLECTION SYSTEM PLAN – 30 Ac. Site
21. LEACHATE COLLECTION SYSTEM PLAN – 65 Ac. Site
22. LEACHATE COLLECTION SYSTEM DETAILS
23. STORMWATER MANAGEMENT PLAN – 30 Ac. Site
24. STORMWATER MANAGEMENT PLAN – 65 Ac. Site
25. STORMWATER MANAGEMENT PLAN – BASIN NO. 1 DETAILS
26. STORMWATER MANAGEMENT PLAN – BASIN NO. 2 DETAILS
27. STORMWATER MANAGEMENT PLAN – BASIN NO. 3 DETAILS
28. SEDIMENT AND EROSION CONTROL PLAN INITIAL DEVELOPMENT – 30 Ac. Site
29. SEDIMENT AND EROSION CONTROL PLAN INITIAL DEVELOPMENT – 65 Ac. Site
30. SEDIMENT AND EROSION CONTROL DETAILS
31. PHASE I – INTERIM GRADING PLAN
32. MONITORING WELL PLAN – 30 Ac. Site
33. MONITORING WELL PLAN – 65 Ac. Site
34. MONITORING WELL DETAILS & SCHEDULE
35. SITE FACILITY PLAN AND DETAILS
36. SITE UTILITY PLAN – SCHEMATIC



VICINITY MAP

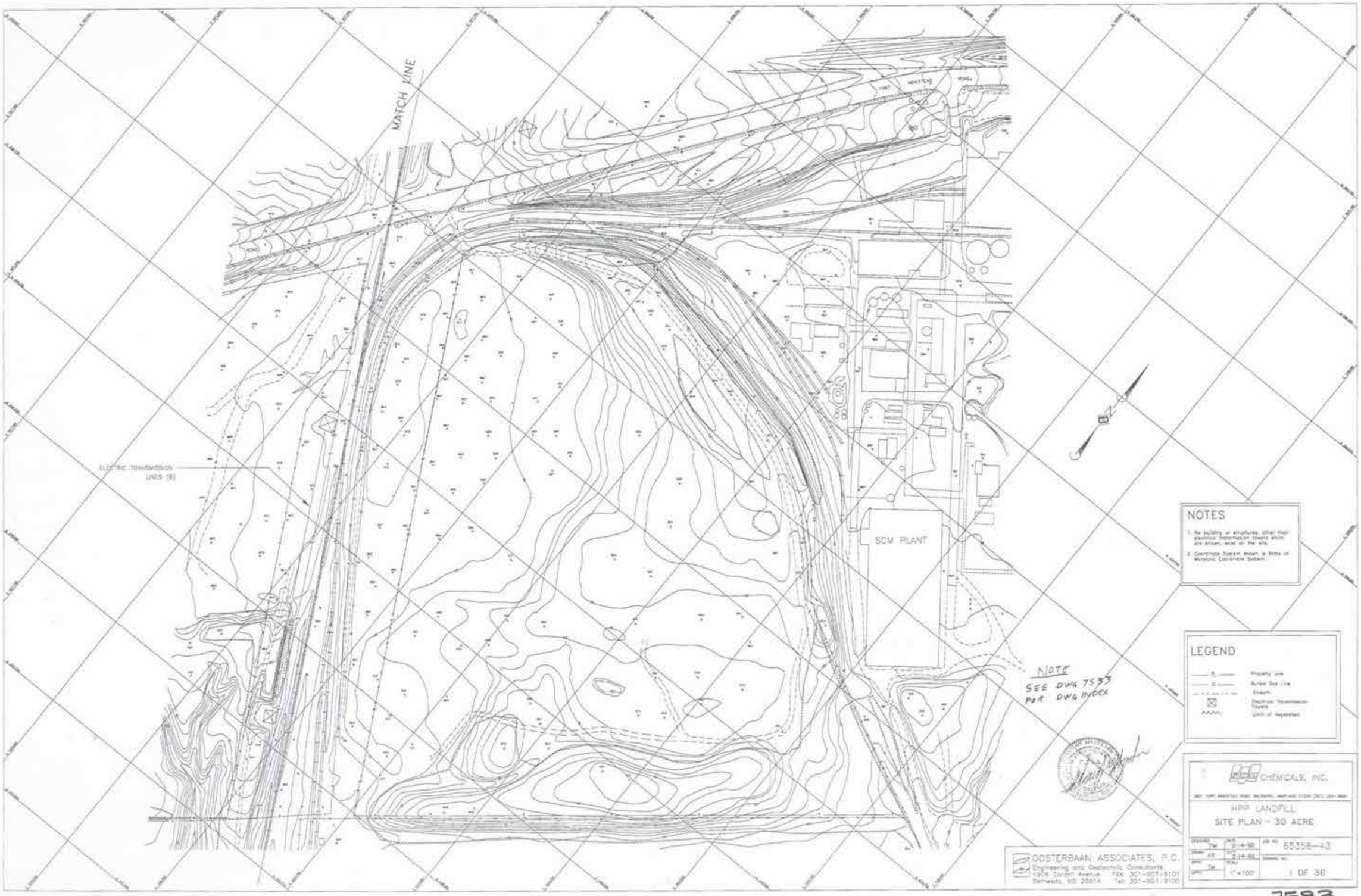
SCALE: 1" = 2000'

14 FEBRUARY 1992

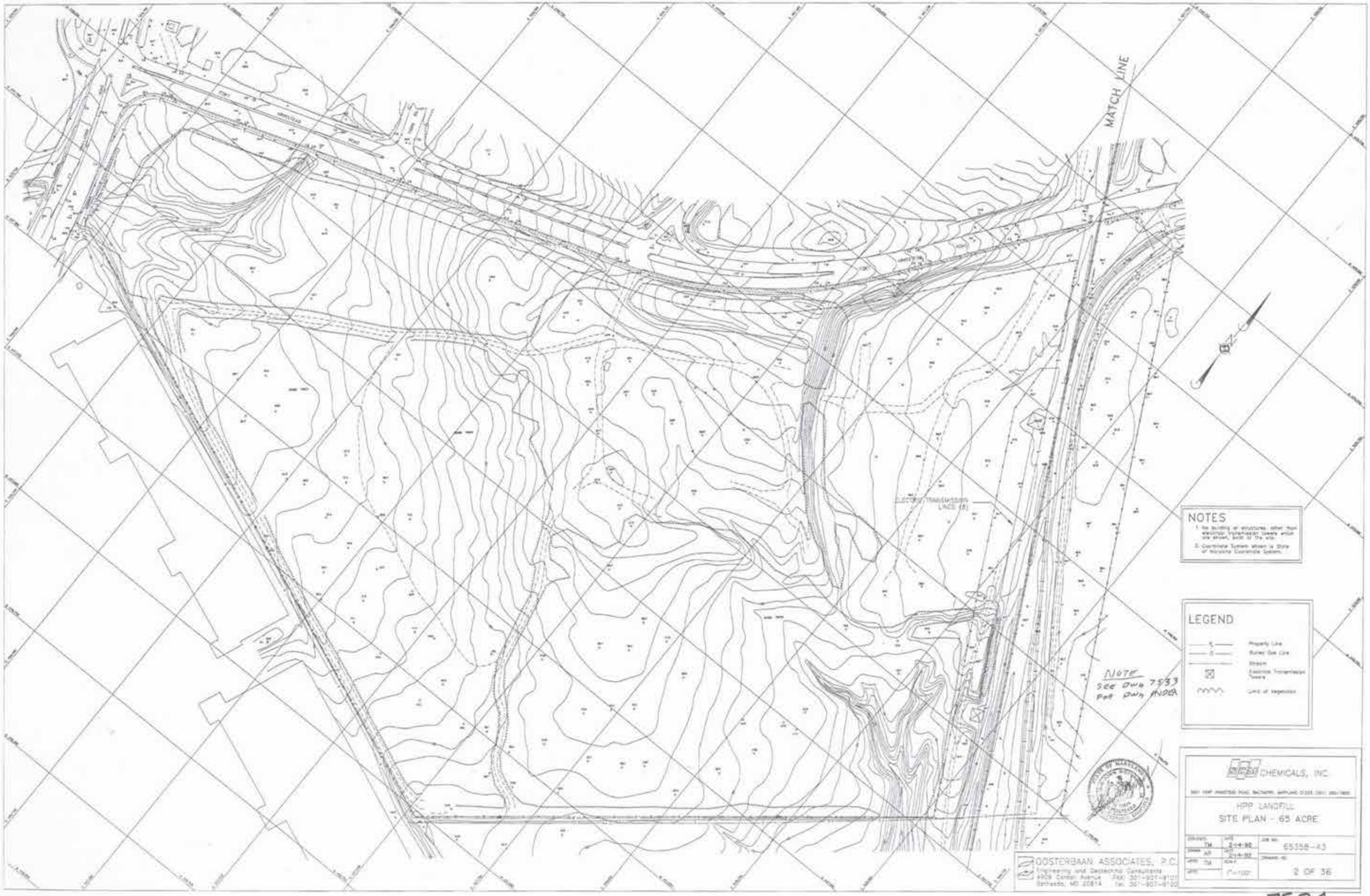
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4909 Cordell Avenue FAX: 301-907-9101
Bethesda, MD 20814 Tel: 301-907-9100

NOTE
SEE DWG 7533
FOR DWG INDEX

7582


MATCH LINE
ELECTRIC TRANSMISSION LINES (8)
SCM PLANT
NOTE
SEE DWG 7533
FOR DWG INDEX
NOTES
LEGEND
CHEMICALS, INC.
HPP LANDFILL
SITE PLAN - 30 ACRE
65358-43
1 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants

7583


MATCH LINE
ELECTRIC TRANSMISSION LINES (8)
NOTES
1. No building or structures, other than electrical transmission towers which are shown, exist at the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buried Gas Line
Stream
Electrical Transmission Towers
Limit of Vegetation
NOTE
SEE DWG 7533
FOR DWG INDEX
CHEMICALS, INC.
HPP LANDFILL
SITE PLAN - 65 ACRE
65358-A3
2 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants
4909 Cordell Avenue
Bethesda, MD 20814

7584

WETLAND LEGEND
PALUSTRINE FORESTED
PALUSTRINE EMERGENT
MATCH LINE
ACCESS ROAD
ELECTRIC TRANSMISSION LINES (8)
SCM PLANT
FILL AREA
ACCESS ROAD
NOTES
1. No building or structures, other than electrical transmission towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buried Gas Line
Stream
Electrical Transmission Towers
Limit of Vegetation
NOTE
SEE DWG 7533
FOR DWG INDEX
CHEMICALS, INC.
HPP LANDFILL
WETLANDS - 30 ACRE
TM
2-14-90
AR
2-14-90
TM
1"=100'
65358-43
3 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
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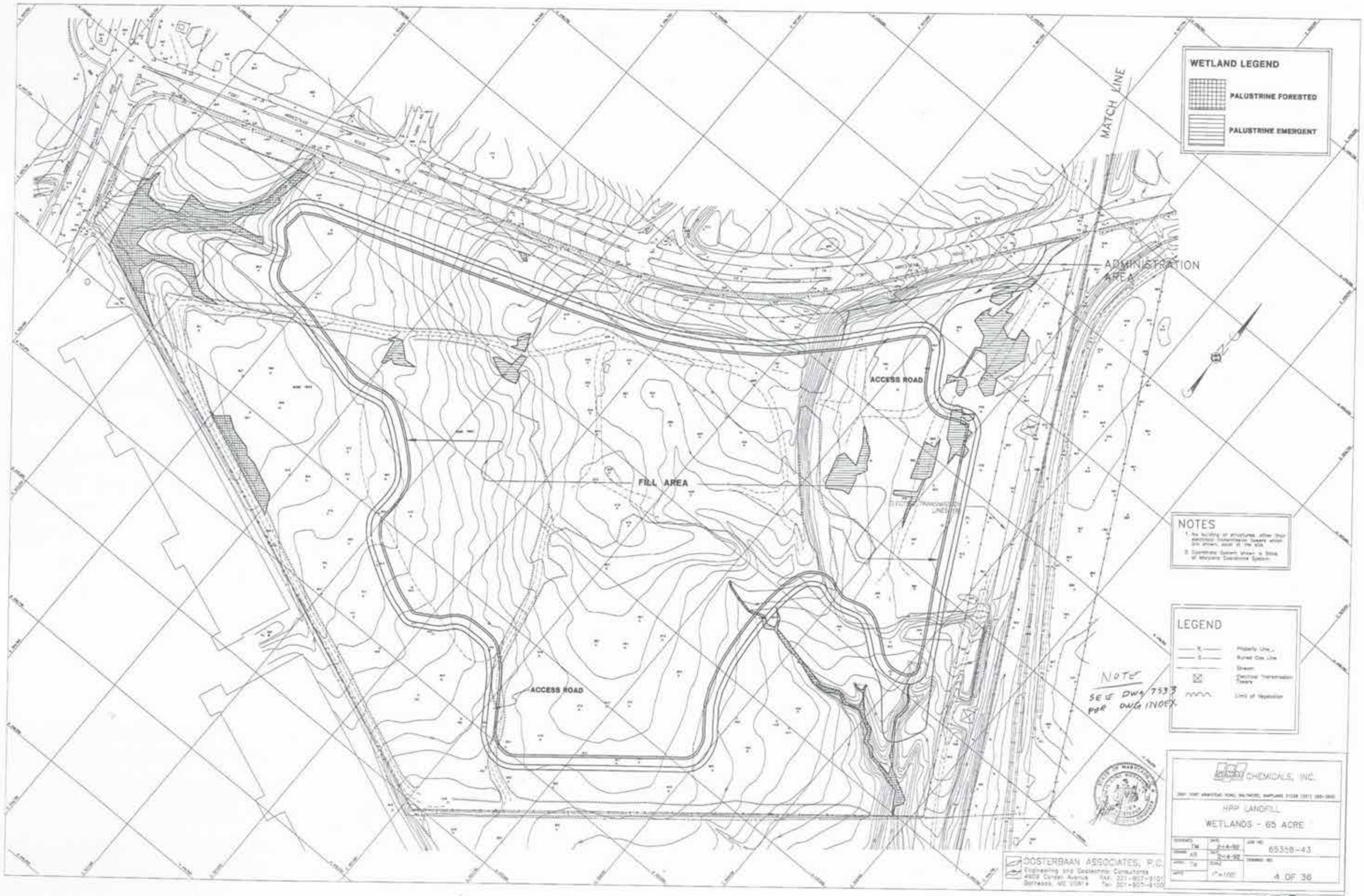
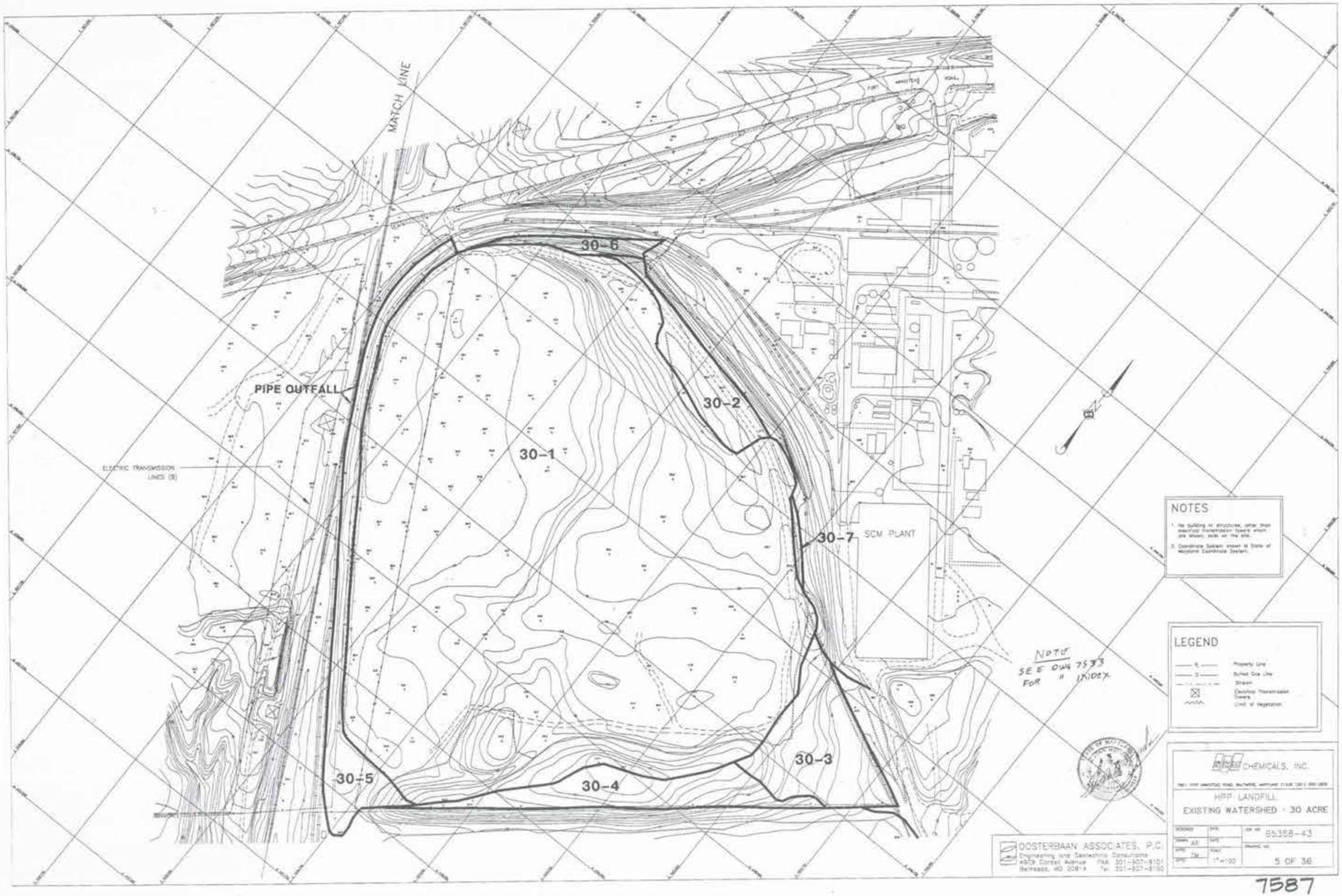
Bethesda, MD 20814

7585


WETLAND LEGEND
PALUSTRINE FORESTED
PALUSTRINE EMERGENT
MATCH LINE
ADMINISTRATION AREA
ACCESS ROAD
FILL AREA
ACCESS ROAD
NOTES
LEGEND
NOTE
SEE DWG 7533 FOR DWG INDEX
CHEMICALS, INC.
HPP LANDFILL
WETLANDS - 65 ACRE
65358-43
4 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants

7586


MATCH LINE
30-6
30-2
30-1
30-7
30-3
30-4
30-5
PIPE OUTFALL
ELECTRIC TRANSMISSION LINES (3)
SCM PLANT
NOTE
SEE DWG 7533 FOR " INDEX
NOTES
LEGEND
Property Line
Buried Gas Line
Stream
Electric Transmission Towers
Limit of Vegetation
CHEMICALS, INC.
HRP LANDFILL
EXISTING WATERSHED - 30 ACRE
85358-43
5 OF 36
1"=100
DOSTERBAAN ASSOCIATES, P.C.
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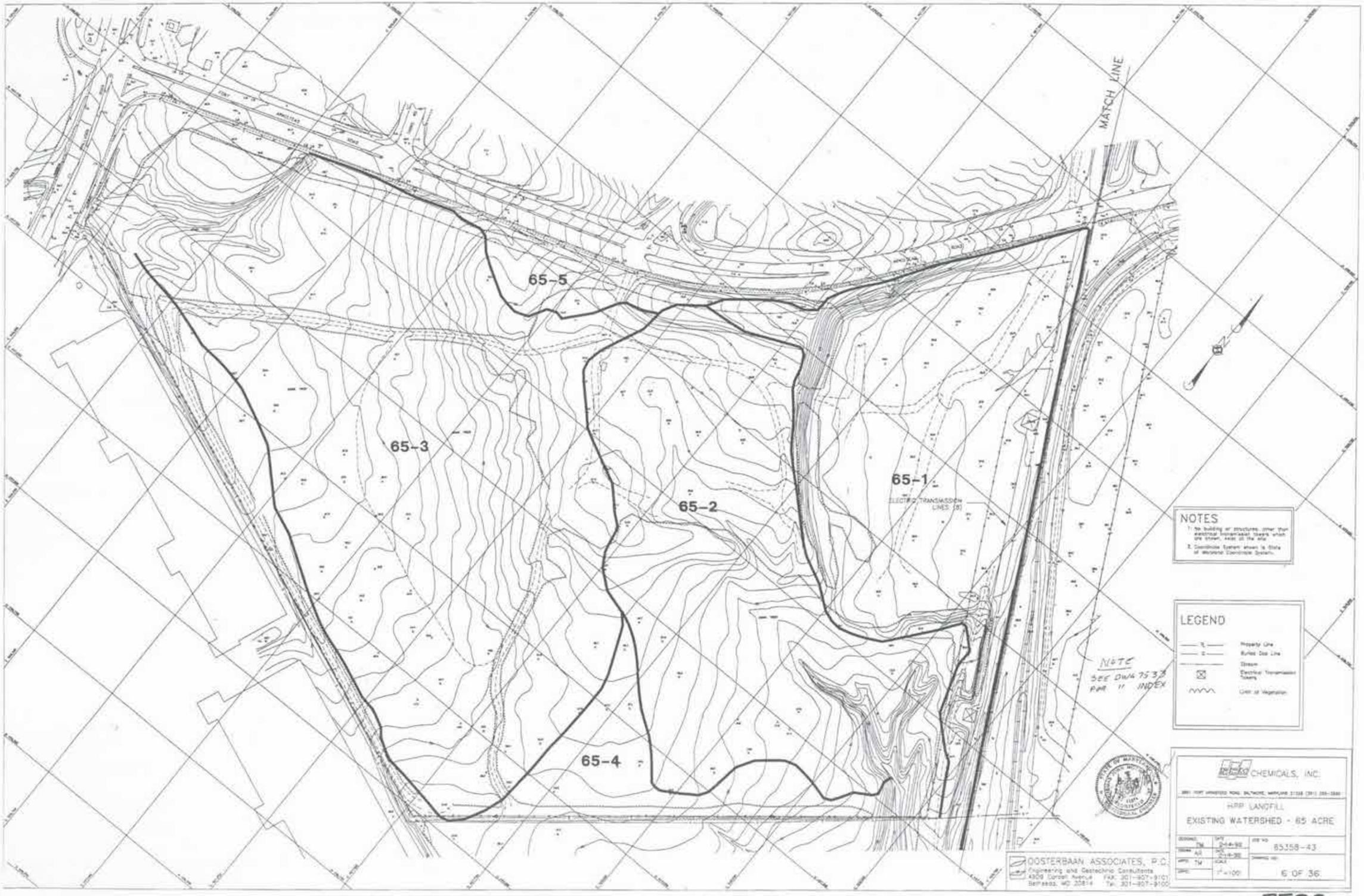
7587


MATCH LINE
65-5
65-3
65-2
65-1
65-4
ELECTRIC TRANSMISSION LINES (8)
NOTES
1. No building or structures, other than electrical transmission towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buffer Zone Line
Stream
Electrical Transmission Towers
Limit of Vegetation
NOTE
SEE DWG 7533 FOR " INDEX
CHEMICALS, INC.
HPP LANDFILL
EXISTING WATERSHED - 65 ACRE
85358-43
6 OF 36
OOSTERBAAN ASSOCIATES, P.C.
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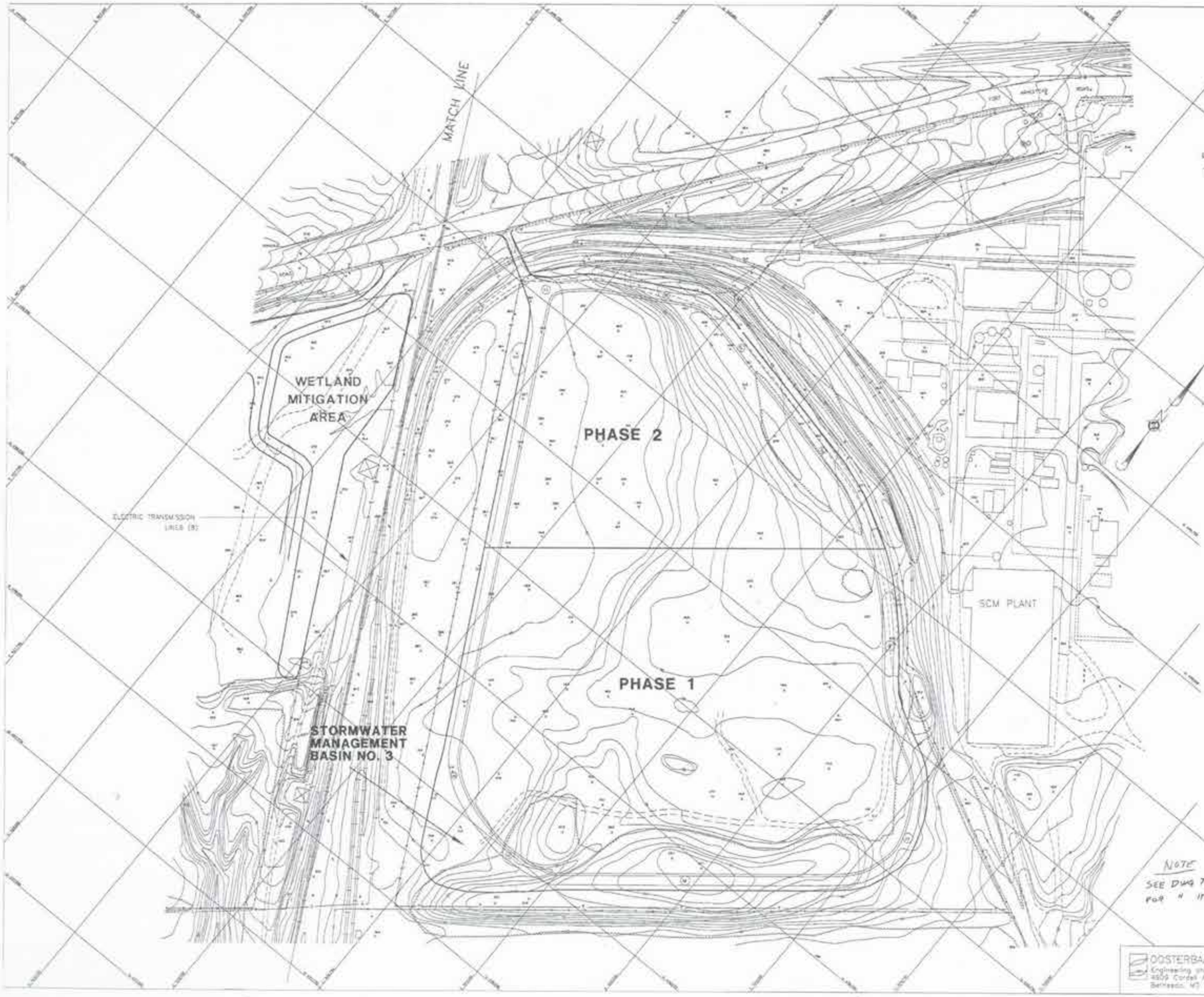
7588



BURNING OF SOLID WASTE IS NOT ALLOWED, EXCEPT AS PERMITTED BY THE MARYLAND DEPARTMENT OF THE ENVIRONMENT (MDE).

LANDFILL DEVELOPMENT SEQUENCE

The HPP Landfill is to be developed in Five (5) Phases as follows:

A. Phase I: Phase I will consist of Initial Site Development for commencement of landfill operation on the 30 Acre Site:

1. Construct Stabilized Construction Entrance on 30 Acre and 65 Acre Site (Drawing Nos. 29 and 30).
2. Place Sediment and Erosion Control Perimeter Devices on the 30 Acre Site and the Stockpile Area of the 65 Acre Site.
3. Construct Perimeter Access Road and Stormwater Conveyance Channels on 30 Acre Site (Drawing No. 28).
4. Construct Stormwater Management Basin No. 3 (Drawing No. 27).
5. Construct Perimeter Access Road and Stormwater Conveyance Channels on 65 Acre Site (Drawing No. 29).
6. Construct Stormwater Management Basin No. 2 (Drawing No. 26).
7. Clear and grub 30 Acre Site, Phase I Area (Drawing No. 28).
8. Clear and grub 65 Acre Site, Stockpile Area (Drawing 29).
9. Excavate 30 Acre Site Phase I Area to grades shown on Drawing No. 28.
10. Transport excavated soil to stockpile area on 65 Acre Site. Grade and stabilize stockpile as shown on Drawing No. 29. Stockpile material will be periodically removed in accordance with demand for natural fill soil. As the number for natural fill soil develops over the next 10 years, the need for a stockpile area will increase.
11. Provide clay liner on perimeter slope as excavation proceeds and on excavation floor in accordance with Drawing No. 19.
12. Install Leachate Collection System (Drawing Nos. 19, 20 and 22).
13. During Phase I, Wetland Mitigation Area on 65 Acre Site will be constructed.
14. Commence placing landfill materials in accordance with Operation Plan and Drawing Nos. 7,8, and 11.

B. Phase II: As Phase I nears fill capacity (3 or more years after start of filling), Phase II will be constructed on the 30 Acre Site:

1. Clear and grub Phase II Area.
2. Excavate Phase II area to grades shown Drawing No. 17.
3. Transport excavated soil to stockpile area on 65 Acre Site. Grade and stabilize stockpile as shown Drawing No. 29.
4. Provide clay liner on perimeter slopes as excavation proceeds and on excavation floor in accordance with Drawing No. 18.
5. Extend Leachate Collection System, Drawing No. 20.
6. Place landfill materials in Phase II area in accordance with HPP Landfill Operations Plan and Drawing Nos. 7,8, and 10.

C. Phase III: As Phase II nears fill capacity (13 or more years from start of landfill operations), Phase III will be constructed on the 65 Acre Site:

1. Clear and grub Phase III Area as shown on Drawing No. 7.
2. Excavate Phase III area to grades shown on Drawing No. 18.
3. Transport excavated soil to off-site location.
4. Provide clay liner on perimeter slopes as excavation proceeds and on excavation floor in accordance with Drawing No. 19.
5. Install Leachate Collection System, Drawing Nos. 21 and 22.
6. Place landfill materials in Phase III area in accordance with HPP Landfill Operations Plan and Drawing Nos. 8, 9 and 11.

D. Phase IV: As Phase III nears fill capacity Phase IV will be constructed on the 65 Acre Site:

1. Clear and grub Phase IV Area as shown on Drawing No. 6.
2. Excavate Phase IV area to grades shown on Drawing No. 18.
3. Transport excavated soil to off-site location.
4. Provide clay liner on perimeter slopes as excavation proceeds and on excavation floor in accordance with Drawing No. 19.
5. Extend Leachate Collection System, Drawing No. 21.
6. Place landfill materials in Phase IV area in accordance with HPP Landfill Operations Plan and Drawing Nos. 6, 9 and 11.

E. Phase V: As Phase IV nears fill capacity, Phase V will be constructed on the 65 Acre Site:

1. Place sediment and erosion control perimeter devices.
2. Construct remainder of perimeter access road and stormwater conveyance channels; Drawing No. 11.
3. Construct stormwater management Basin No. 1, Drawing No. 25.
4. Clear and grub Phase V area as shown on Drawing No. 6.
5. Excavate Phase V area to grades shown on Drawing No. 18.
6. Transport excavated soil to off-site location.
7. provide clay liner on perimeter slopes as excavation proceeds and on excavation floor in accordance with Drawing No. 19.
8. Extend leachate collection system, Drawing No. 21.
9. Place landfill materials in Phase V area in accordance with HPP Landfill operations plan and Drawing Nos. 6, 9 and 11.

NOTE
SEE DWG 7535
FOR " INDEX

CHEMICALS, INC.

HPP LANDFILL
SCHEMATIC LANDFILL DEVELOPMENT PLAN
30 ACRE SITE

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43	
DRAWN AJD	DATE 2-14-92		
APPD TM	SCALE 1"=100'	DRAWING NO. 7 OF 36	

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Engineering and Geotechnic Consultants
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Bethesda, MD 20814 Tel. 301-907-9100

7589

BURNING OF SOLID WASTE IS NOT ALLOWED, EXCEPT AS PERMITTED BY THE MARYLAND DEPARTMENT OF THE ENVIRONMENT (MDE).

MATCH LINE

WETLAND MITIGATION AREA

STORMWATER MANAGEMENT BASIN NO. 1

PHASE 5

PHASE 3

PHASE 4

STORMWATER MANAGEMENT BASIN NO. 2

OPERATIONS TRAILER

ELECTRIC TRANSMISSION LINES

NOTE
SEE DWG 7533 FOR INDEX

LANDFILL DEVELOPMENT SEQUENCE

The HPP Landfill is to be developed in Five (5) Phases as follows:

A. Phase I: Phase I will consist of Initial Site Development for commencement of landfill operations on the 30 Acre Site:

1. Suspension Sediment Construction Entrance on 30 Acre and 65 Acre Site (Drawing No. 18 and 20).
2. Place Temporary and Erosion Control Perimeter Fencing on the 30 Acre Site and the Temporary Area on the 65 Acre Site.
3. Construct Perimeter Access Road and Stormwater Conveyance Channels on 30 Acre Site (Drawing No. 20).
4. Construct Stormwater Management Basin No. 1 (Drawing No. 20).
5. Construct Perimeter Access Road and Stormwater Conveyance Channels on 65 Acre Site (Drawing No. 20).
6. Construct Stormwater Management Basin No. 2 (Drawing No. 20).
7. Clear and grub 30 Acre Site, Phase I area (Drawing No. 20).
8. Clear and grub 65 Acre Site, Temporary Area (Drawing No. 20).
9. Excavate 30 Acre Site Phase I area to grades shown on Drawing No. 20.
10. Transport excavated soil to stockpile area on 65 Acre Site. Grade and stabilize stockpile as shown on Drawing No. 20. Stockpile materials with an erosionally resistant in accordance with detailed for erosion fill cut. As the stockpile for topsoil fill and developed over two year 10 years, the need for a separate area will commence.
11. Provide dust from on environment during all construction activities and on temporary from in accordance with Drawing No. 20.
12. Install Leachate Collection System (Drawing Nos. 19, 20 and 22).
13. During Phase I, Wetland Mitigation Area on 65 Acre Site will be commenced.
14. Commence taking landfill materials in accordance with Operations Plan and Drawing Nos. 12, and 21.

B. Phase II: At Phase I open 30 acres (1 or more years after start of Site), Phase II will be commenced on the 30 Acre Site:

1. Clear and grub Phase II area.
2. Excavate Phase II area to grades shown Drawing No. 11.
3. Transport excavated soil to stockpile area on 65 Acre Site. Grade and stabilize stockpile as shown Drawing No. 20.
4. Provide dust from on permanent basis as necessary provide and on temporary from in accordance with Drawing No. 19.
5. Extend Leachate Collection System, Drawing No. 22.
6. Place landfill materials in Phase II area in accordance with HPP Landfill Operations Plan and Drawing Nos. 12, and 21.

C. Phase III: As Phase II open 30 acres (1 or more years from start of landfill operations), Phase III will be commenced on the 30 Acre Site:

1. Clear and grub Phase III Area as shown on Drawing No. 11.
2. Excavate Phase III area to grades shown on Drawing No. 11.
3. Transport excavated soil to stockpile area.
4. Provide dust from on permanent basis as necessary provide and on temporary from in accordance with Drawing No. 19.
5. Extend Leachate Collection System, Drawing No. 22.
6. Place landfill materials in Phase III area in accordance with HPP Landfill Operations Plan and Drawing Nos. 5, 9 and 11.

D. Phase IV: As Phase III open 30 acres Phase IV will be commenced on the 65 Acre Site:

1. Clear and grub Phase IV Area as shown on Drawing No. 5.
2. Excavate Phase IV area to grades shown on Drawing No. 19.
3. Transport excavated soil to off site stockpile.
4. Provide dust from on permanent basis as necessary provide and on temporary from in accordance with Drawing No. 19.
5. Extend Leachate Collection System, Drawing No. 22.
6. Place landfill materials in Phase IV area in accordance with HPP Landfill Operations Plan and Drawing Nos. 5, 9 and 11.

E. Phase V: As Phase IV open 30 acres Phase V will be commenced on the 65 Acre Site:

1. Place wildlife and impact mitigation measures.
2. Construct revegetate or permanent access road and stormwater management structure, Drawing No. 11.
3. Construct stormwater management Basin No. 3, Drawing No. 20.
4. Clear and grub Phase V area as shown on Drawing No. 5.
5. Excavate Phase V area to grades shown on Drawing No. 19.
6. Transport excavated soil of off site stockpile.
7. Provide dust from on permanent basis as necessary provide and on temporary from in accordance with Drawing No. 19.
8. Extend leachate collection system, Drawing No. 22.
9. Place landfill materials in Phase V area in accordance with HPP Landfill Operations Plan and Drawing Nos. 5, 9 and 11.

BCC CHEMICALS, INC.

HPIP LANDFILL
SCHEMATIC LANDFILL DEVELOPMENT PLAN
65 ACRE SITE

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43	
DRAWN JLF	DATE 2-14-92		
APVD. TM	SCALE 1"=100'	DRAWING NO. 8 OF 36	
APVD.			

OOSTERBAAN ASSOCIATES, P.C.
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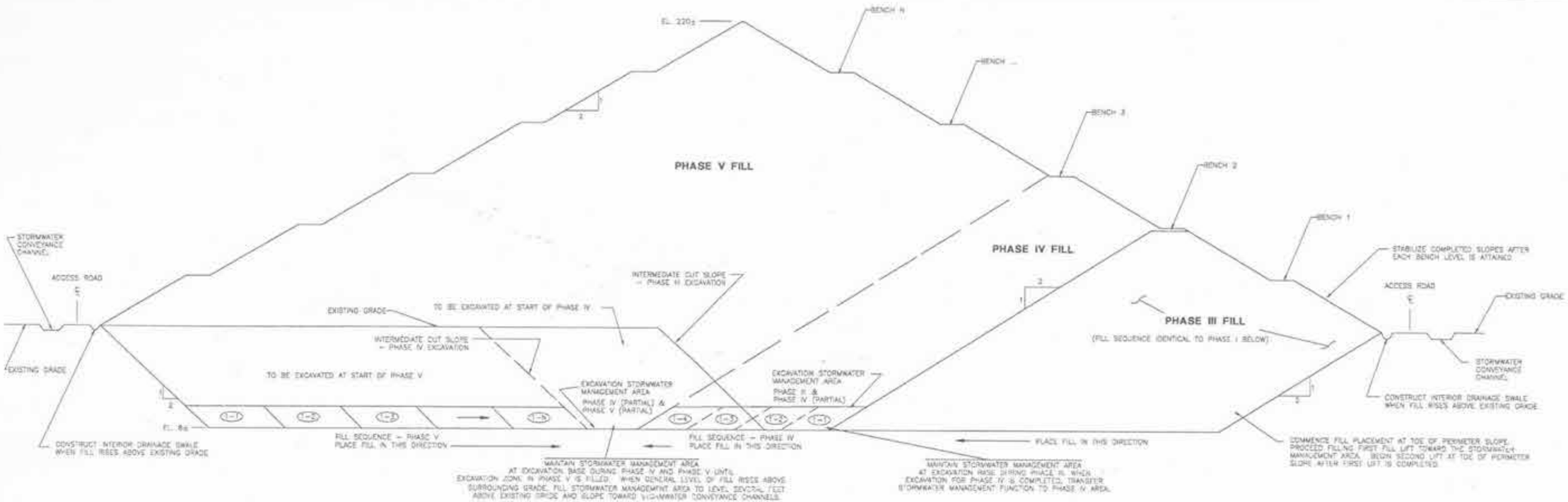
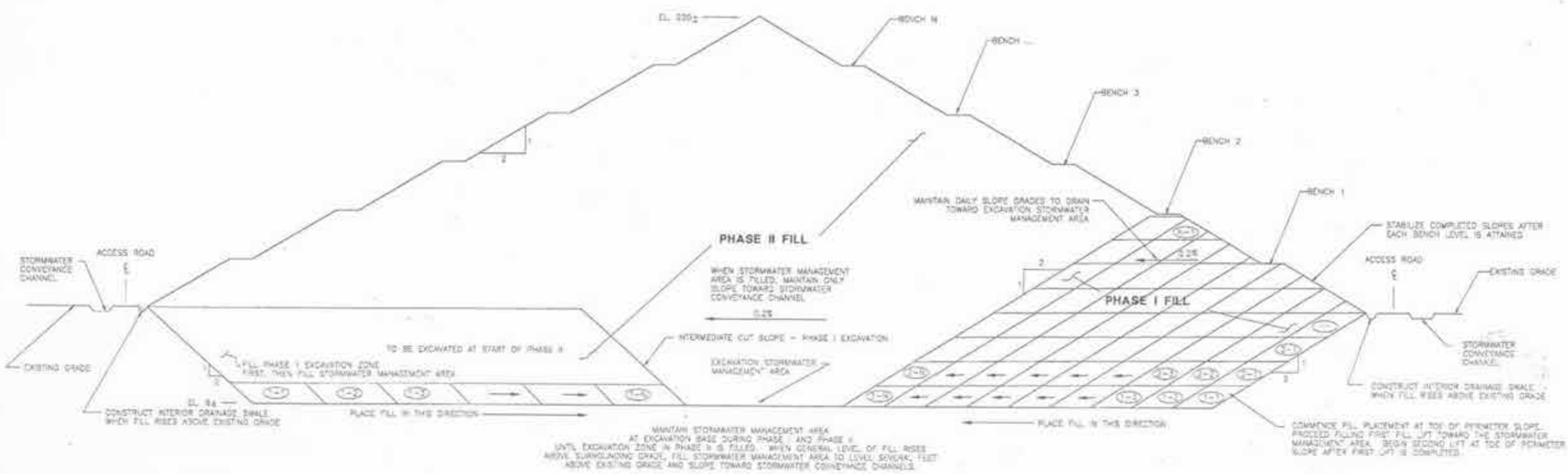
4909 Garrison Avenue FAX: 301-907-9101
Baltimore, MD 21214 Tel: 301-907-9100

7590



65 ACRE LANDFILL DEVELOPMENT SCHEMATIC SECTION

(NOT TO SCALE)



30 ACRE LANDFILL DEVELOPMENT SCHEMATIC SECTION

(NOT TO SCALE)

NOTE
SEE DWG 7533
FOR " INDEX

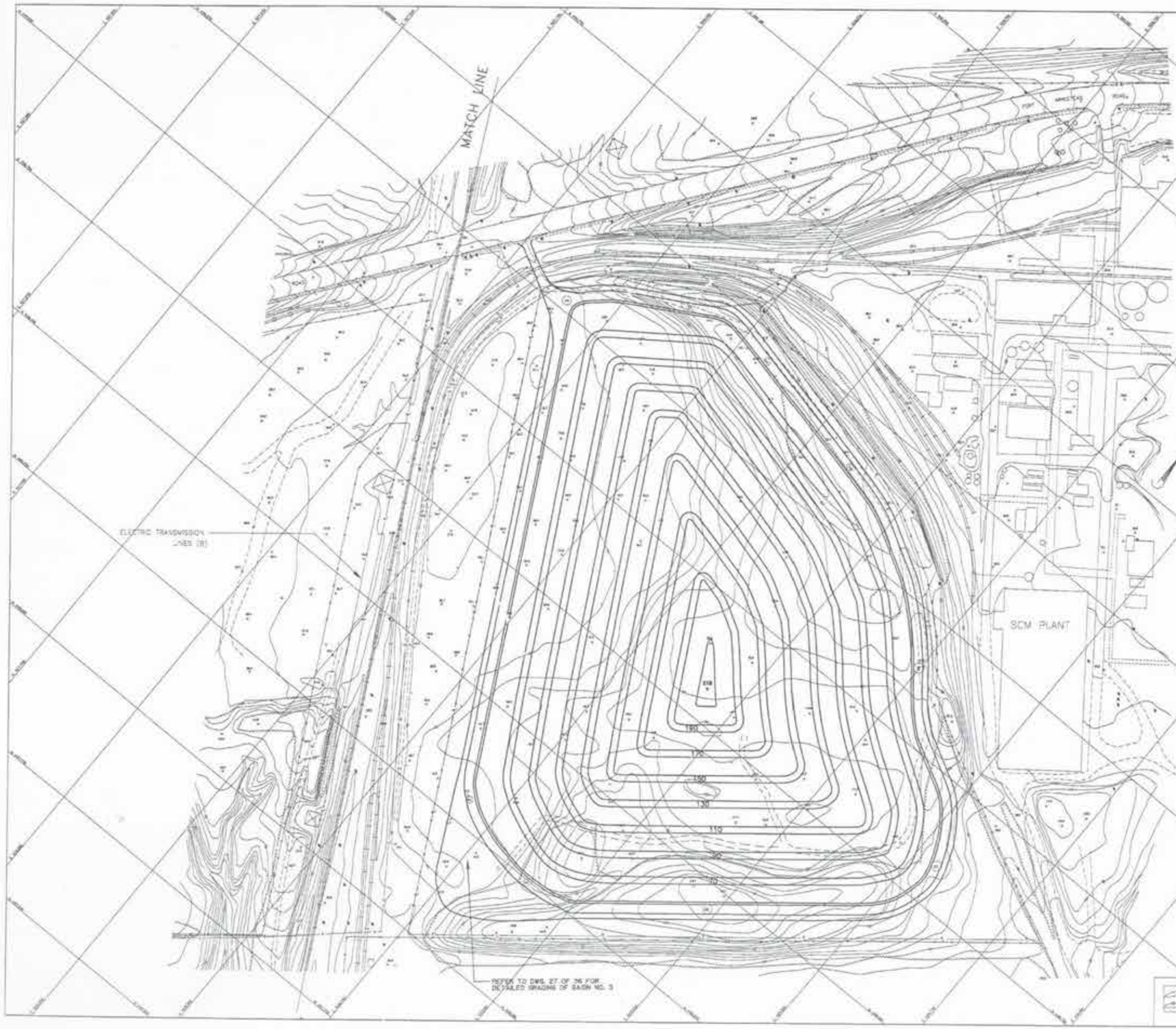
CHEMICALS, INC.

HPP LANDFILL
SCHEMATIC LANDFILL
DEVELOPMENT SECTIONS

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43
DRAWN JB	DATE 2-14-92	
APPD TM	SCALE AS SHOWN	DRAWING NO. 9 OF 38

DOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4908 Golden Avenue FAX: 301-907-9101
Bethesda, MD 20814 Tel: 301-907-9100

7591



SEDIMENT & EROSION CONTROL NOTES

1. The Owner and Contractor will comply with all requirements of Sediment and Erosion Control as set forth in the Baltimore City Sediment Control manual.
2. All utilities to be constructed first.
3. All excavated material shall be placed on the high side whenever possible and confined to an area where it will not obstruct the normal flow of drainage courses.
4. Continuous inspection and maintenance of all Sediment Control devices will be required.
5. During the layout of sediment control devices, field adjustments may be made as required to accommodate field conditions.
6. All erosion and sediment controls shown on the plans have been designed and are in total accordance with the "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas", approved by the State of Maryland, Department of Water Resources, an agency of the Department of Natural Resources.
7. All sediment control devices shall remain in operation until the area of disturbance is fully stabilized.
8. Silt fences will be erected to prevent sediment migration from disturbed areas. In the event that the season is inopportune for planting, the silt fences will remain until an adequate stand of grass is established.
9. All sediment controls and critical slopes must be stabilized within seven calendar days. All other disturbed areas on the project site must be stabilized within fourteen calendar days.
10. No pumping from foundation excavations will be allowed directly into City systems unless it is filtered by way of Sediment Traps or Filter.
11. Plantings of appropriate species of trees may be included as part of the site stabilization.
12. Permanent Seeding - All disturbed areas shall be stabilized as follows:

Seedbed Preparation - Loosen upper 3 inches of soil by raking, dising or other acceptable means before seeding.

Soil Amendments - Lime and fertilize according to soil test. In lieu of soil test, apply 2,000 lbs. of ground dolomitic lime stone per acre and 600 lbs. per acre 0-20-20 fertilizer (14 lb/1,000 sq. ft.). Harrow or rice lime and fertilizer into upper three inches of soil. At time of seeding, apply 400 lbs. per acre (9.2 lbs./1,000 sq. ft.) of 10-0-0 sensitive fertilizer and 500 lbs per acre (11.5 lbs./1,000 sq. ft.) of 10-20-20 fertilizer.

Seeding - For the periods March 1 through April 30 and August 1 through October 15, seed with 60 lbs per acre (1.4 lbs./1,000 sq. ft.) of Kentucky 31 Tall Fescue. For the period May 1 through July 31, seed with 60 lbs Kentucky 31 Tall Fescue per acre with 2 lbs. per acre (.05 lbs./1,000 sq. ft.) of weeping lovegrass. During the period of October 16 through February 28, provide site by: Option (1) - 2 tons per acre of well anchored straw mulch and seed as soon as possible in the spring. Option (2) - see text. Option (3) - seed with 60 lbs per acre Kentucky 31 Tall Fescue and mulch with 2 tons per acre well anchored straw.

Mulching - Apply 1 - 1½ to 2 tons per acre (70 to 90 lbs./1,000 sq. ft.) of unrotted small grain straw immediately after seeding. Anchor mulch immediately after application using 200 gallons per acre (5 gallons/1,000 sq. ft.) of emulsified asphalt on flat areas. On slopes 8 feet or higher, use 348 gallons per acre (8 gallons/1,000 sq. ft.) for anchoring.

NOTES

1. No building or structures, other than electrical transmission towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.

LEGEND

—— ℄ ——	Property Line
—— ⊠ ——	Buried Site Line
- - - - -	Stream
⊠	Electrical Transmission Towers
∿∿∿	Limit of Vegetation

NOTE
SEE DWG 7533
FOR " INDEX

CHEMICALS, INC.

HPP LANDFILL
FINAL GRADING PLAN
30 ACRE SITE

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43	
DRAWN AR	DATE 2-14-92		
APPD.	SCALE 1"=100'	DRAWING NO. 10 OF 36	

OOSTERBAAN ASSOCIATES, P.C.
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4808 Cordell Avenue Fax: 301-907-9101
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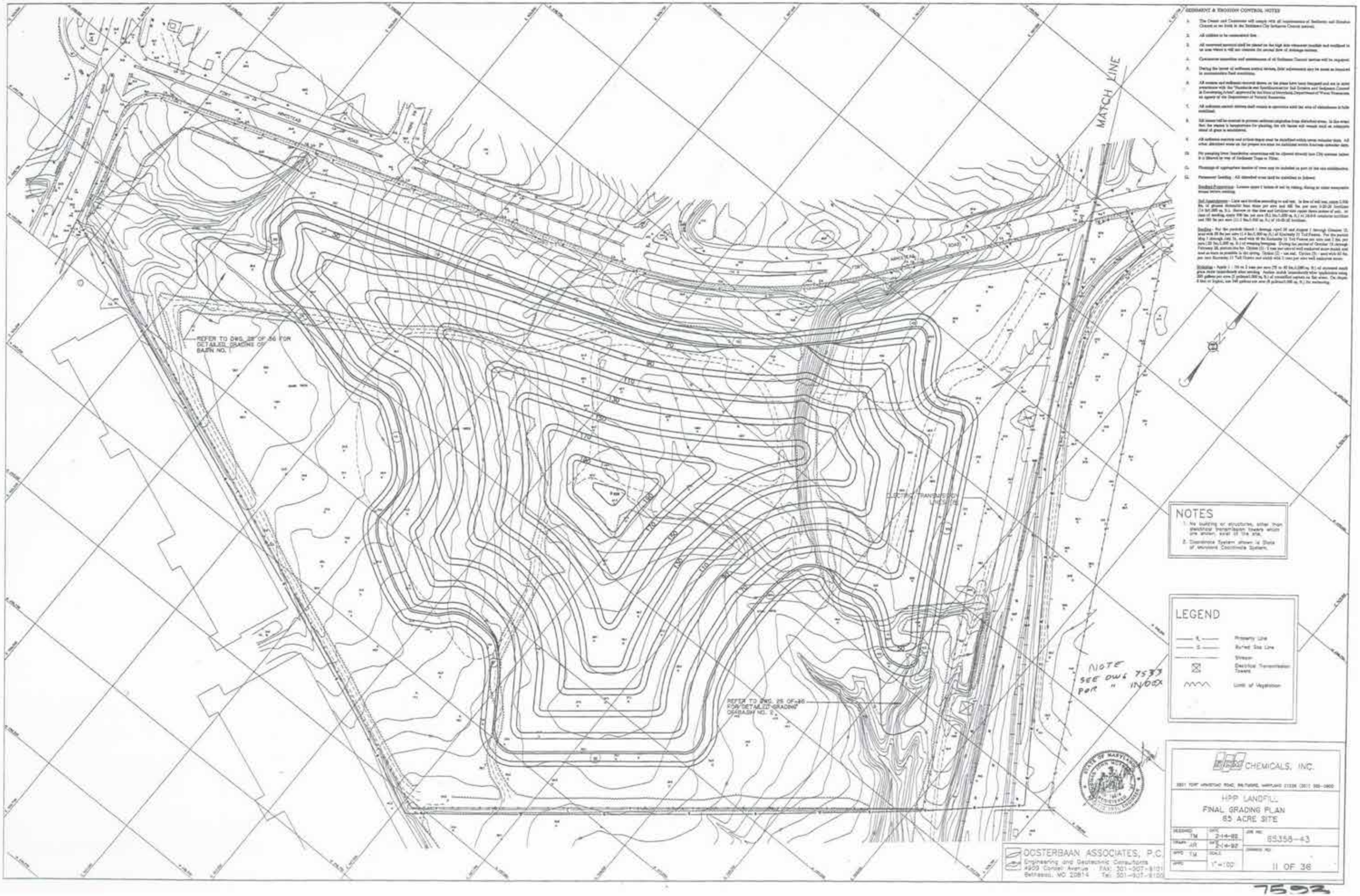
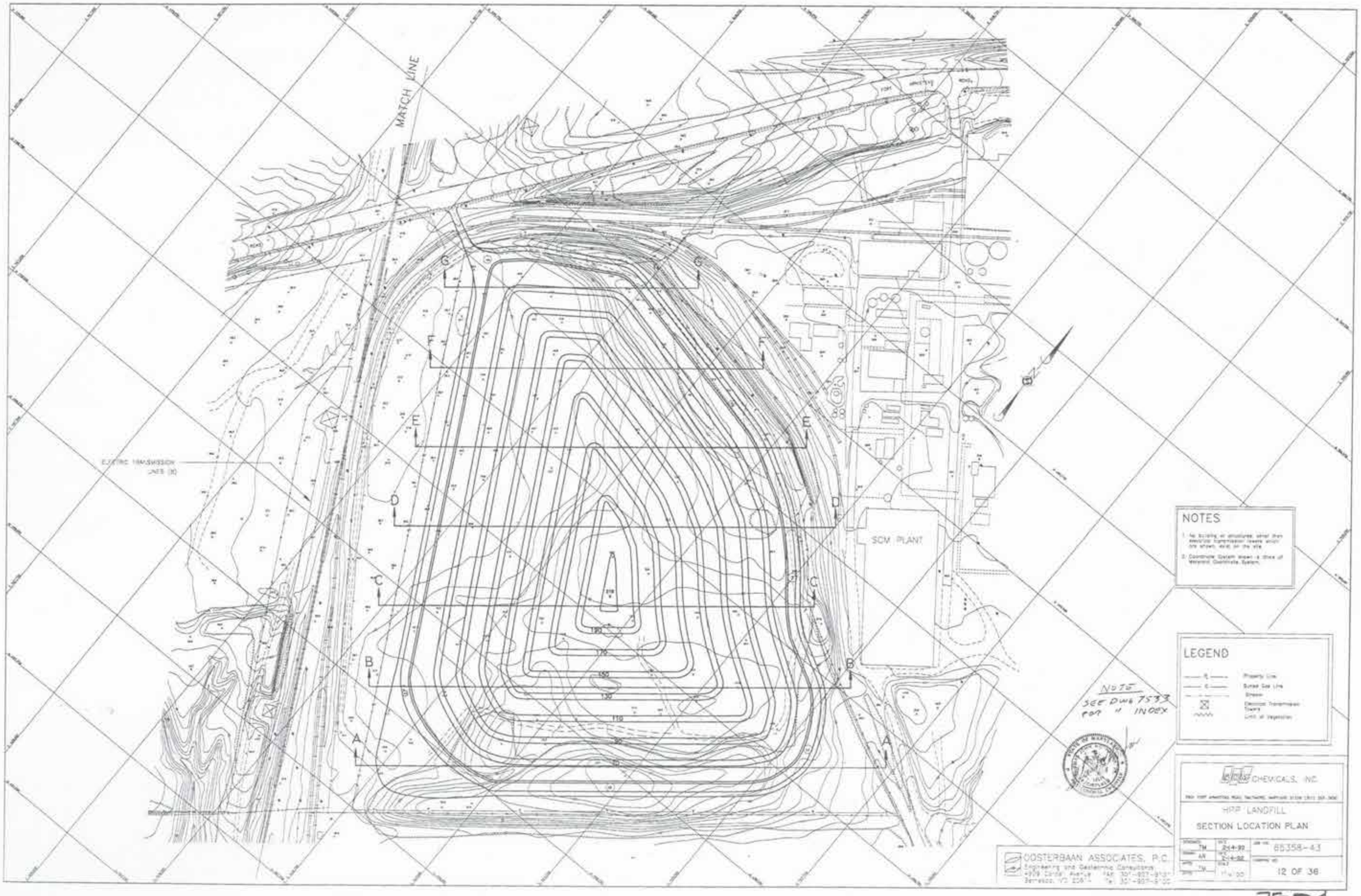
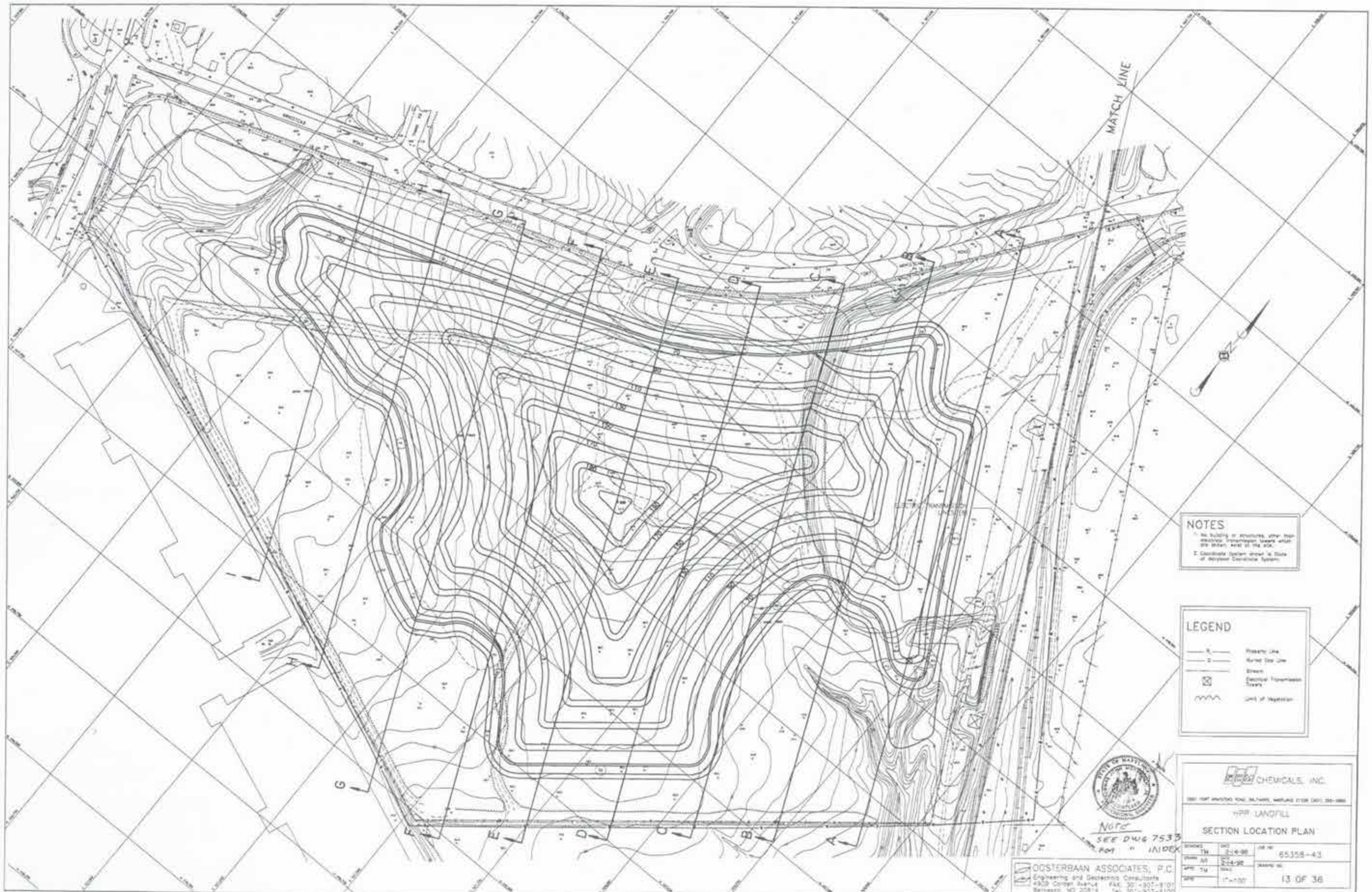
7592


SEDIMENT & EROSION CONTROL NOTES
MATCH LINE
REFER TO DWG. 28 OF 36 FOR DETAILED GRADING OF BASIN NO. 1
REFER TO DWG. 26 OF 36 FOR DETAILED GRADING OF BASIN NO. 5
ELECTRIC TRANSMISSION LINES
NOTE SEE DWG 7533 FOR " INDEX
NOTES
1. No building or structures, other than electrical transmission towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buried Gas Line
Stream
Electrical Transmission Towers
Limit of Vegetation
CHEMICALS, INC.
HPP LANDFILL
FINAL GRADING PLAN
65 ACRE SITE
65358-43
1" = 100'
11 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4909 Cordell Avenue
Bethesda, MD 20814

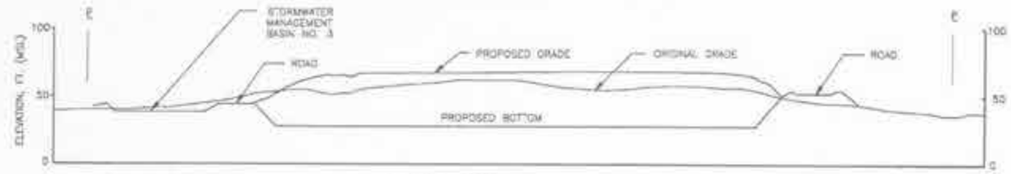
7592


MATCH LINE
SCM PLANT
NOTES
LEGEND
NOTE
SEE DWG 7533
FOR " INDEX
CHEMICALS, INC.
HPP LANDFILL
SECTION LOCATION PLAN
65358-43
12 OF 36
OOSTERBAAN ASSOCIATES, P.C.

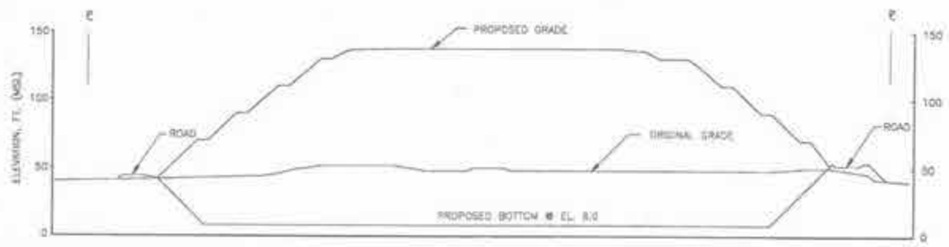
7534


MATCH LINE
NOTES
LEGEND
Note
SEE DWG 7533
FOR " INDEX
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants
CHEMICALS, INC.
HPR LANDFILL
SECTION LOCATION PLAN
65358-43
13 OF 36

7595



SECTION A-A



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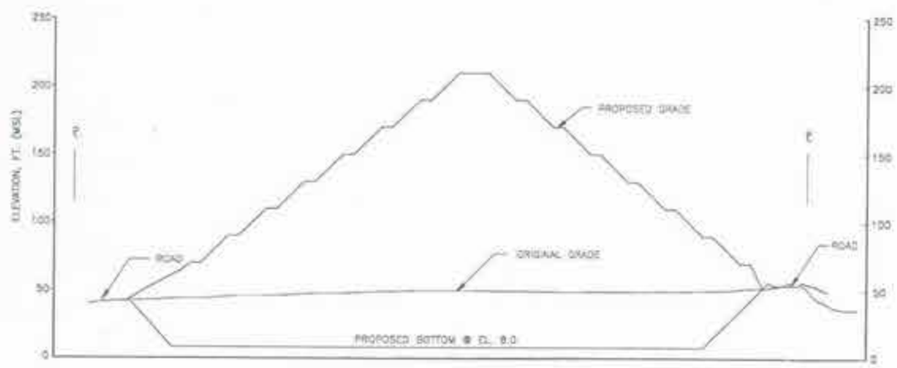

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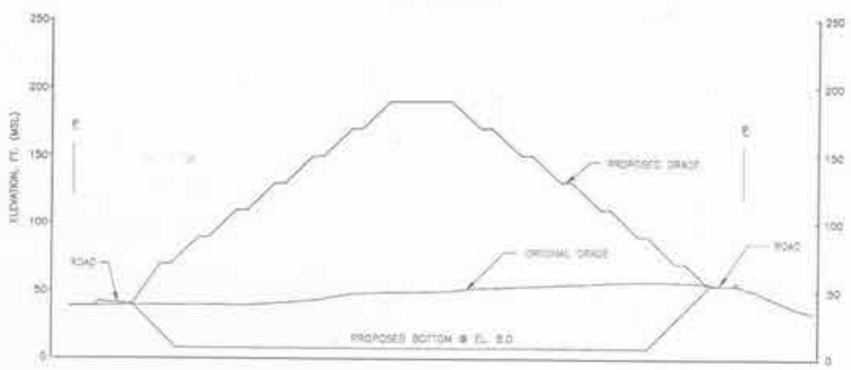

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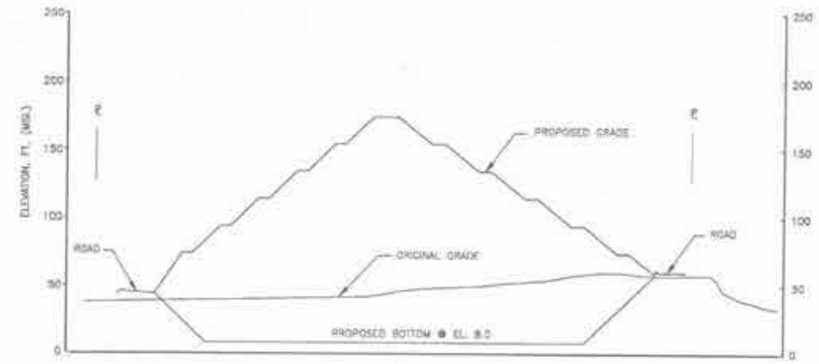

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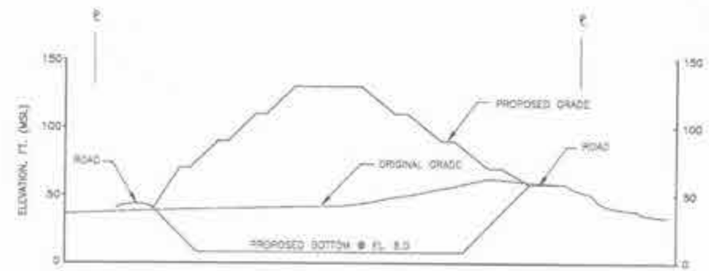
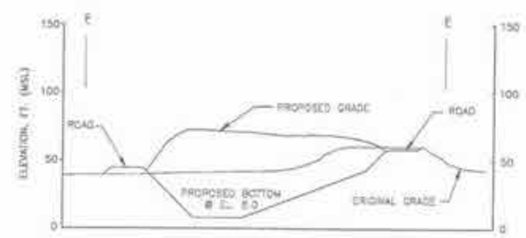


SECTION F-F



SECTION G-G

NOTE
SEE DWG 7533 FOR " INDEX

NOTE: A scale which exaggerates the vertical scale by a factor of 2 when compared to the horizontal scale has been used to graphically depict the landfill section. The landfill therefore appears twice as high as the actual case.

SCALE: H: 1"=100'
V: 1"=50'

OOSTERBAAN ASSOCIATES, P.C.
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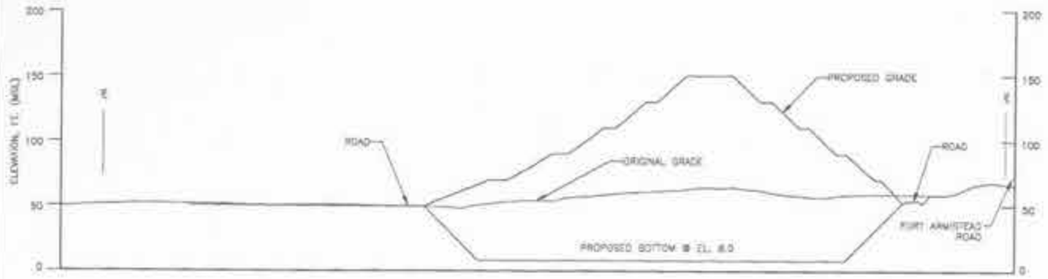
Bethesda, MD 20814 Tel: 301-907-8100

CHEMICALS, INC.

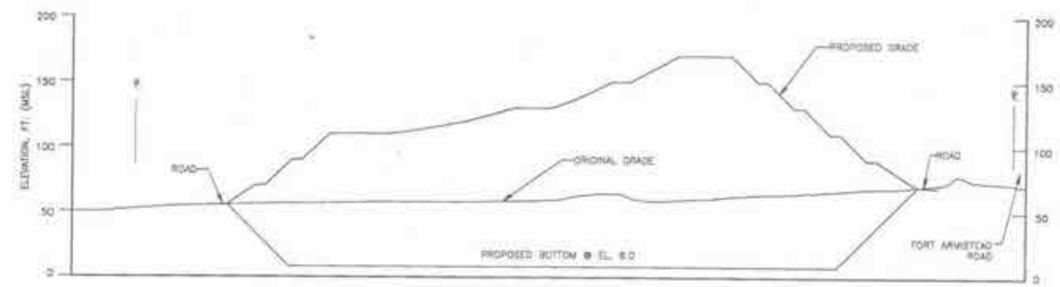
HPP LANDFILL
LANDFILL SECTIONS - 30 ACRE

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43	
DRAWN AR	DATE 2-14-92	DRAWING NO. 14 OF 38	
APPD TM	SCALE AS SHOWN		

7596



SECTION C-C



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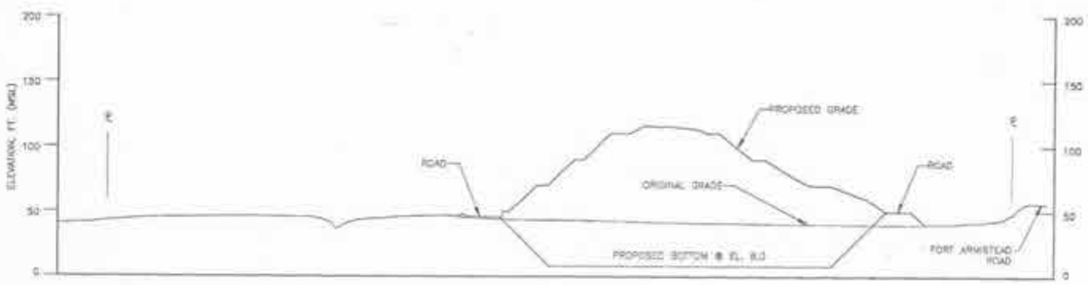
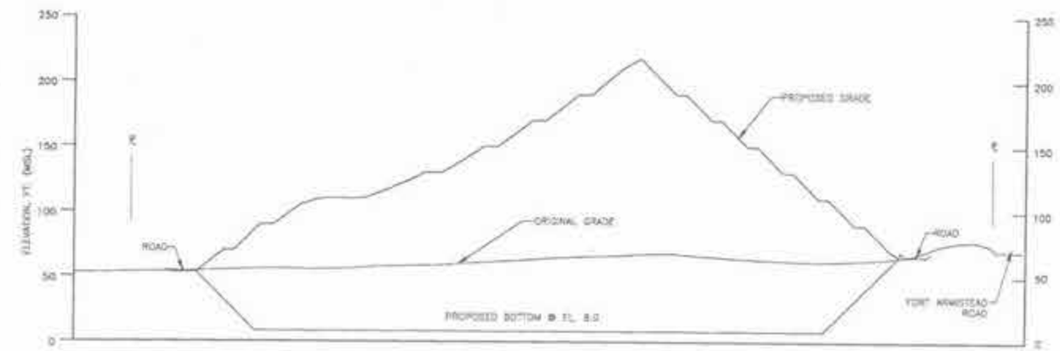
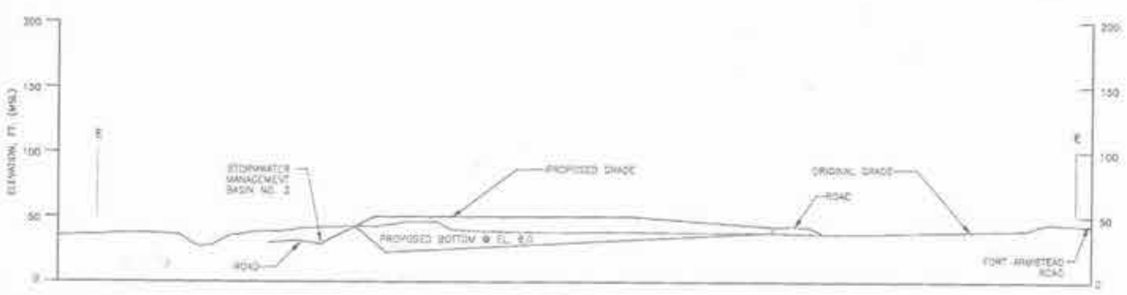


SECTION B-B



SECTION E-E



SECTION A-A

NOTE
SEE DWG 7533
FOR " INDEX

NOTE: A scale which exaggerates the vertical scale by a factor of 2 when compared to the horizontal scale has been used to graphically depict the landfill section. The landfill therefore appears twice as high as the actual case.

SCALE: H: 1"=100'
V: 1"=50'

OOSTERBAAN ASSOCIATES, P.C.
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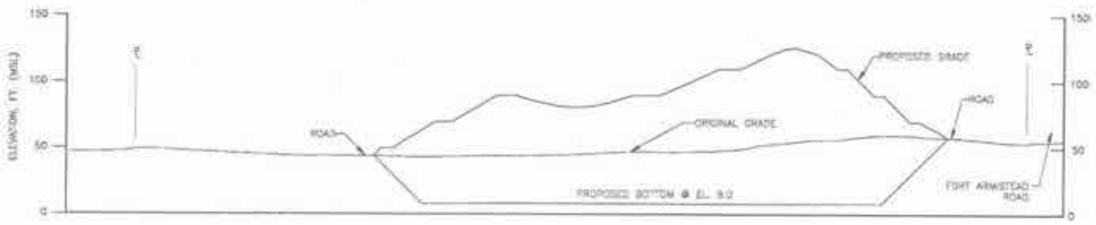
Bethesda, MD 20814 Tel: 301-907-8100

CHEMICALS, INC.

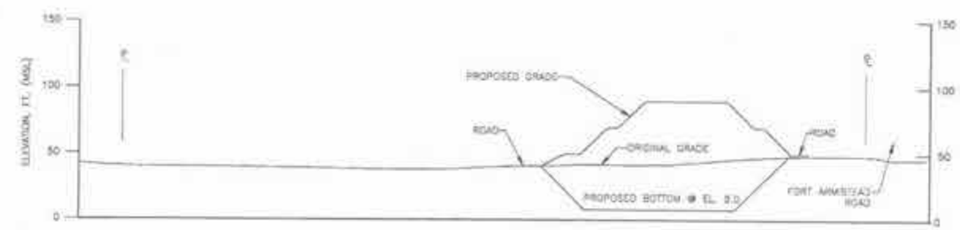
HPP LANDFILL
LANDFILL SECTIONS – 65 ACRE

TM	2-14-92	65358-43
AR	2-18-92	
TM	AS SHOWN	15 OF 36

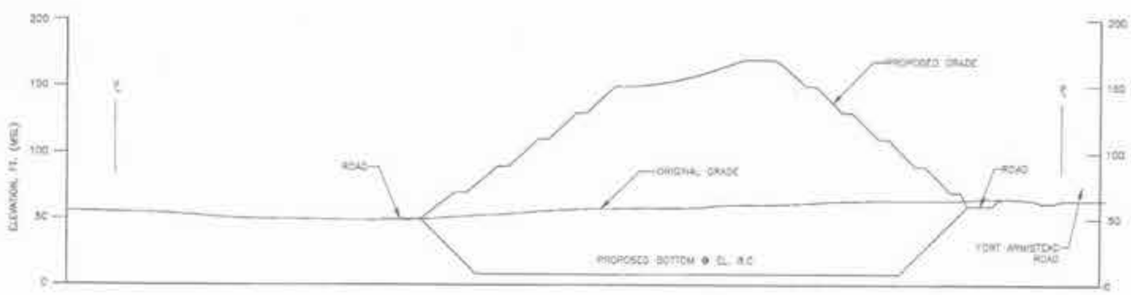
7537



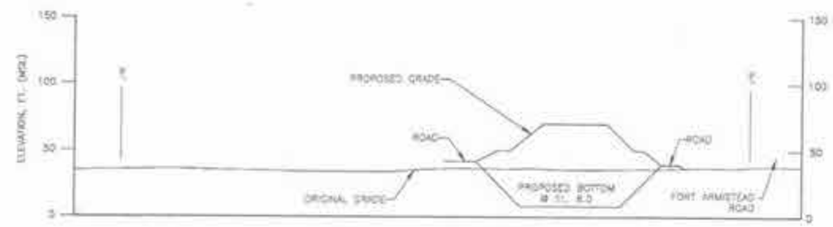
SECTION G-G



SECTION H-H



SECTION F-F



SECTION I-I

NOTE: A scale which exaggerates the vertical scale by a factor of 2 when compared to the horizontal scale has been used to graphically depict the landfill section. The landfill therefore appears twice as high as the actual case.

SCALE: H: 1"=100'
V: 1"=50'

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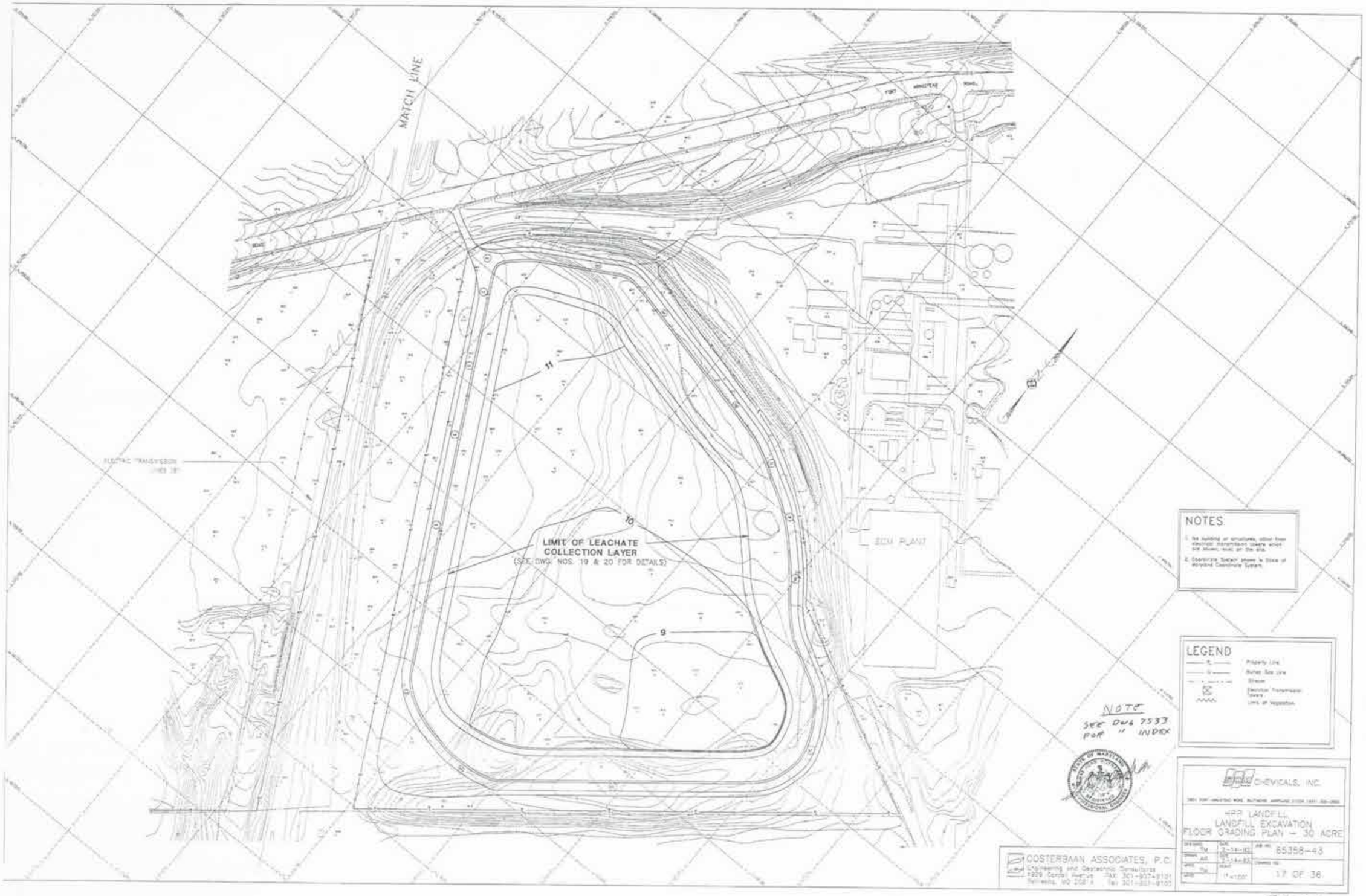
Bethesda, MD 20814 Tel: 301-907-9100

CHEMICALS, INC.

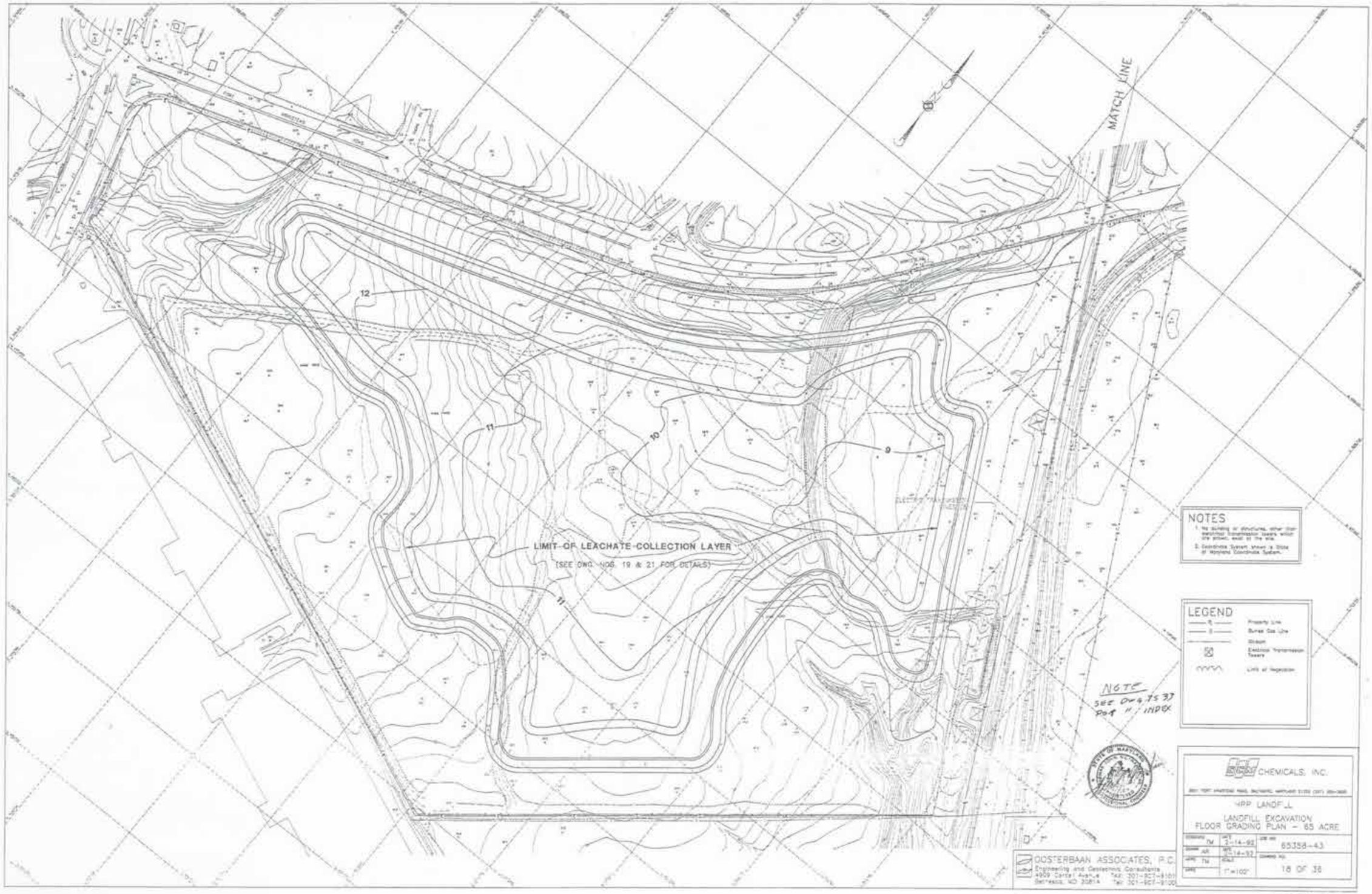
HPP LANDFILL
LANDFILL SECTIONS – 65 ACRE

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43
DRAWN KB	DATE 2-14-92	DRAWING NO. 16 OF 36
CHKD TM	SCALE AS SHOWN	

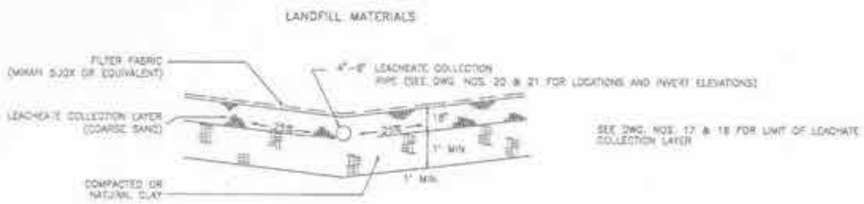
7598


MATCH LINE
FORT MIDDLETON ROAD
ELECTRIC TRANSMISSION LINES 18'
11
10
9
LIMIT OF LEACHATE COLLECTION LAYER
(SEE DWG. NOS. 19 & 20 FOR DETAILS)
SCM PLANT
NOTES
1. No building or structures, other than electrical transmission towers which are shown, must be on the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buffer Site Line
Stream
Electrical Transmission Towers
Limit of Vegetation
NOTE
SEE DWG 7533
FOR " INDEX
CHEMICALS, INC.
HPP LANDFILL
LANDFILL EXCAVATION
FLOOR GRADING PLAN – 30 ACRE
65358-43
17 OF 36
COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4929 Cordell Avenue
Bethesda, MD 20814

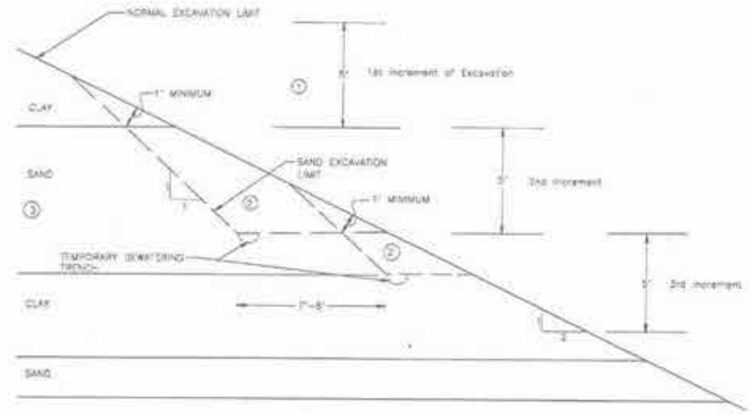
7599


MATCH LINE
12
11
10
9
LIMIT OF LEACHATE COLLECTION LAYER
(SEE DWG. NOS. 19 & 21 FOR DETAILS)
NOTES
LEGEND
Property Line
Burrow Gas Line
Stream
Electrical Transmission Towers
Limit of Vegetation
NOTE
SEE DWG 75 37
FOR " INDEX
CHEMICALS, INC.
HPP LANDFILL
LANDFILL EXCAVATION
FLOOR GRADING PLAN - 65 ACRE
2-14-92
65358-43
1"=100'
18 OF 38
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants

7600



DETAIL 'A' - TYPICAL LINER/LEACHEATE COLLECTION LAYERS

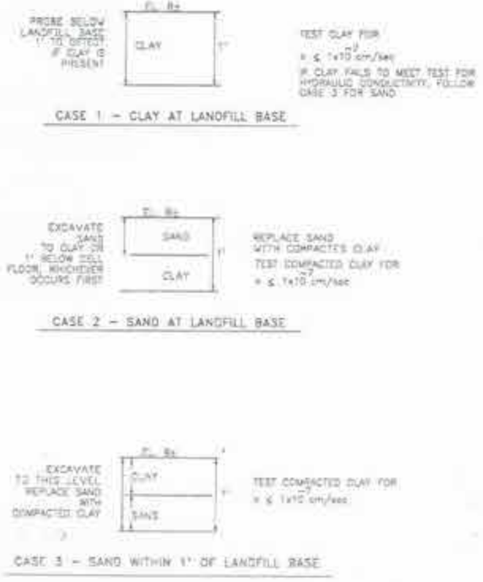


NOTES FOR DETAIL C NORMAL SLOPE CONSTRUCTION

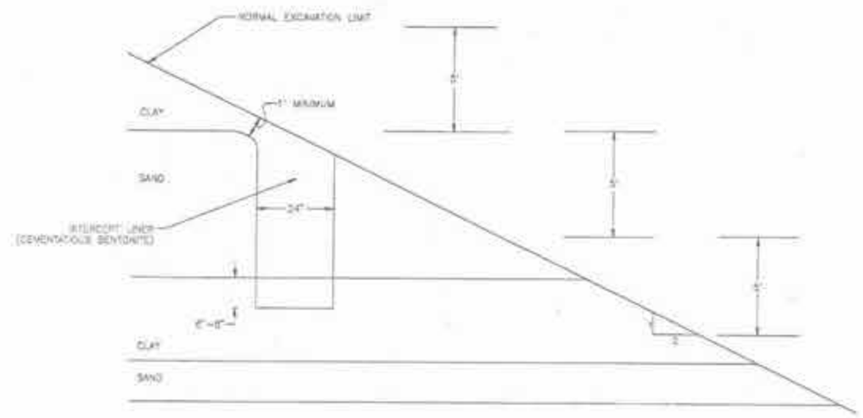
1. EXCAVATION TO PROCEED IN FIVE (5) FOOT INCREMENTS. SLOPES WILL BE OBSERVED AND TESTED AT EACH INCREMENT TO DEMONSTRATE CONTINUOUS CLAY, AT LEAST ONE (1) FOOT THICK.
2. EXCAVATED SAND LAYERS ALONG THE APPROXIMATE LINES SHOWN REPLACE SAND WITH COMPACTED CLAY.
3. TEMPORARY DEWATERING TRENCHES LEADING TO TEMPORARY SUMP AND PUMP WILL REMAIN IN OPERATION WHILE COMPACTED CLAY IS BEING PLACED.
4. IF INITIAL EXCAVATION ON SLOPE UNCOVERS A ZONE OF SEEPAGE OF A NOTICEABLE VOLUME OR A POTENTIALLY PERSISTENT BAND, THE CONTRACTOR WILL BE DIRECTED TO IMPLEMENT DETAIL 'D'

DETAIL C: NORMAL SLOPE CONSTRUCTION

NOT TO SCALE



DETAIL B: LANDFILL BASE PREPARATION



DETAIL D: CONTINGENT SLOPE CONSTRUCTION

NOT TO SCALE

NOTES FOR DETAIL D CONTINGENT SLOPE CONSTRUCTION

1. EXCAVATE INTERCEPT LINER TWO (2) FEET ON WIDTH THROUGH SAND LAYER TO CLAY.
2. BACKFILL INTERCEPT LINER WITH CEMENTACIOUS BENTONITE WITH HYDRAULIC CONDUCTIVITY OF $1x10^{-7}$ cm/sec.
3. ALLOW CEMENTACIOUS BENTONITE TO CURE UNTIL INITIAL SET.
4. CONTINUE NEXT INCREMENT OF GENERAL EXCAVATION

GENERAL NOTES

1. EXCAVATION FOR LANDFILL AT FINAL CUT SLOPES WILL PROCEED IN VERTICAL INCREMENTS NOT EXCEEDING FIVE (5) FEET.
2. FINAL CUT SLOPES WILL BE OBSERVED AND TESTED AT EACH INCREMENT BY A QUALIFIED FIELD TECHNICIAN UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL GEOTECHNICAL ENGINEER TO DEMONSTRATE CONTINUOUS CLAY, AT LEAST ONE (1) FOOT THICK, REMAINING PERPENDICULAR TO THE SLOPE FACE AS SHOWN IN DETAILS 'C' AND 'D' ON THIS DRAWING SHEET.
3. CLAY TESTS WILL CONSIST OF IN-PLACE DENSITY TESTS, MOISTURE CONTENTS, LIQUID AND PLASTIC LIMITS (LL AND PL), MECHANICAL ANALYSES TO DETERMINE THE PERCENT PASSING U.S. NO. 200 SIEVE AND FIELD OR LABORATORY HYDRAULIC CONDUCTIVITY TESTS PERFORMED ON FIELD SAMPLES OF COMPACTED CLAY.
4. ACCEPTABLE TESTS WILL BE AS FOLLOWS:
   A. IN-PLACE DENSITY: $\gamma \geq$ 95% ASTM D-698.
   B. PLASTIC INDEX, (PI=LL-PL) $\geq$ 7.
   C. PERCENT PASSING NO. 200 SIEVE $\geq$ 40%
   D. HYDRAULIC CONDUCTIVITY: $k \leq 1x10^{-7}$ cm/sec.
5. FREQUENCY OF TESTS:
   A. IN-PLACE DENSITY: 10 PER ACRE
   B. PLASTIC INDEX: 10 PER ACRE
   C. PERCENT PASSING NO. 200 SIEVE: 10 PER ACRE
   D. HYDRAULIC CONDUCTIVITY: 1 PER ACRE, OR MORE
   E. CLAY THICKNESS PROBES: 10 PER ACRE
   * IN-PLACE DENSITY, PL, AND PERCENTAGE PASSING NO. 200 SIEVE WILL BE USED AS INDICATOR TESTS AFTER CORRELATION WITH HYDRAULIC CONDUCTIVITY TESTS
6. SAND USED FOR LEACHATE COLLECTION LAYER SHALL BE CLEAN SILICA SAND WITH LESS THAN 3% OF THE MATERIAL PASSING THE U.S. NO. 200 SIEVE AND WITH A HYDRAULIC CONDUCTIVITY $k \geq 5x10^{-3}$ cm/sec.
7. IN CIRCUMSTANCES WHERE SEEPAGE OF NOTICEABLE VOLUME OR A POTENTIALLY PERSISTANCE BAND IS ENCOUNTERED IN SURFICIAL SAND, AN EXCAVATION TWO (2) FEET OF WIDTH, WILL BE CONSTRUCTED ON THE STORMWATER CONVEYANCE CHANNEL SIDE OF THE ACCESS ROAD. THE EXCAVATION WILL PROCEED VERTICALLY TO CLAY AND BE FILLED WITH SAND MEETING THE REQUIREMENTS OF THE LEACHATE COLLECTION LAYER SAND IN GENERAL NOTE NO.6 ABOVE. THE EXCAVATION WILL BE GRADED TO DRAIN BY GRAVITY TO A DOWNGRADIENT LOCATION IN THE STORMWATER CONVEYANCE CHANNEL AND/OR A STORMWATER MANAGEMENT BASIN.

NOTE
SEE DWG 7533
FOR " " INDEX

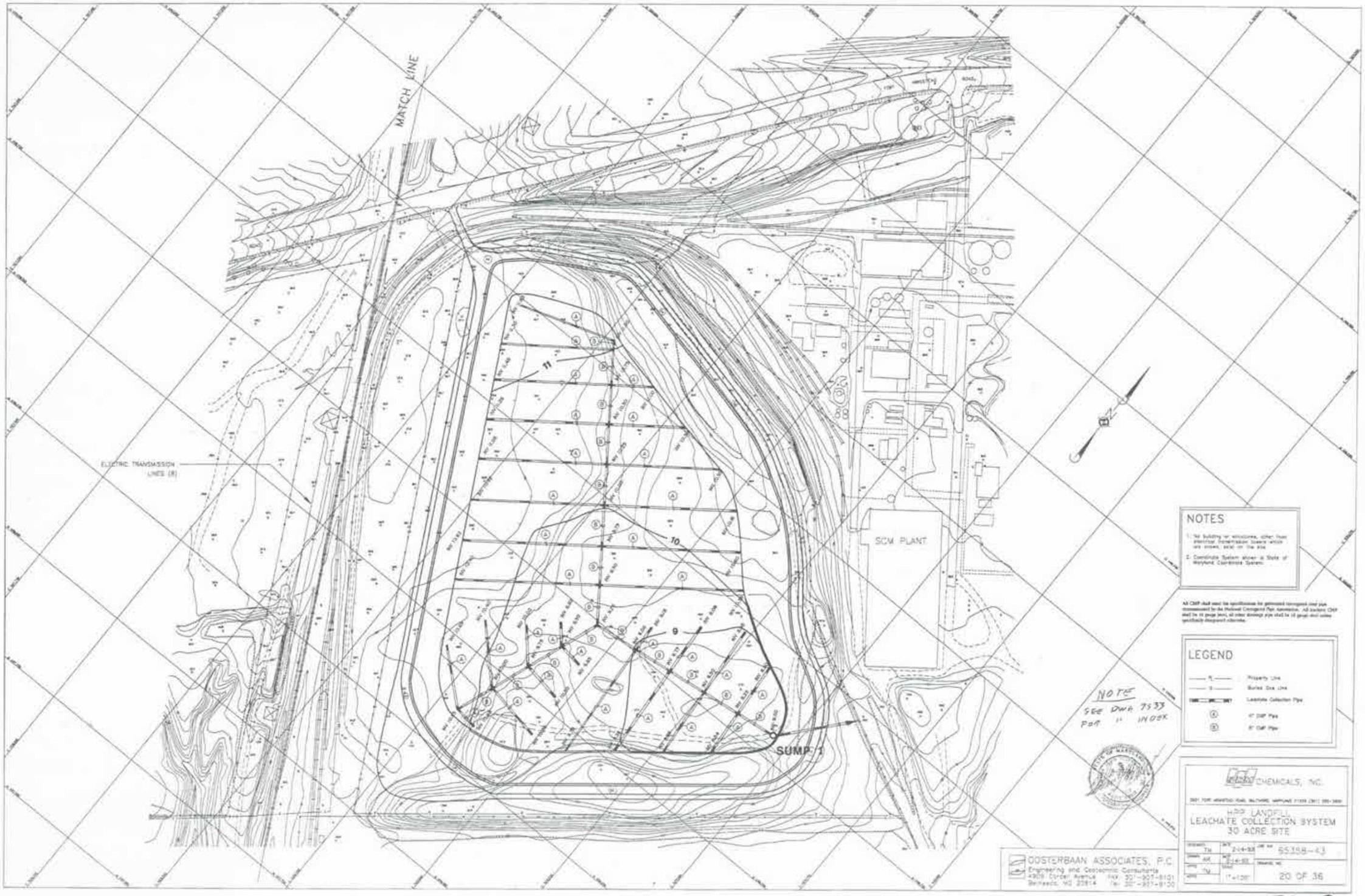
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants
4806 Corset Avenue FAX: 301-907-8101
Berwyn, MD 20814 Tel: 301-907-8100

CHEMICALS, INC.

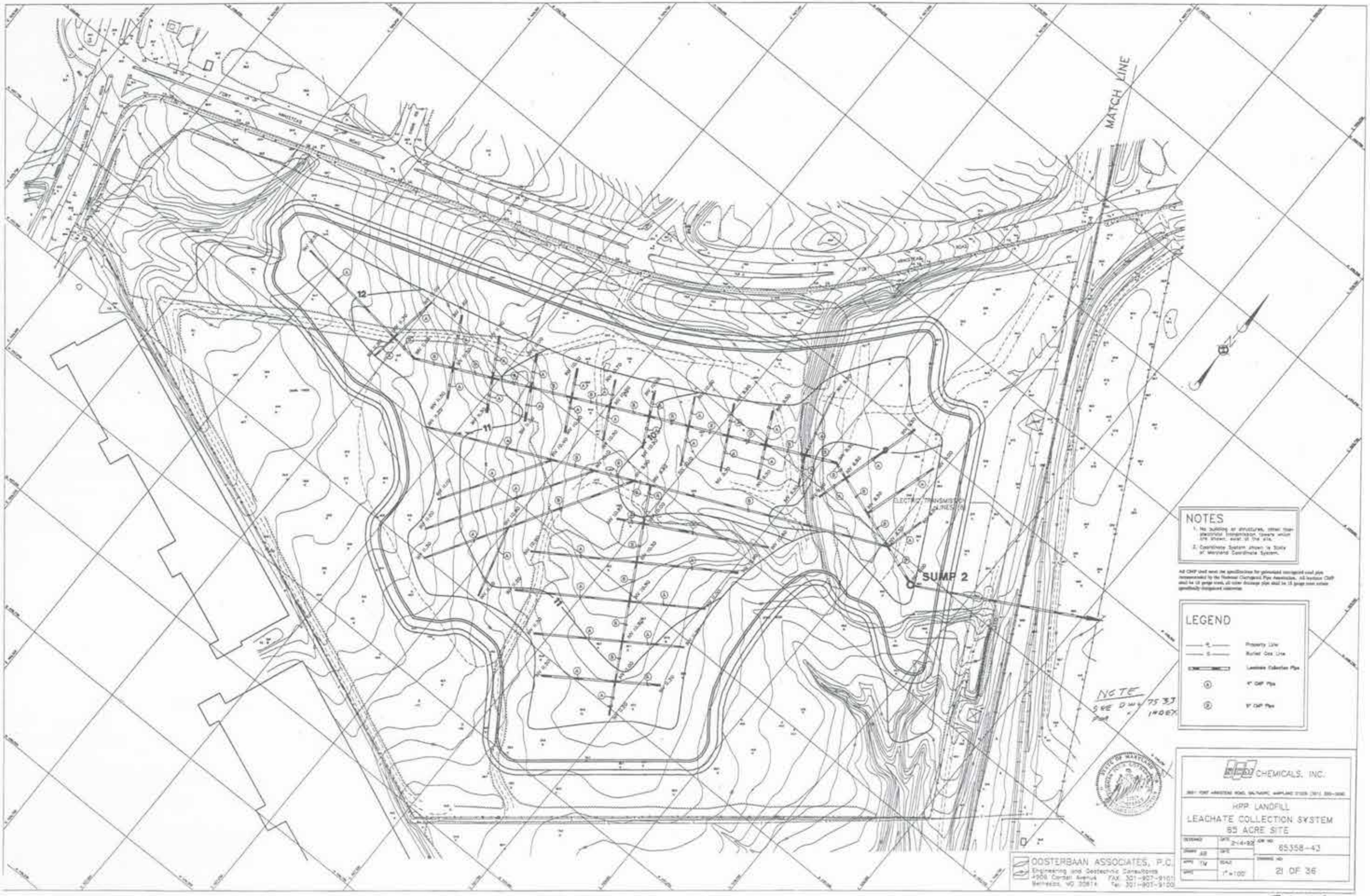
HPP LANDFILL
CLAY LINER DETAILS
SECTIONS & SPECIFICATIONS

DESIGNED TM	DATE 3-14-92	JOB NO. 85358-43	
DRAWN AB	DATE 3-14-92	DRAWING NO. 18 OF 38	
CHKD TV	SCALE AS SHOWN		

7601


MATCH LINE
ELECTRIC TRANSMISSION LINES (8)
SCM PLANT
SUMP 1
11
10
9
NOTES
LEGEND
NOTE
SEE DWG 7533 FOR 11 INDEX
CHEMICALS, INC.
HPP LANDFILL
LEACHATE COLLECTION SYSTEM
30 ACRE SITE
65358-43
20 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants

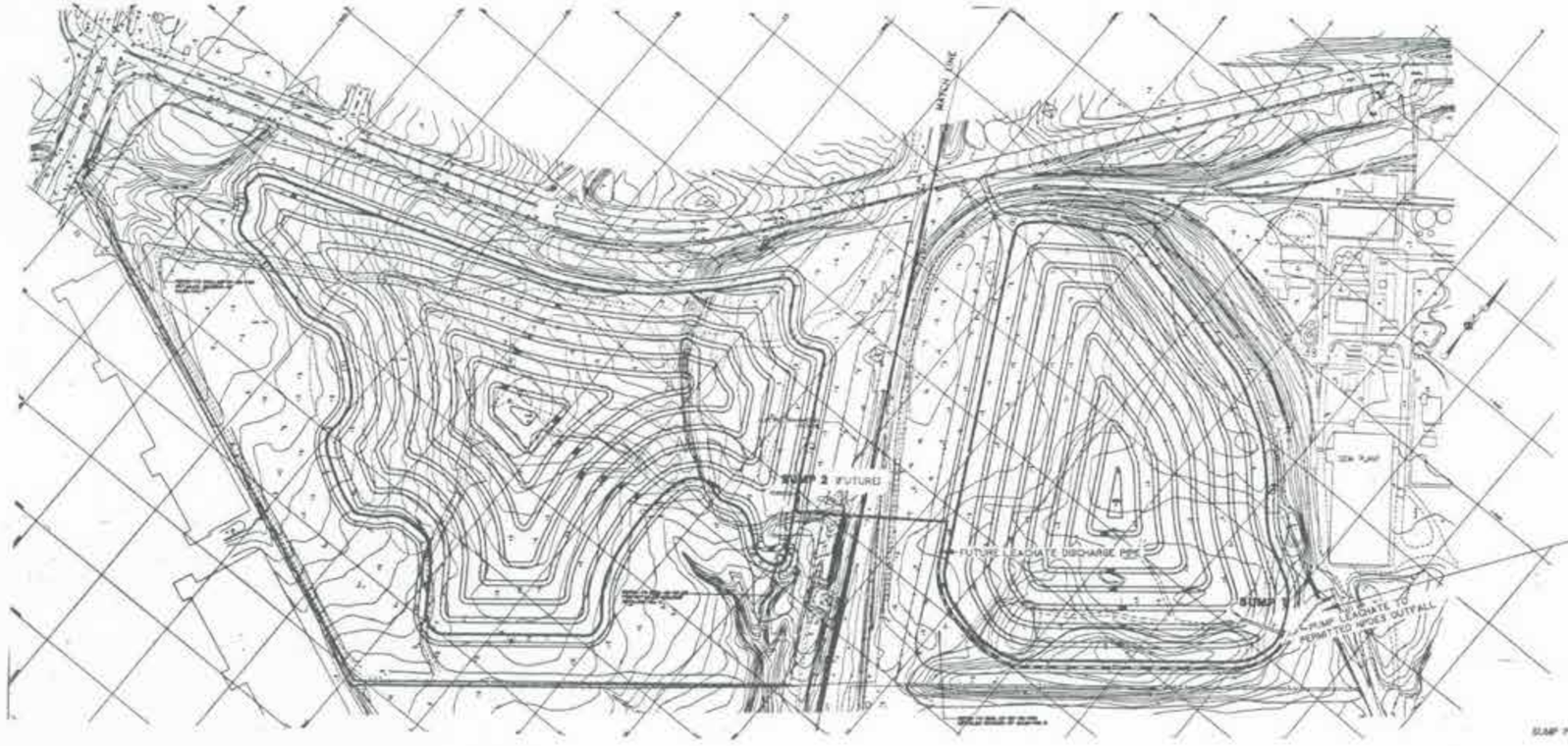
7602


MATCH LINE
SUMP 2
ELECTRIC TRANSMISSION LINES
12
11
10
NOTES
LEGEND
Property Line
Buried Gas Line
Leachate Collection Pipe
4" CMP Pipe
9" CMP Pipe
NOTE
SEE DWG 7533 FOR INDEX
CHEMICALS, INC.
HPP LANDFILL
LEACHATE COLLECTION SYSTEM
65 ACRE SITE
2-14-92
65358-43
1"=100'
21 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4906 Cordell Avenue FAX 301-907-9101
Bethesda, MD 20814 Tel: 301-907-9100

7603

NOTES

1. Construct Sump 1 during Phase I Construction.
2. Install pump with 60 gallon per minute capacity in Sump 1 during Phase I Construction.
3. See Drawings S-4, S-5, and S-6 for details of Sump 1 construction.
4. Leachate collected in Sump 1 will be pumped to an NPDES outfall located at the SCM Chemicals Hawkins Point Plant (HPP) through a 2-inch discharge pipe.
5. Sump 2 will be constructed at a future time as part of Phase III Construction.



SEE NOTES ABOVE FOR SUMP DETAILS

NOTE
SEE DWG 7533 FOR INDEX

SUMP PLAN REVISED BY HALEY & ALDRICH 10-15-90

LEACHATE SUMP AND PIPE LOCATION PLAN SCALE: 1" = 400'

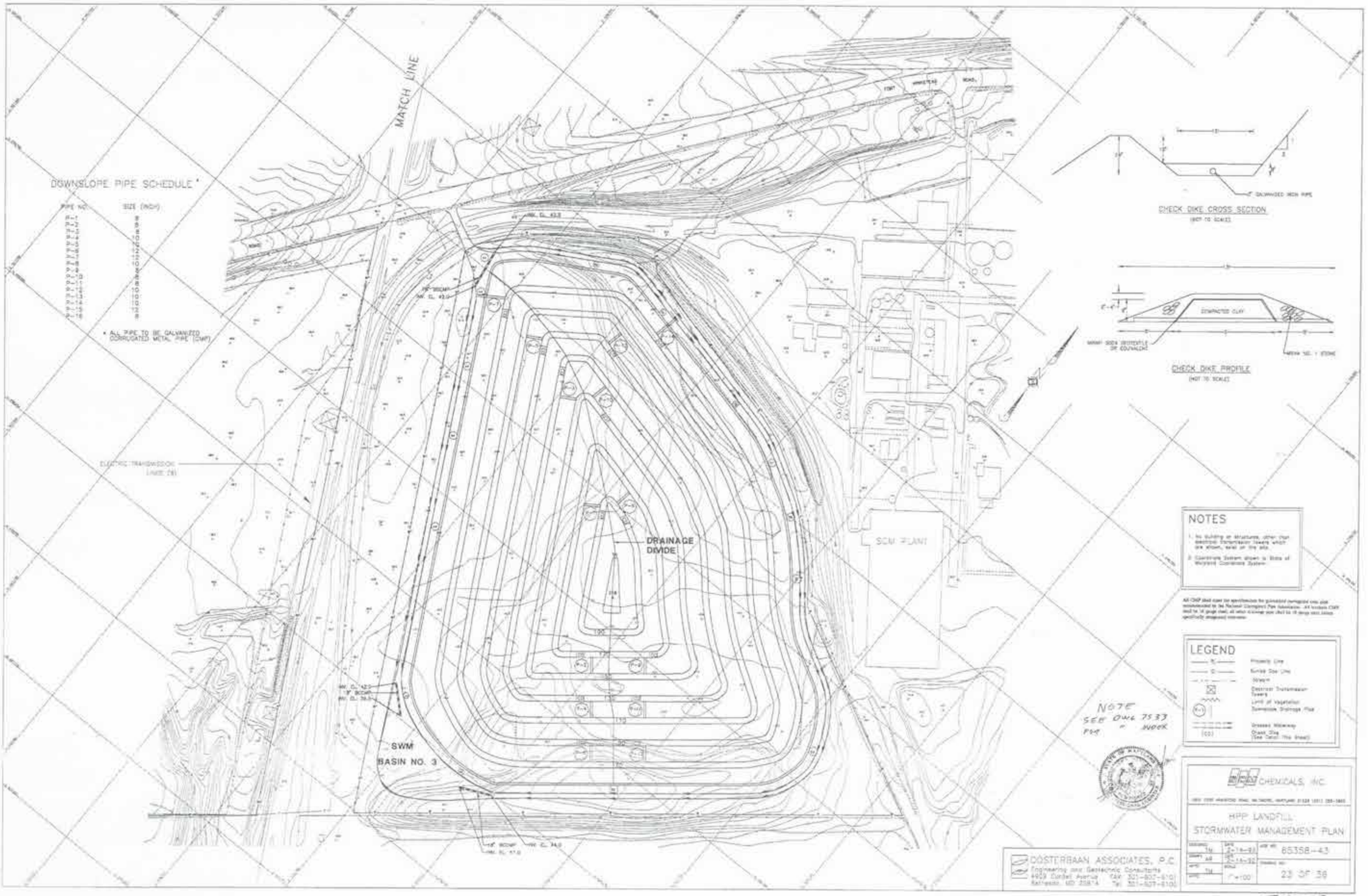
COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4829 Cordell Avenue TEL: 301-907-9101
Bethesda, MD 20814 Fax: 301-907-9100

CHEMICALS, INC.
2001 FORT HOWARD ROAD, BALTIMORE, MARYLAND 21226 (301) 355-3000

HPP LANDFILL
LEACHATE COLLECTION SYSTEM PLAN

DESIGNED TM	DATE 9-5-92	JOB NO. 65358-43
DRAWN AJS	DATE 7-14-92	DRAWING NO.
APPD TM	SCALE AS SHOWN	22 OF 36

7604


MATCH LINE
DOWNSLOPE PIPE SCHEDULE *
PIPE NO. SIZE (INCH)
P-1 8
P-2 8
P-3 8
P-4 10
P-5 10
P-6 12
P-7 12
P-8 10
P-9 8
P-10 8
P-11 8
P-12 10
P-13 10
P-14 10
P-15 12
P-16 8
* ALL PIPE TO BE GALVANIZED CORRUGATED METAL PIPE (CMP)
ELECTRIC TRANSMISSION LINES (28)
DRAINAGE DIVIDE
SCM PLANT
SWM BASIN NO. 3
CHECK DIKE CROSS SECTION
(NOT TO SCALE)
CHECK DIKE PROFILE
(NOT TO SCALE)
NOTES
LEGEND
NOTE
SEE DWG 7533
FOR " INDEX
CHEMICALS, INC.
HPP LANDFILL
STORMWATER MANAGEMENT PLAN
85358-43
23 OF 38
DOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants

7605

MATCH LINE

SWM BASIN NO. 1

18" BCCMP

REFER TO DWG. 26 OF 38 FOR DETAILED GRADING OF BASIN NO. 1

18" BCCMP

OPERATIONS TRAILER

DRAINAGE DIVIDE

18" BCCMP

REFER TO DWG. 26 OF 38 FOR DETAILED GRADING OF BASIN NO. 2

SWM BASIN NO. 2

NOTE
SEE DWG 7537 FOR 11 INDEX

DOWNSLOPE PIPE SCHEDULE*

PIPE NO.	SIZE (INCH)
P-1	8
P-2	8
P-3	8
P-4	12
P-5	12
P-6	12
P-7	12
P-8	12
P-9	8
P-10	8
P-11	8
P-12	12
P-13	12
P-14	12
P-15	12
P-16	8

* ALL PIPE TO BE GALVANIZED CORRUGATED METAL PIPE (CMP)

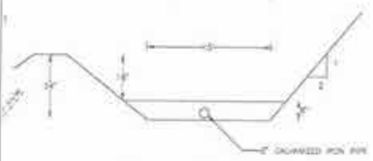
NOTES

1. No building or structures, other than permitted temporary towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.

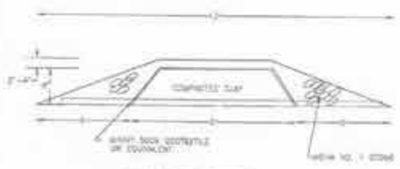
All CMP shall meet the specifications for galvanized corrugated steel pipe recommended by the Personal Corrugated Pipe Association. All culverts CMP shall be 16 gauge min. all inlet trashrack shall be 12 gauge min unless specifically designed otherwise.

LEGEND

- Property Line
- Buried Gas Line
- Stream
- Existing Temporary Trailers
- Limits of Vegetation
- Downslope Diversion Dike
- Outlaw Roadway
- Check Dike (See Detail This Sheet)



CHECK DIKE CROSS SECTION
(NOT TO SCALE)



CHECK DIKE PROFILE
(NOT TO SCALE)

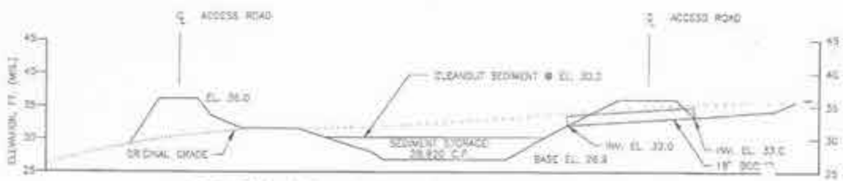
COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants
12608 Cohasset Avenue Fax: 301-621-9120
Rockville, MD 20814 Tel: 301-621-6100

CHEMICALS, INC.

HPP LANDFILL
STORMWATER MANAGEMENT PLAN

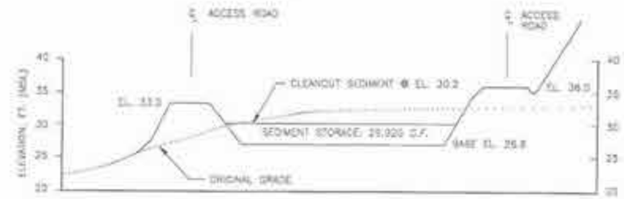
DESIGNED TM	DATE 2-14-92	JOB NO. 85358-A3	
DRAWN AB	DATE 2-14-92	DRAWING NO.	
APPR. TM	SCALE 1"=100'	26 OF 38	

7606



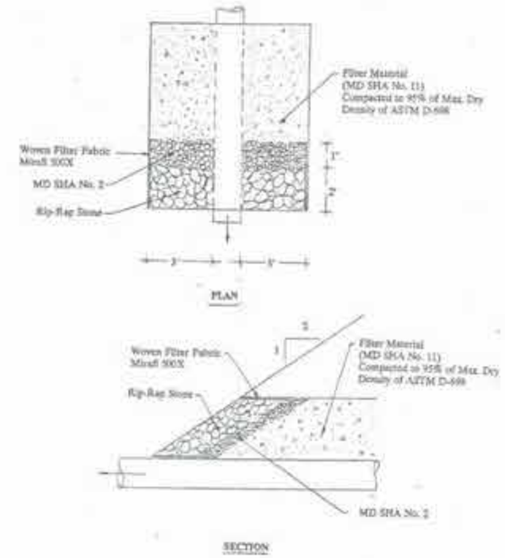
BASIN NO. 1: CROSS SECTION A-A

SCALE: H: 1"=30' V: 1"=10'



BASIN NO. 1: CROSS SECTION B-B

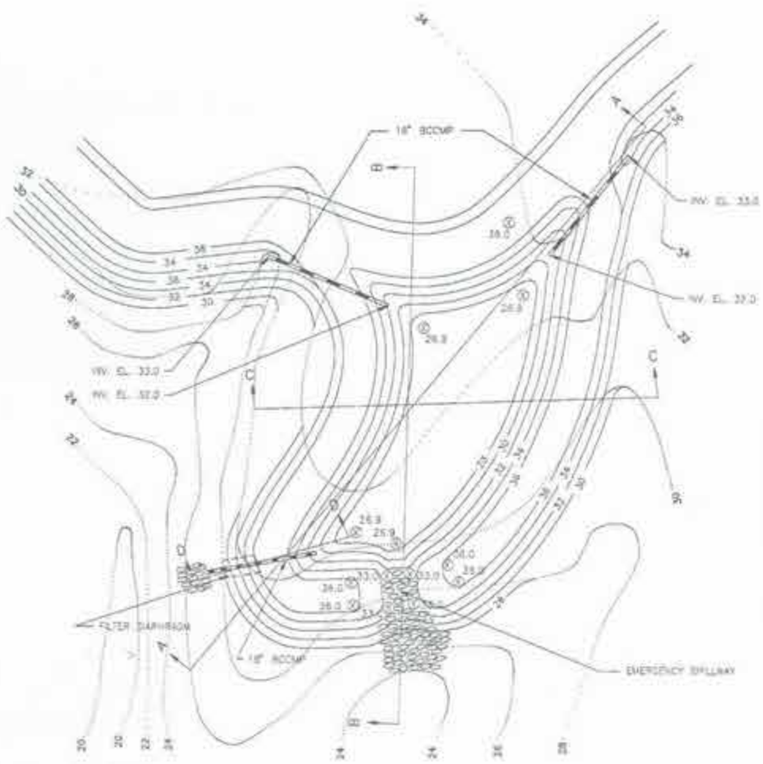
SCALE: H: 1"=30' V: 1"=10'



FILTER DIAPHRAGM DETAILS

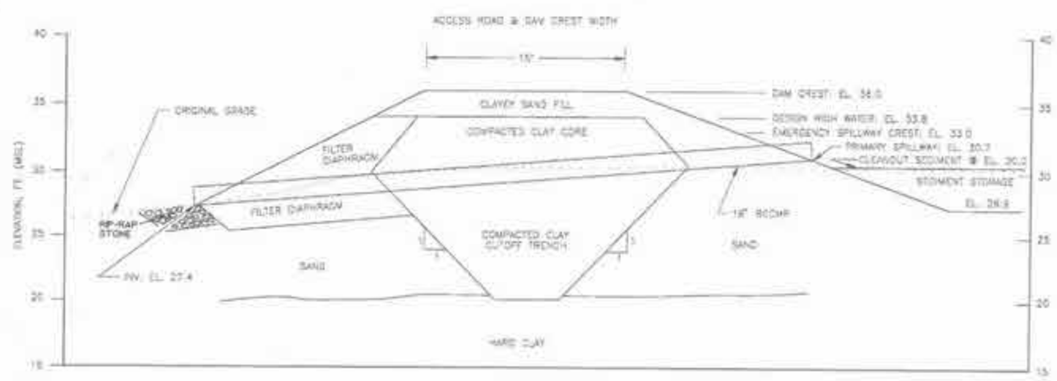
BASIN NO. 1: CROSS SECTION C-C

SCALE: H: 1"=30' V: 1"=10'



BASIN NO. 1: PLAN

SCALE: 1"=30'



BASIN NO. 1: CROSS SECTION D-D

SCALE: 1"=5'

LEGEND

⊗ FINISH GRADE SPOT ELEVATION

NOTE
SEE DWG 7533 FOR 11 INDEX

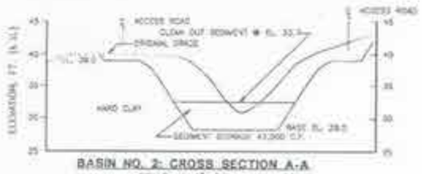
CHEMICALS, INC.

HPP LANDFILL
BASIN NO. 1 DETAILS

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43
DRAWN AR	DATE 2-14-92	DRAWING NO. 25 OF 36
APPR. TM	SCALE AS SHOWN	

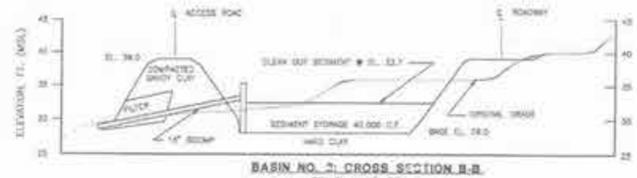
COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
1909 Cornell Avenue FAX 301-907-9101
Rockville, MD 20854 Tel 301-907-9100

7607



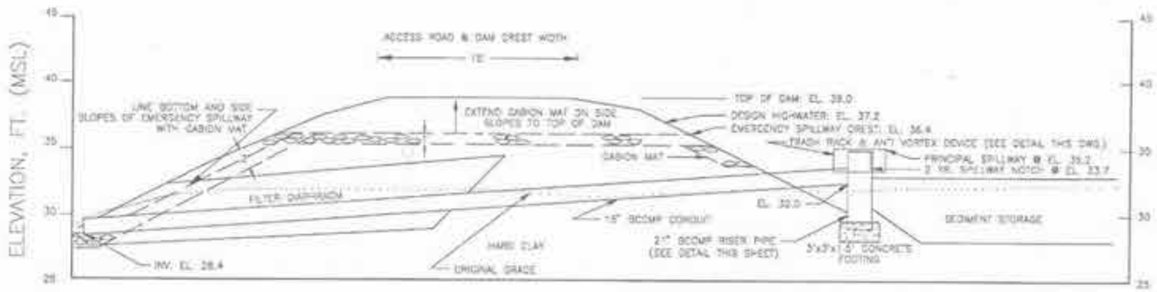
BASIN NO. 2: CROSS SECTION A-A

SCALE: H: 1"=30' V: 1"=10'



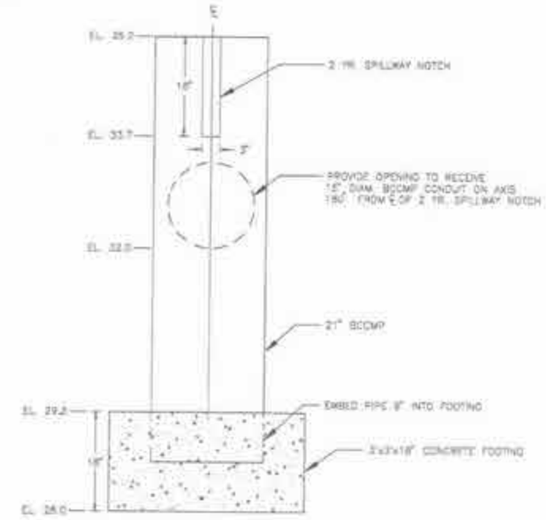
BASIN NO. 2: CROSS SECTION B-B

SCALE: H: 1"=30' V: 1"=10'



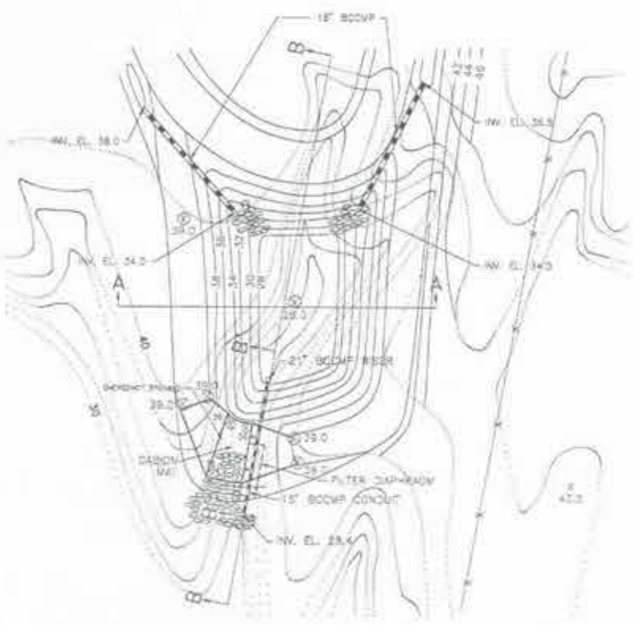
BASIN NO. 2: CROSS SECTION B'-B'

SCALE: 1"=5'



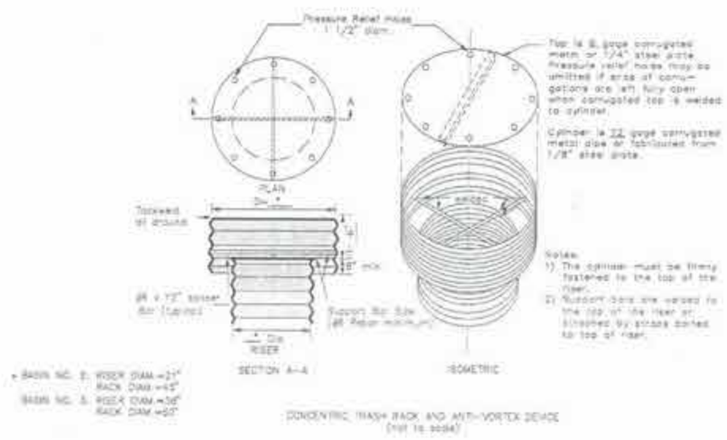
PRINCIPAL SPILLWAY DETAIL

SCALE: 1"=1'

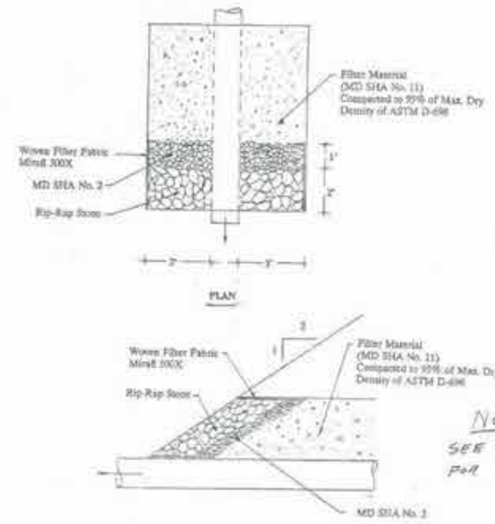


BASIN NO. 2: PLAN

SCALE: 1"=30'



CONCENTRIC TRASH RACK AND ANTI-VORTEX DEVICE (not to scale)



FILTER DIAPHRAGM DETAILS

LEGEND

③ FINISH GRADE SPOT ELEVATION

NOTE
SEE DWG 7537 FOR " INDEX

CHEMICALS, INC.

HPP LANDFILL
BASIN NO. 2 DETAILS

DESIGNED TW	DATE 2-14-92	JOB NO. 85358-43
DRAWN AR	DATE 2-14-92	DRAWING NO. 26 OF 36
CHKD TW	SCALE AS SHOWN	

OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4808 Sandell Avenue FAX: 301-907-9101
Bethesda, MD 20814 Tel: 301-907-9100

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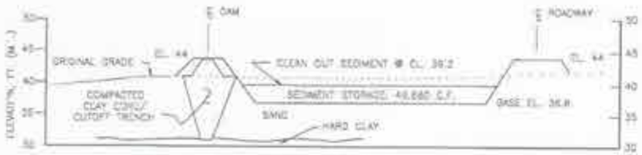
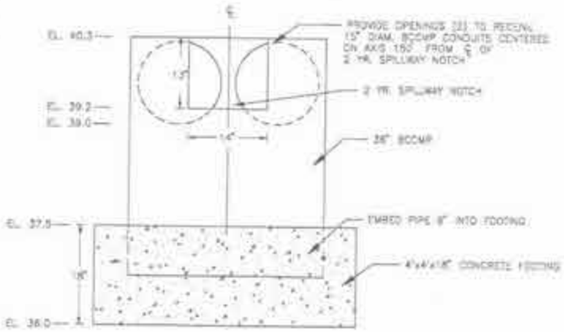


BASIN NO. 3: CROSS SECTION A-A

SCALE: H: 1"=30' V: 1"=10'

BASIN NO. 3: CROSS SECTION B-B

SCALE: H: 1"=30' V: 1"=10'

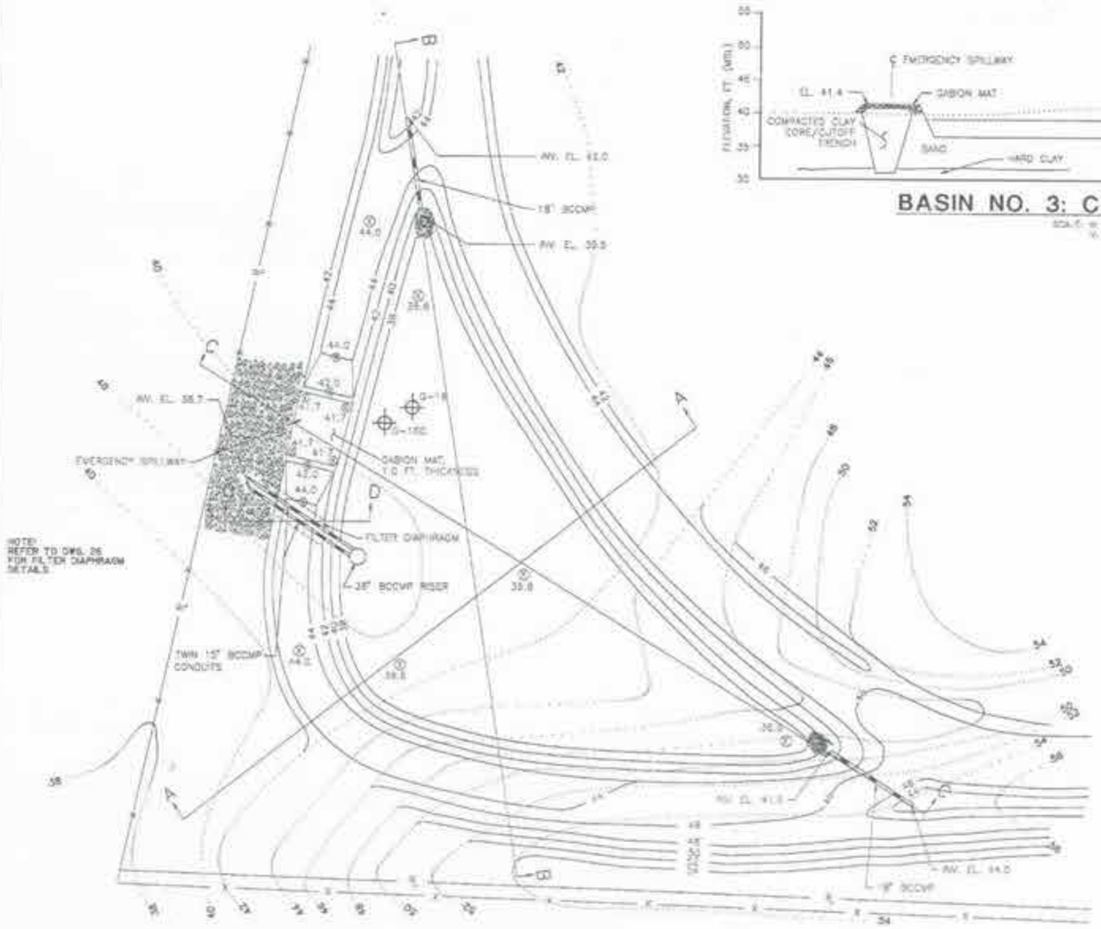


PRINCIPAL SPILLWAY DETAIL

SCALE: 1"=1'

BASIN NO. 3: CROSS SECTION C-C

SCALE: H: 1"=30' V: 1"=10'

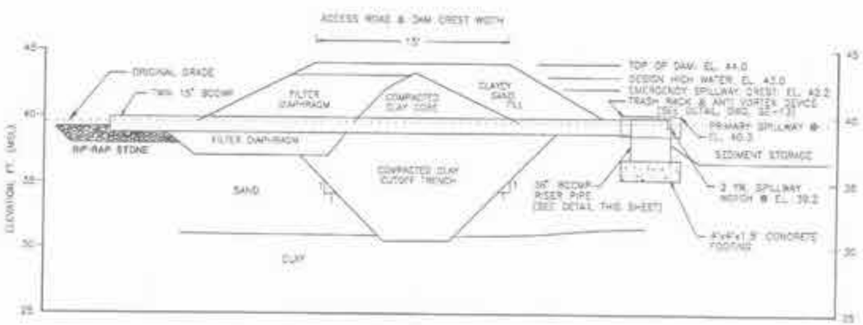


BASIN NO. 3: PLAN

SCALE: 1"=30'

LEGEND

⊗ FINISH GRADE SPOT ELEVATION



BASIN NO. 3: CROSS SECTION D-D

SCALE: 1"=30'

NOTE
SEE DWG 7583
FOR 1" INDEX

OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4800 Cordell Avenue FAX 301-907-8131
Bethesda, VA 20814 Tel 301-907-8130

CHEMICALS, INC.

HRP LANDFILL
BASIN NO. 3 DETAILS

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43	
DRAWN KR	DATE 2-14-92		
APPR TM	SCALE AS SHOWN	DRAWING NO. 27 OF 36	

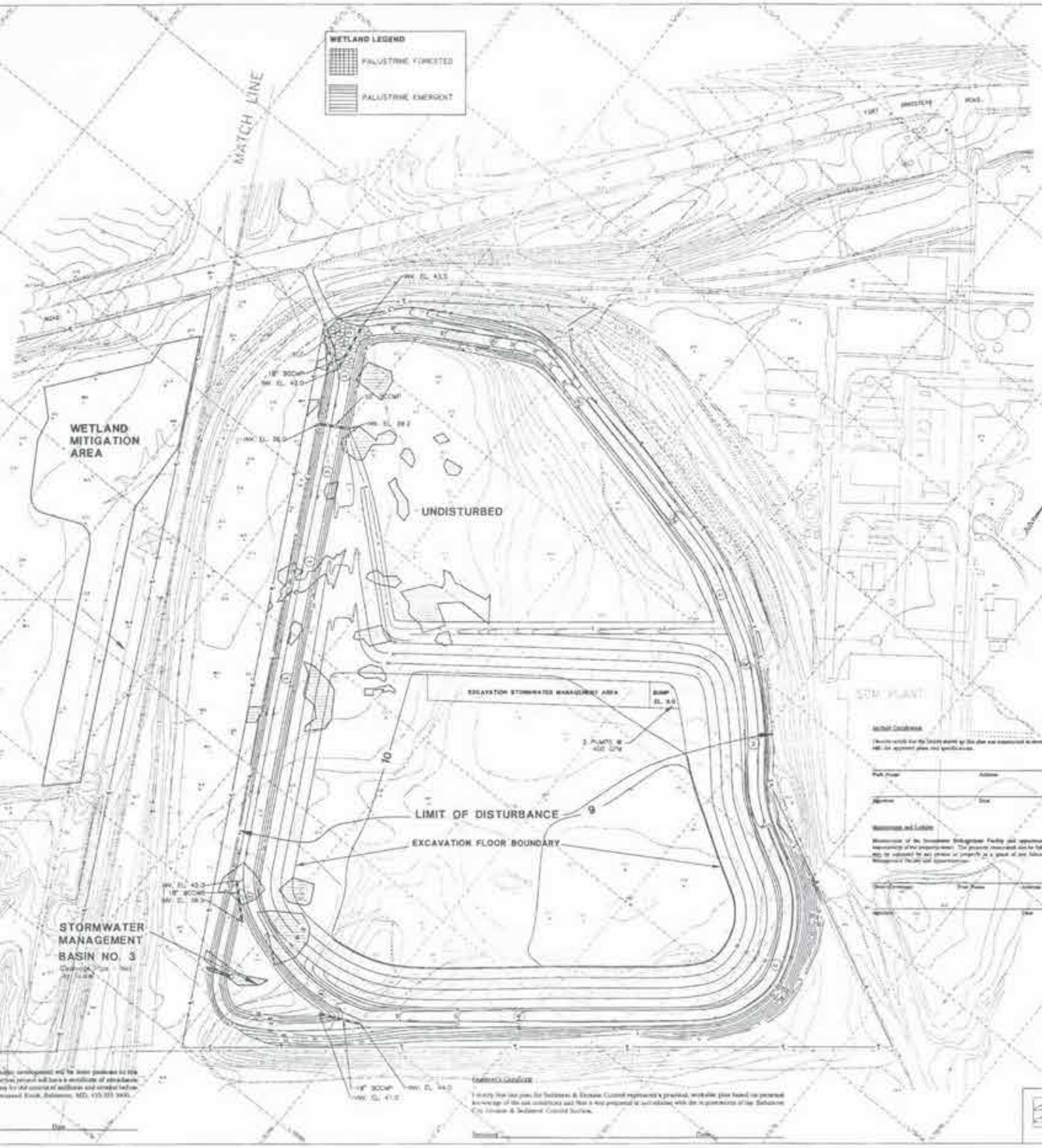
7609

CONSTRUCTION SEQUENCE

1. Obtain proper permits.
2. Seventy-two (72) hours prior to any construction activity, the contractor must submit to Baltimore City's Sediment & Erosion Control Department a written notification stating:
   a. When the contractor intends to begin construction.
   b. Source of borrow material.
   c. Disposal site of any material.
   d. Contractor's telephone closing date.
3. Clear and grub for installation of silt fence. (Refer to Note 3 for Working in Nontidal Wetlands).
4. Install silt fence.
5. Construct access roads and adjacent grassed diversion drainage channels. (Refer to Notes 1/2, 3, and 4 for Working in Nontidal Wetlands)
6. Install stormwater outlet/conveyance/forebays and erosion controls. Basin Nos. 2 and 3. (Refer to Notes 1 and 2 for Working in Nontidal Wetlands)
7. Apply permanent or temporary stabilization within seven (7) calendar days to the surface of all perimeter dikes, swales, berms, perimeter slopes, and all critical slopes greater than three (3) horizontal to one (1) vertical (3:1).
8. Clear and grub project out to excavation and stockpile areas. (Refer to Note 3 for Working in Nontidal Wetlands)
9. Place topsoil and fill materials in designated stockpile area.
10. Excavate to the floor grades shown on Drawing 28.
11. Place excavated material in stockpile area in the contours shown on Drawing 28. (Refer to Note 1 for Working in Nontidal Wetlands)
12. Install downslope drains at the level of the stockpile dams.
13. All inactive areas on the project site must have either permanent or temporary stabilization within fourteen (14) days of being disturbed.

CONDITIONS AND MANAGEMENT PRACTICES FOR WORKING IN NONTIDAL WETLANDS

1. Remove excess fill or construction material or debris to an approved disposal area outside of the bottom.
2. If backfill is contaminated, use clean material free of waste paint products, unsightly debris, toxic material or any other deleterious substance.
3. Conduct the activity so as not to cause or contribute to a degradation of water quality as determined by the Maryland Department of The Environment.
4. Maintain the hydrologic regime of nontidal wetlands outside the limits of disturbance.



SEDIMENT & EROSION CONTROL NOTES

1. The Owner and Contractor will comply with all requirements of Sediment and Erosion Control as set forth in the Baltimore City Sediment Control manual.
2. All removed material shall be placed in the high side whenever possible and confined to an area where it will not obstruct the normal flow of drainage courses.
3. Continuous inspection and maintenance of all Sediment Control devices will be required.
4. During the lifetime of sediment control devices, minor field adjustments may be made as required to accommodate field conditions upon approval from the sediment control inspector.
5. All erosion and sediment controls shown on the plans have been designed and are in strict accordance with the "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas", approved by the State of Maryland Department of the Environment.
6. All sediment control devices shall remain in operation until the area of disturbance is fully stabilized.
7. Silt fences will be utilized to prevent sediment migration from disturbed areas. In the event that the contractor is inexperienced in planning, the silt fences will remain until an adequate stand of grass is established.
8. All sediment controls and critical slopes must be stabilized within seven calendar days. All other disturbed areas on the project site must be stabilized within fourteen calendar days.
9. No pumping from excavations will be allowed directly into City systems unless it is filtered by way of Sediment Traps or Filter.
10. The disturbed area for this phase of the project is 22.5 Acres.
11. Permanent Seeding - All disturbed areas shall be stabilized as follows:

Seedbed Preparation - Loosen upper 2 inches of soil by raking, disking or other acceptable means before seeding.

Soil Amendments - Lime and fertilize according to soil test. In lieu of soil test, apply 2,000 lbs. of ground dolomitic lime stone per acre and 600 lbs. per acre 0-20-20 fertilizer (14 lbs/1,000 sq. ft.). Incorporate lime and fertilizer into upper three inches of soil. As part of seeding, apply 400 lbs. per acre (9.2 lbs./1,000 sq. ft.) of 10-10-10 fertilizer and 500 lbs per acre (11.5 lbs/1,000 sq. ft.) of 10-20-20 fertilizer.

Seeding - For the period March 1 through April 30 and August 1 through October 15, seed with 60 lbs per acre (1.4 lbs./1,000 sq. ft.) of Kentucky 31 Tall Fescue. For the period May 1 through July 31, seed with 60 lbs Kentucky 31 Tall Fescue per acre and 2 lbs. per acre (.05 lbs./1,000 sq. ft.) of weeping lovegrass. During the period of October 16 through February 28, protect site by: Option (1) - 2 tons per acre of well anchored straw mulch and seed as soon as possible in the spring. Option (2) - sod. Option (3) - seed with 60 lbs. per acre Kentucky 31 Tall Fescue and mulch with 2 tons per acre well anchored straw.

Mulching - Apply 1 - 1½ to 2 tons per acre (70 to 90 lbs./1,000 sq. ft.) of unrotted small grain straw immediately after seeding. Anchor mulch immediately after application using 236 gallons per acre (7 gallons/1,000 sq. ft.) of emulsified asphalt on flat areas. On slopes 8 feet or higher, use 348 gallons per acre (8 gallons/1,000 sq. ft.) for anchoring.

Rev. Date	Description
5-4-92	Wetlands Added wording

NOTES

1. No building or structures, other than electrical transmission towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.

CUT VOLUME: 890,045 C.Y.

LEGEND

- Property Line
- Buried Gas Line
- Stream
- Electrical Transmission Towers
- Limit of vegetation
- Silt Fence
- Grassed Waterway
- Nontidal Construction Limits

NOTE
SEE DWG 7537 FOR INDEX

Owner/Developer's Certificate

"We hereby certify that any clearing, grading, construction, and/or development will be done pursuant to this plan and that any responsible personnel involved in the construction project will have a certificate of attendance at a Department of Natural Resources approved training program for the control of sediment and erosion before beginning the project" by ICM Chemicals, Inc., 3901 Fort Armistead Road, Baltimore, MD. 410-355-3600.

Owner/Developer (Name and Title) Date

Contractor's Certificate

I hereby that my plan for Sediment & Erosion Control represents practical, workable plan based on personal knowledge of the site conditions and that it was prepared in accordance with the requirements of the Baltimore City Erosion & Sediment Control Section.

Signature Date

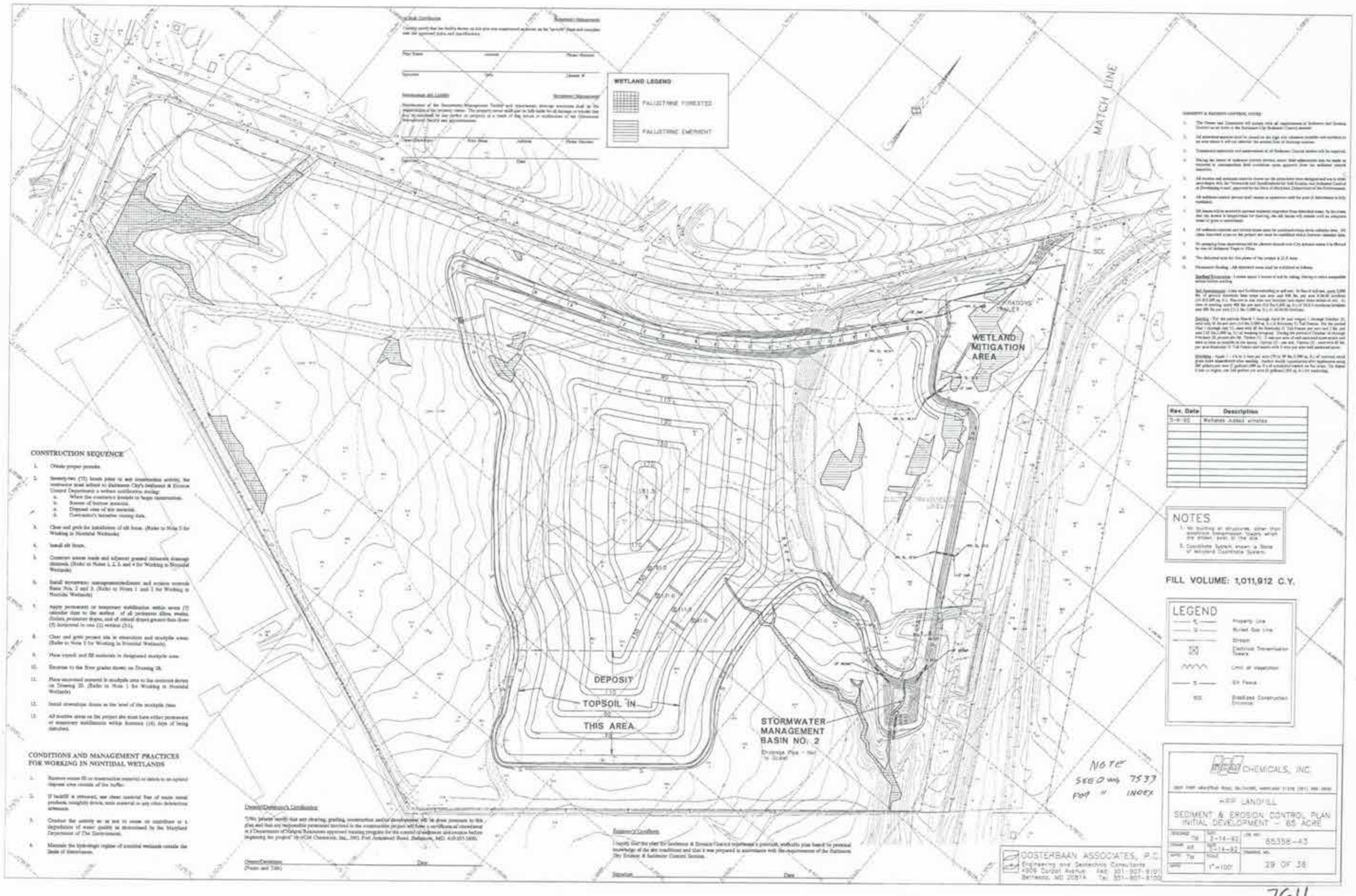
DOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4909 Cordell Avenue Fax: 301-907-9101
Bethesda, MD 20814 Tel: 301-907-9100

ICM CHEMICALS, INC.

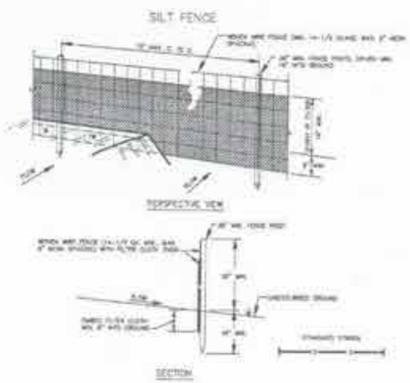
HPP LANDFILL
SEDIMENT & EROSION CONTROL PLAN - INITIAL DEVELOPMENT

DESIGNED TM	DATE 5-4-92	JOB NO. 65358-43	
DRAWN AH	DATE 5-4-92	DRAWING NO.	
CHKD TM	SCALE 1" = 100'	28 OF 36	

7610


WETLAND LEGEND
PALUSTRINE FORESTED
PALUSTRINE EMERGENT
MATCH LINE
WETLAND MITIGATION AREA
DEPOSIT
TOPSOIL IN
THIS AREA
STORMWATER MANAGEMENT BASIN NO. 2
Drainage Pipe - Not to Scale
NOTE
SEE DWG 7537
FOR " INDEX
CONSTRUCTION SEQUENCE
CONDITIONS AND MANAGEMENT PRACTICES FOR WORKING IN NONTIDAL WETLANDS
Rev. Date
Description
Wetlands Added wireless
NOTES
FILL VOLUME: 1,011,912 C.Y.
LEGEND
CHEMICALS, INC.
HRP LANDFILL
SEDIMENT & EROSION CONTROL PLAN
INITIAL DEVELOPMENT - 65 ACRE
65358-43
29 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
4909 Cordell Avenue
Bethesda, MD 20814

7611



CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGE" DEVELOPS IN THE SILT FENCE.

POSTS: STEEL EITHER T OR U TYPE OR 2" HARDWOOD.

FENCE: WOVEN WIRE, 14 GA. 2" MAX. MESH OPENING.

FILTER CLOTH: FILTER X, MIRAFI 1000, STABINAX, TRIDIM OR APPROVED EQUAL.

PREFABRICATED UNIT: GEOFAB, ENVIROFENCE OR APPROVED EQUAL.

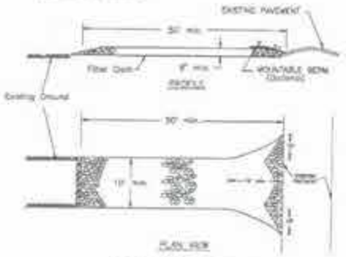
DETAIL 1 - SILT FENCE

SLOPE DETAIL (WITH BENCH)

Construction Specifications

1. All graded or disturbed areas including slopes shall be protected during clearing and construction in accordance with the approved sediment control plan until they are permanently stabilized.
2. All sediment control practices and measures shall be constructed, applied and maintained in accordance with the approved sediment control plan and the "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas".
3. Topsoil required for the establishment of vegetation shall be stockpiled in amount necessary to complete finish grading of all exposed areas.
4. Areas to be filled shall be cleared, grubbed and stripped of topsoil to remove trees, vegetation, roots or other objectionable material.
5. Areas which are to be topsoiled shall be scarified to a minimum depth of three inches prior to placement of topsoil.
6. All fill to be placed and compacted as required to reduce erosion, slippage, settlement, subsidence or other related problems. Fill intended to support buildings, structures and conduits, etc. shall be compacted in accordance with local requirements or codes.
7. Natural soil fill to be placed and compacted in layers not to exceed 8 inches in thickness.
8. Except for approved landfills, fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris and other objectionable materials that would interfere with or prevent construction of satisfactory fills.
9. Frozen materials or soft, mucky or highly compressible materials shall not be incorporated into fills.
10. Fill shall not be placed on a frozen foundation.
11. All benches shall be kept free of sediment during all phases of development.
12. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specifications for Subsurface Drain or other approved method.
13. All graded areas shall be permanently stabilized immediately following finished grading.
14. Stockpiles, borrow areas and spoil areas shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

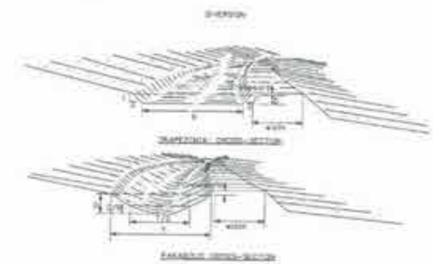
DETAIL 2 - SLOPE CONFIGURATION



Construction Specifications

1. Stone Size – Use 2" stone, or reclaimed or recycled concrete equivalent.
2. Length – As required, but not less than 30 feet (except on a single residence lot where a 30 foot minimum length would apply).
3. Thickness – Not less than six (6) inches.
4. Width – Ten (10) foot minimum, but not less than the full width at points where ingress or egress occurs.
5. Filter Cloth – Will be placed over the entire area prior to placing of stone. Filter will not be required on a single family residence lot.
6. Surface Water – All surface water flowing or diverted toward construction entrances shall be piped across the entrance. If piping is impractical, a mountable berm with 5:1 slopes will be permitted.
7. Maintenance – The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and /or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed or thrown onto public rights-of-way must be removed immediately.
8. Washing – Wheels shall be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device.
9. Periodic inspection and needed maintenance shall be provided after each rain.

DETAIL 3 - STABILIZED CONSTRUCTION ENTRANCE

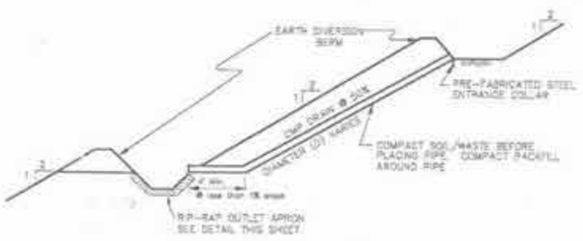


Construction Specifications

1. All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the diversion.
2. The diversion shall be excavated or shaped to line, grade, and cross section as required to meet the criteria specified herein, and be free of irregularities which will impede normal flow.
3. Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the completed diversion.
4. All earth removed and not needed in construction shall be spread and disposed of so that it will not interfere with the functioning of the diversion.
5. Stabilization shall be done according to the appropriate Standard and Specifications for Vegetative Practices.
   A. For design velocities of less than 3.5 ft. per sec., seeding and mulching may be used for the establishment of the vegetation. It is recommended that, when conditions permit, temporary diversions or other means be used to prevent water from entering the diversion during the establishment of the vegetation.
   B. For design velocities of more than 3.5 ft. per sec., the diversion shall be stabilized with sod, with seeding protected by jute or excelsior matting or with seeding and mulching including temporary diversion of water until the vegetation is established. See the Standard and Specifications for Protective Materials.

Standard Symbol

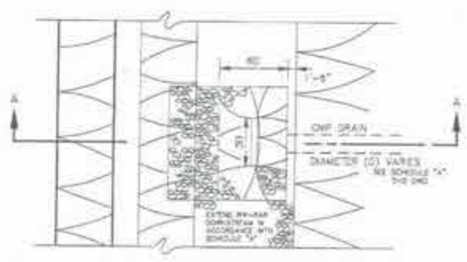
DETAIL 4 - DIVERSION-CENVEYANCE CHANNEL



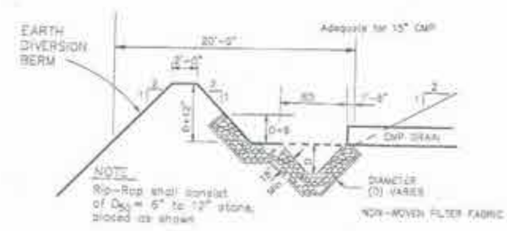
TYPICAL PROFILE OF BENCH DRAIN

NOT TO SCALE

DETAIL 5 - BENCH DRAIN PROFILE



PLAN



SECTION A–A

DETAIL 6 - BENCH DRAIN RIP-RAP OUTLET APRON

NOTE
SEE DWG 7537
FOR " INDEX

CHEMICALS, INC.

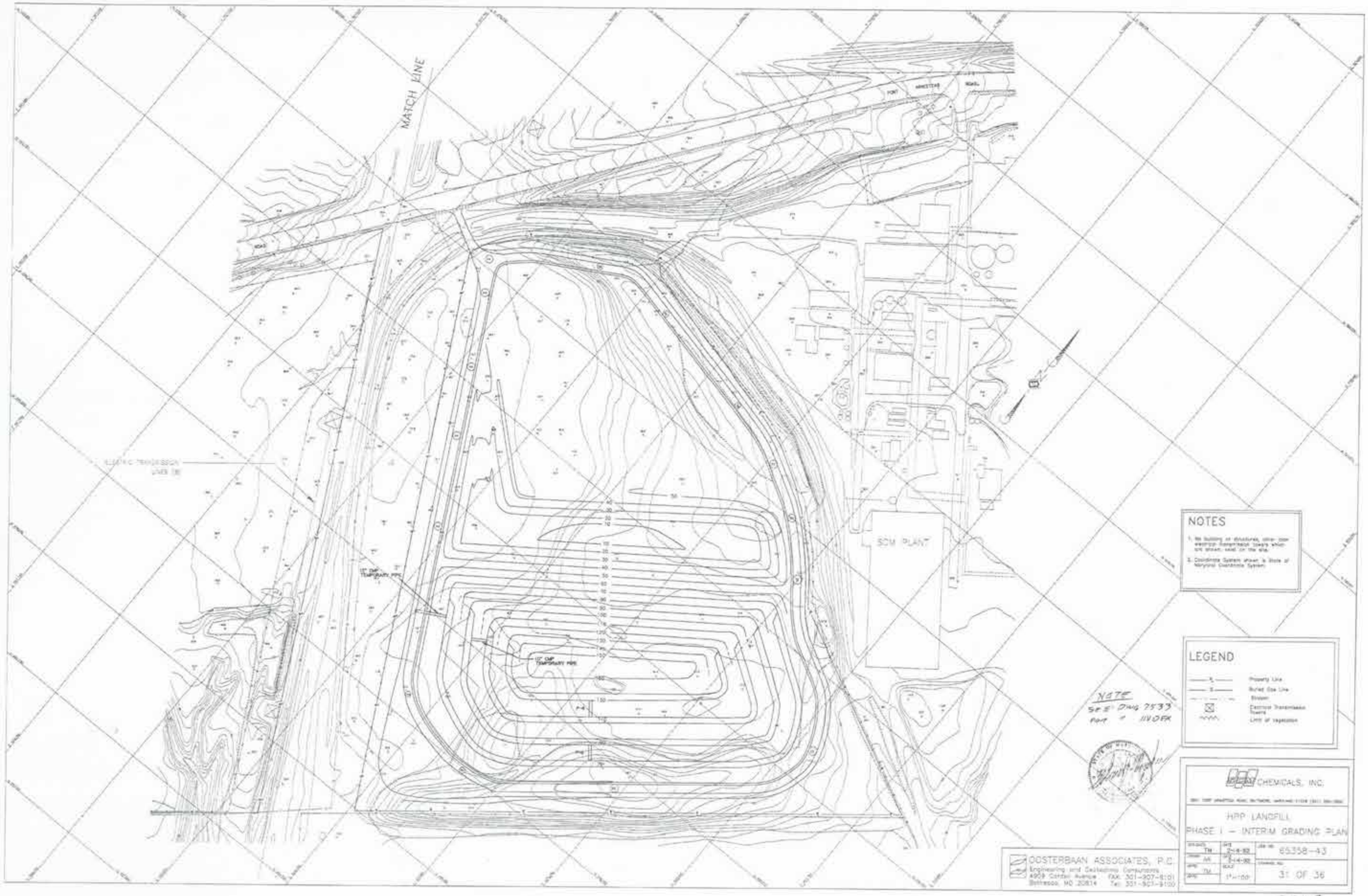
HPP LANDFILL

SEDIMENT & EROSION CONTROL DETAILS

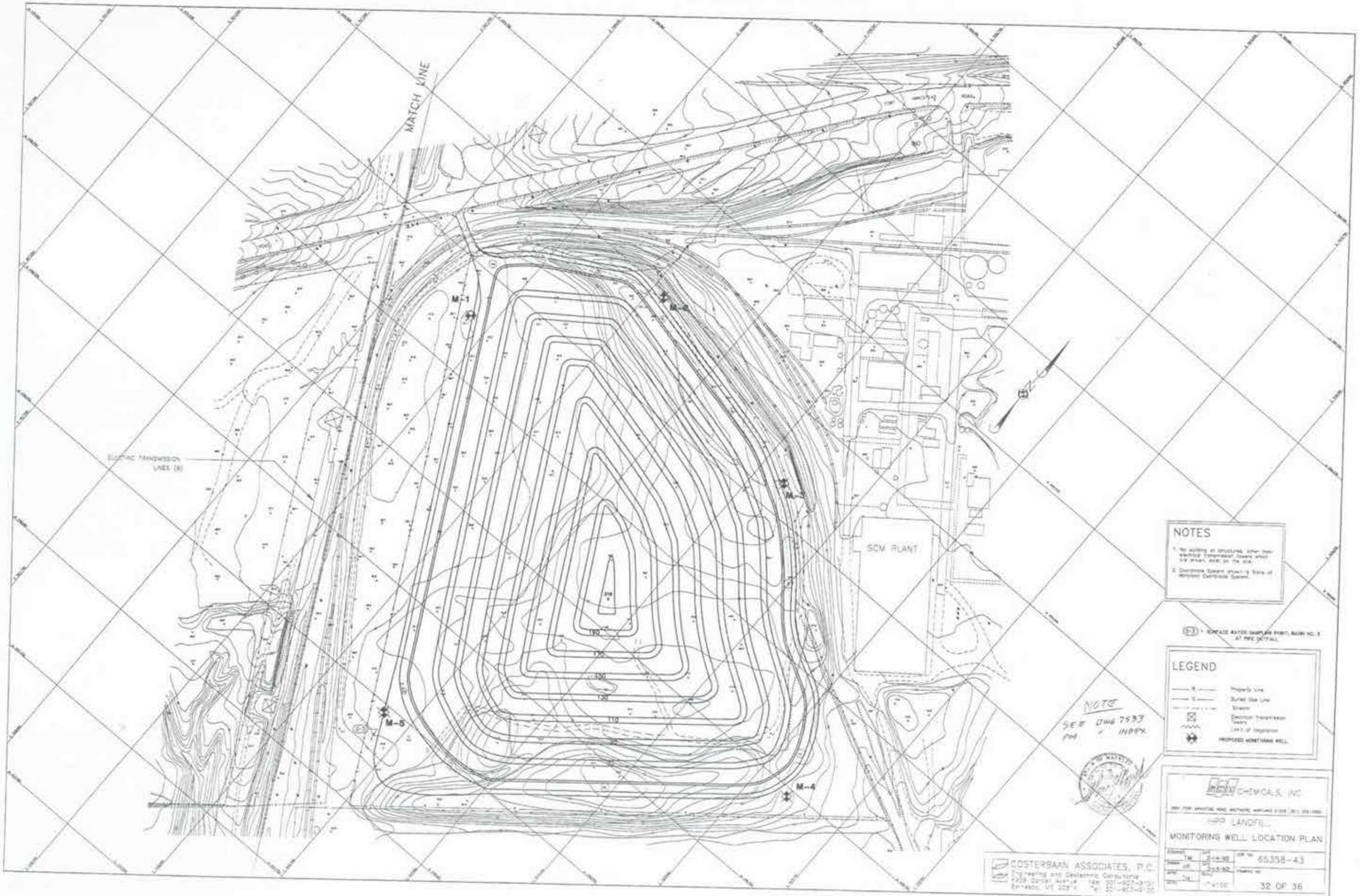
DESIGNED: A.P.	DATE: 2-14-88	FILE NO: 65358-43
DRAWN: A.P.	DATE: 2-15-88	DRAWING NO:
CHKD: V	CHKD:	30 OF 38
SCALE:	NO SCALE	

COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants
8609 Cordell Avenue FAX: 301-907-9101
Bethesda, MD 20814 Tel: 301-907-9100

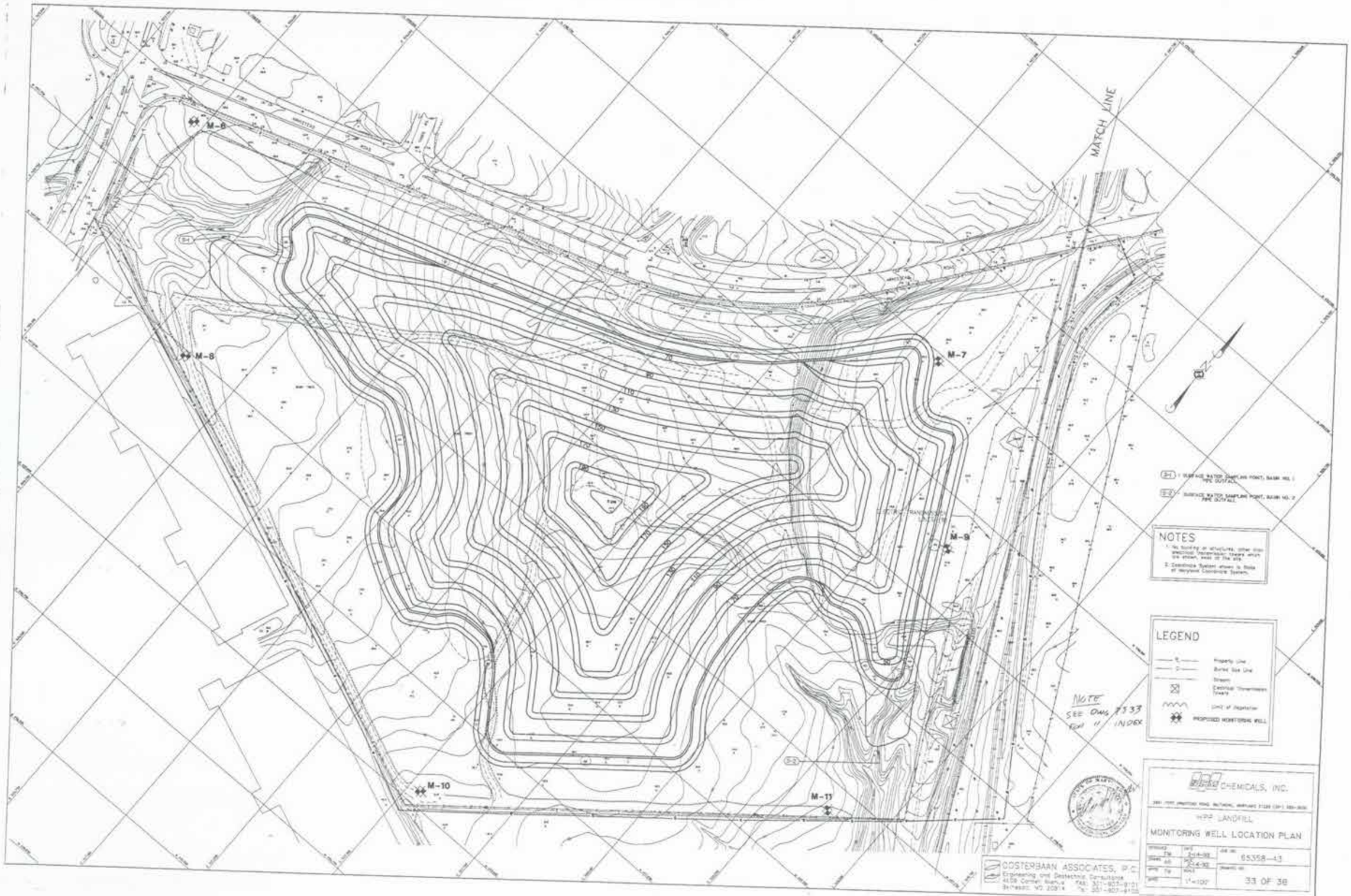
7612


MATCH LINE
SCM PLANT
NOTES
LEGEND
Property Line
Buried Gas Line
Stream
Electrical Transmission Towers
Limit of Vegetation
NOTE
SEE DWG 7533
FOR " 11VDFK
CHEMICALS, INC.
HPP LANDFILL
PHASE I – INTERIM GRADING PLAN
65358-43
31 OF 36
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants
4909 Cordell Avenue FAX: 301-907-8101
Bethesda, MD 20814 Tel: 301-907-9100

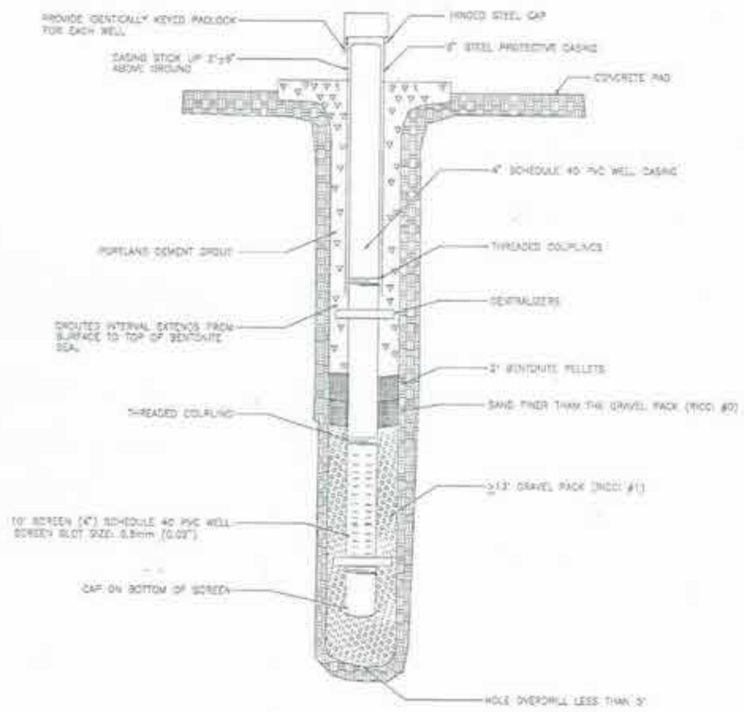
7613


MATCH LINE
M-1
M-2
M-3
M-4
M-5
SCM PLANT
ELECTRIC TRANSMISSION LINES (8)
NOTES
LEGEND
Property Line
Buried Gas Line
Stream
Electrical Transmission Towers
Limit of Vegetation
PROPOSED MONITORING WELL
NOTE
SEE DWG 7533
FOR INDEX
CHEMICALS, INC.
LANDFILL
MONITORING WELL LOCATION PLAN
65358-43
32 OF 36
COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnic Consultants

7614


MATCH LINE
M-6
M-7
M-8
M-9
M-10
M-11
NOTES
1. No building or structures, other than electrical transmission towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buffer Set Line
Stream
Electrical Transmission Towers
Limit of Vegetation
PROPOSED MONITORING WELL
NOTE
SEE DWG #333 FOR INDEX
CHEMICALS, INC.
HPP LANDFILL
MONITORING WELL LOCATION PLAN
65358-43
33 OF 38
1"=100'
COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants

7615



WELL CONSTRUCTION SCHEDULE

WELL NO.	STATUS	MONITORING WELL SCHEDULE (ELEV., FT)								WELL NO.
		GROUND ELEV.	BOTTOM OF HOLE	BOTTOM OF SCREEN	TOP OF SCREEN	TOP OF FILTER SAND[1]	TOP OF CLAY SEAL[2]	TOP OF 4" PVC CASING	TOP OF STEEL CASING[3]	
M-1	New	38	-122	-120	-110	-108	-106	40.5	40.7	M-1
M-2	New	61	-122	-120	-110	-108	-106	63.3	63.7	M-2
M-3	New	56	-122	-120	-110	-108	-106	58.5	58.7	M-3
M-4	New	45	-122	-120	-110	-108	-106	47.3	47.7	M-4
M-5	New	40	-122	-120	-110	-108	-106	42.5	42.7	M-5
M-6	New	32	-122	-120	-110	-108	-106	34.5	34.7	M-6
M-7	New	39	-122	-120	-110	-108	-106	41.3	41.7	M-7
M-8	Existing G-19	30.4	-103.6	-99.8	-89.8	-75.6	-66.6	33.10	33.18	M-8
M-9	New	37	-122	-120	-110	-108	-106	39.3	39.7	M-9
M-10	New	54	-122	-120	-110	-108	-106	56.5	56.7	M-10
M-11	New	39	-122	-120	-110	-108	-106	41.5	41.7	M-11

NOTES:

1. Top of Filter elevation same as bottom of Clay Seal.
2. All wells are to be grouted from top of clay seal to a level 30-inches below ground surface. Top three feet of borehole backfill will be concrete.
3. Top of Steel Casing, with cap open, will be used as reference point for groundwater measurements.
4. All Wells are to be installed by a State of Maryland licensed well driller in accordance with COMAR 26.04.04.

NOTE
SEE DWG 7533
PART " INDEX

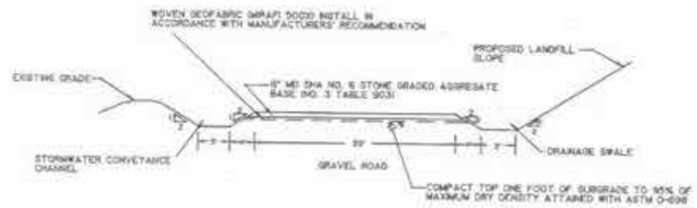
OSTERGAAN ASSOCIATES, P.C.
Engineering and Geological Consultants
1828 Center Avenue FAX: 201-907-9101
Fairlawn, NJ 07410 Tel: 201-907-9100

CHEMICALS, INC.

HPP LANDFILL
MONITORING WELL
DETAILS & SCHEDULE

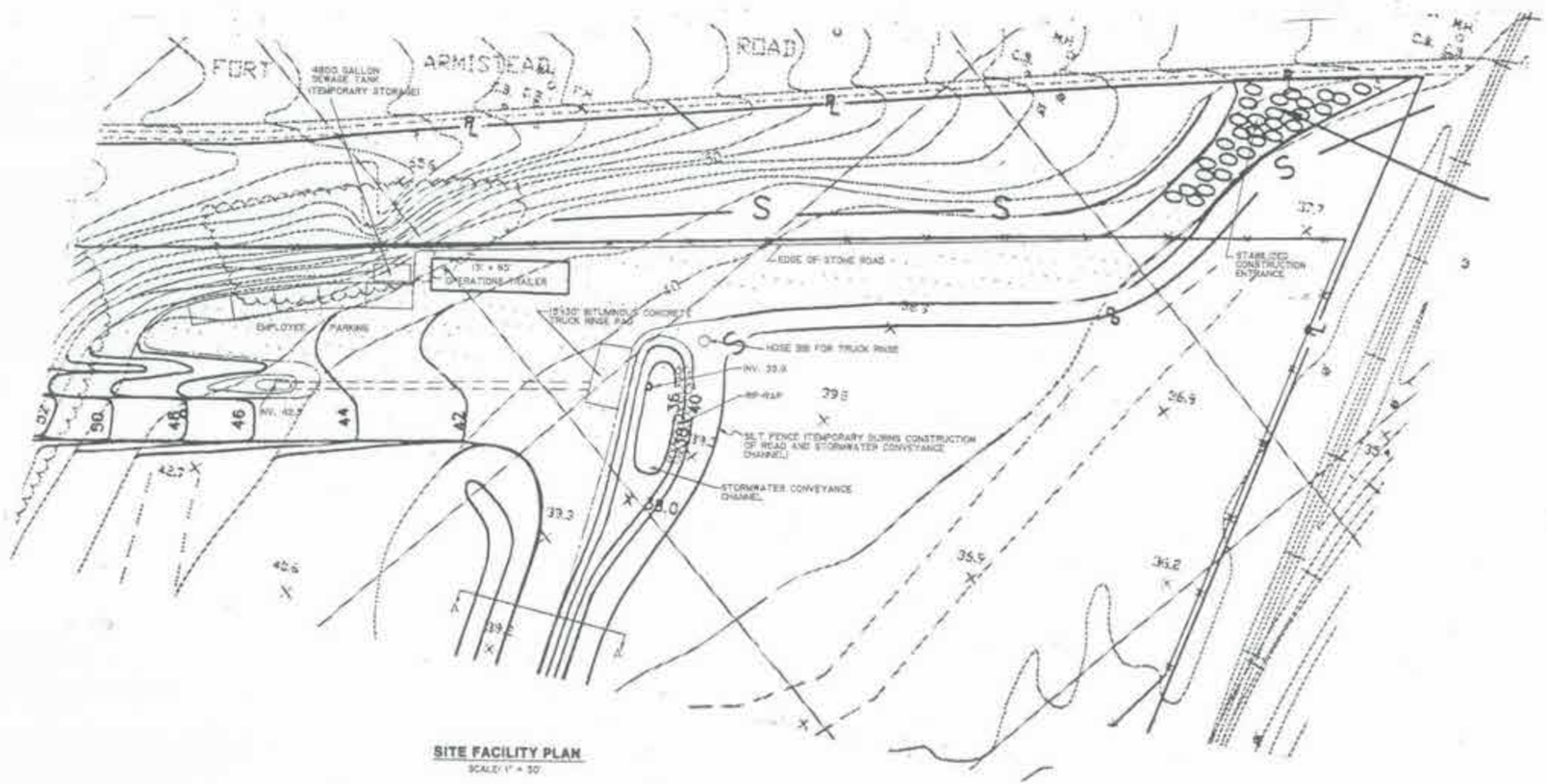
DESIGNED TM	DATE 2-14-93	JOB NO. 6535B-43
DRAWN AJF	DATE 2-14-93	
CHK'D TM	SCALE	
APPD	AS SHOWN	34 OF 38

7616



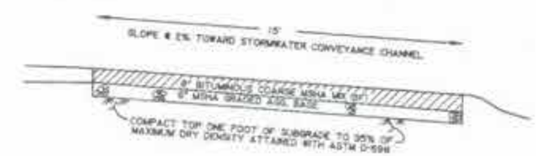
SECTION A-A ROADWAY DETAILS

SCALE: AS SHOWN



SITE FACILITY PLAN

SCALE: 1" = 50'



TRUCK RINSE PAD DETAILS

SCALE: 3/8" = 1'

NOTE
SEE DWG 7533
FOR " INV DEX

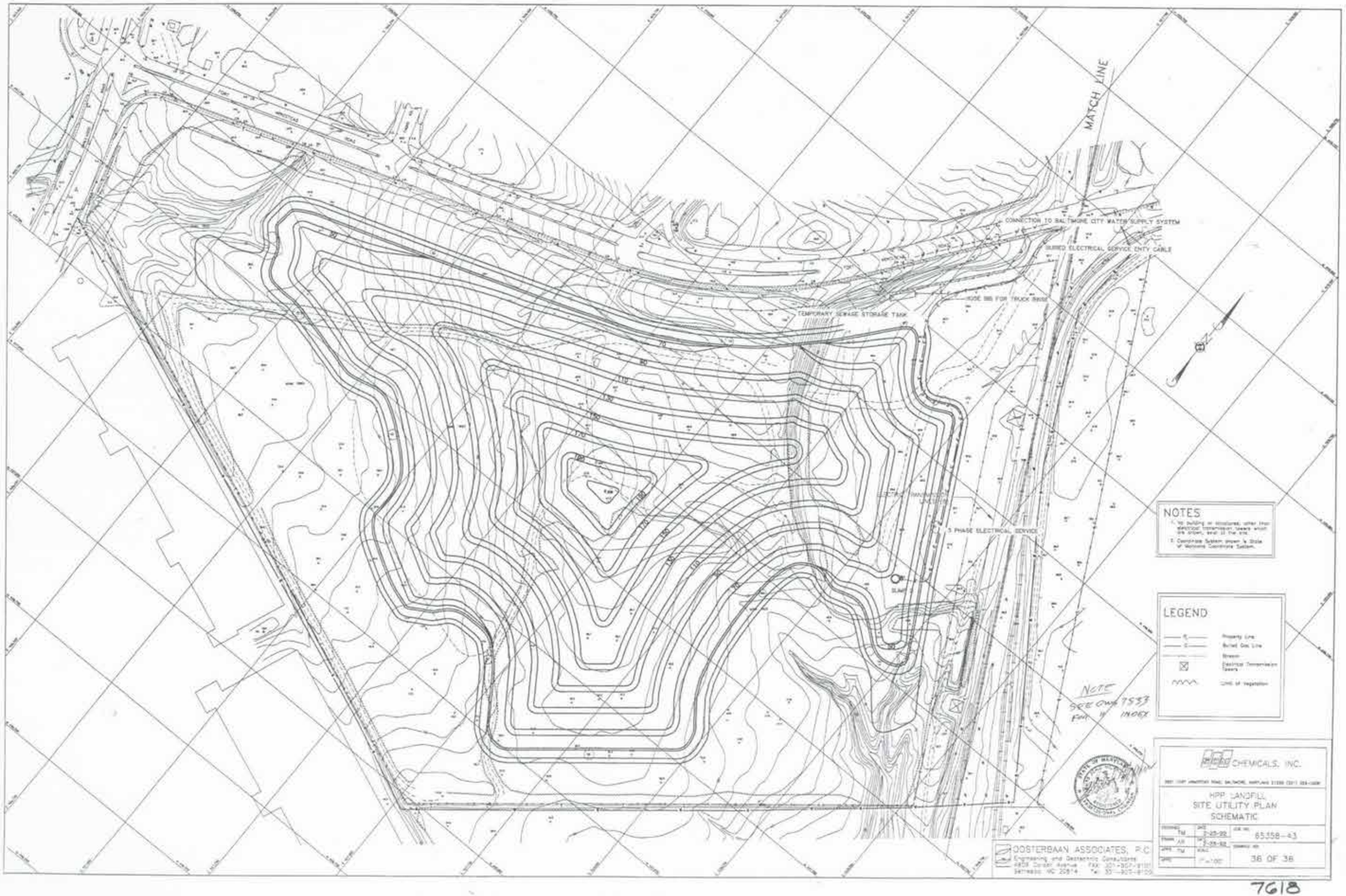
CHEMICALS, INC.

HPP LANDFILL
SITE FACILITY PLAN
AND DETAILS

DESIGNED TM	DATE 2-14-92	JOB NO. 65358-43	
DRAWN AR	DATE 2-14-92	DRAWING NO. 35 OF 36	
APPR. TM	SCALE AS SHOWN		
APPR.			

COSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants
4908 Carsel Avenue Tel: 301-907-8101
Bethesda, MD 20814 Fax: 301-907-8100

7617


MATCH LINE
CONNECTION TO BALTIMORE CITY WATER SUPPLY SYSTEM
BURIED ELECTRICAL SERVICE ENTY CABLE
TEMPORARY SEWAGE STORAGE TANK
3 PHASE ELECTRICAL SERVICE
SUMP
NOTES
1. No building or structures, other than electrical transmission towers which are shown, exist on the site.
2. Coordinate System shown is State of Maryland Coordinate System.
LEGEND
Property Line
Buried Gas Line
Stream
Electrical Transmission Towers
Line of Vegetation
NOTE
SEE DWG 7533 FOR INDEX
CHEMICALS, INC.
HPP LANDFILL
SITE UTILITY PLAN
SCHEMATIC
65358-43
38 OF 38
OOSTERBAAN ASSOCIATES, P.C.
Engineering and Geotechnical Consultants

7618

MILLENNIUM INORGANIC CHEMICALS, INC.

BALTIMORE, MARYLAND

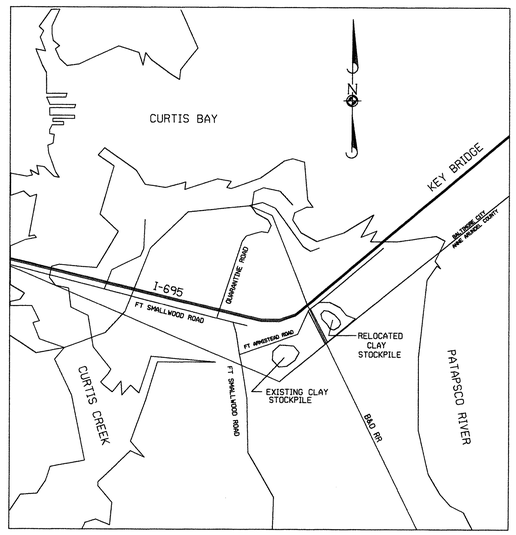
HPP LANDFILL - 30 ACRE SITE.

CLAY STOCKPILE RELOCATION

1. COVER SHEET AND VICINITY MAP
2. CLAY STOCKPILE GRADING PLAN
3. EROSION AND SEDIMENT CONTROL WATERSHED AREAS AND DRAINAGE
4. DETAILS AND SPECIFICATIONS

4A. CROSS-SECTIONS

REV. 11-4-10



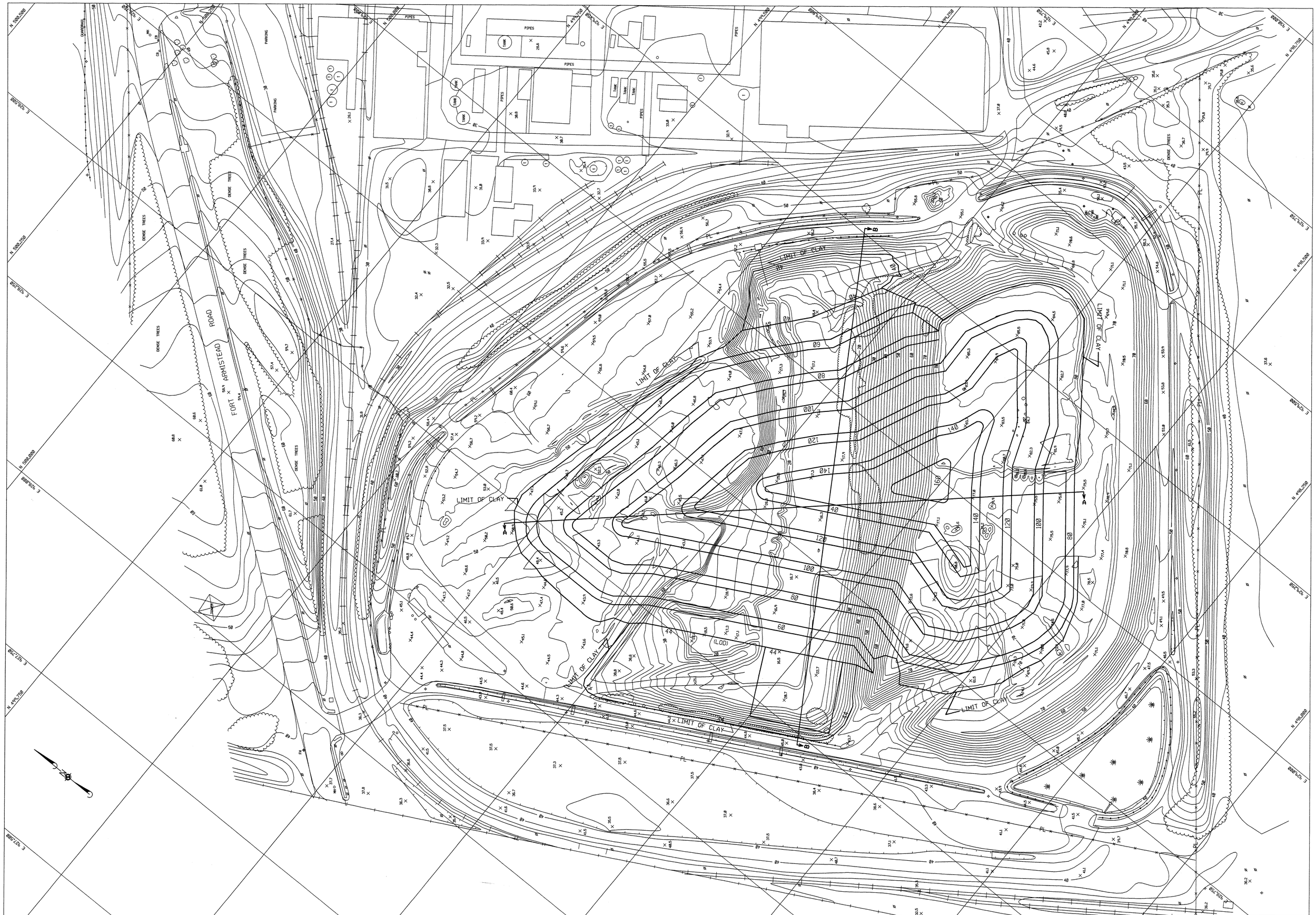
VICINITY MAP

3000'

AUGUST 6, 2010

TM ENGINEERING, INC.
2501 WESTMINSTER DRIVE
OLNEY, MARYLAND 20832

(410)792-2467
(301)924-0273


FORT ARMISTEAD ROAD
LIMIT OF CLAY
DENSE TREES
PARKING
PIPES
TANK
(LOD)
PL
A
B
N 498,250
N 498,000
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N 497,000
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OWNER'S/DEVELOPER'S CERFTIFICATION

I/We hereby certify that all clearing, grading, construction and/or development will be done pursuant to this plan and that any responsible personnel involved in the construction project will have a certificate of attendance at the Maryland Department of the Environment approved training program for the control of erosion and sediment before beginning the project. I hereby authorize the right of entry for periodic on-site evaluation by the State of Maryland, Department of the Environment Compliance Inspectors.

Date _____ Owner/Developer Signature _____

Card No. _____ Printed Name and Title _____

DESIGN CERFTIFICATION

I hereby certify that this plan has been designed in accordance with the 1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control, the 2000 Maryland Stormwater Design Manual, Volumes I & II with 2009 Supplement and the Maryland Department of the Environment erosion and sediment control and stormwater management regulations.

Date _____ Designer's Signature _____

MD P.E. Registration No. _____ Printed Name _____

Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. _____ Expiration Date _____

STORMWATER DETENTION DRAIN (SWDD)

NOT TO SCALE

PIPE SCHEDULE FOR SWDD

SWDD-1: 1.5" PVC SWDD-2: 1.5" PVC

SWDD-3A: 1.5" PVC SWDD-3B: 1" PVC

SWDD-4: 1.5" PVC SWDD-5A: 1.5" PVC

SWDD-5B: 1" PVC

STANDARD STABILIZATION NOTE

Following initial soil disturbance or redisturbance, permanent or temporary stabilization shall be completed within seven (7) calendar days as to the surface of all perimeter controls, dikes, swales, ditches, perimeter slopes and all slopes greater than 3 horizontal to 1 vertical (3:1); and fourteen days as to all other disturbed or graded areas on the project site.

STABILIZATION SCHEDULE

	AREA IDENTIFICATION	AREA SQUARE FEET	STABILIZATION TYPE	CONSTRUCTION SEQUENCE NUMBER
A	BUILDING	0	N/A	N/A
B	ROADWAYS /PAVING	0	N/A	N/A
C	PERVIOUS AREAS	522,966	GRADING - PERMANENT SEEDING	N/A
D	SEDIMENT CONTROLS	18,900	FOREBAY - TEMPORARY	3,4,5,6

SEE DRAWING 4 OF 4 FOR SEQUENCE OF CONSTRUCTION

ALL VEGETATIVE STABILIZATION WORK TO BE IN ACCORDANCE WITH SECTION G.20.B "STANDARDS AND SPECIFICATIONS FOR VEGETATIVE PRACTICE" 1994 MARYLAND SEDIMENT AND EROSION CONTROL MANUAL

PERMANENT SEEDING SUMMARY

SEED MIXTURE FOR HARDINESS ZONE 7b (FROM TABLE 25)				FERTILIZER RATE[1]			LIME RATE
NO.	SPECIES	APPLICATION RATE (LBS/AC)	SEEDING DATES	SEEDING DEPTHS(IN)	N	P2O5	K2O	
	TALL FESCUE	832	110	3-15	1			
	WEEPING LOVEGRASS	22	3	TO	½			
	SERECIA LESPEDEZA	152	20	11-15	1			

[1] SINCE DISTURBED AREA IS OVER FIVE (5) ACRES, CONTRACTOR SHALL HAVE SOIL AMENDMENT TESTS PERFORMED BY APPROVED AGENCY TO DETERMINE FERTILIZER AND LIME REQUIREMENTS

TEMPORARY SEEDING SUMMARY

SEED MIXTURE FOR HARDINESS ZONE 7b (FROM TABLE 26)				FERTILIZER RATE 10-10-10	LIME RATE
NO.	SPECIES (SELECT ONE)	APPLICATION RATE (LBS/AC)	SEEDING DATES	SEEDING DEPTHS(IN)	
	WEEPING LOVEGRASS	4	5/1-8/14	¼-½	600 LB/AC (15 LB/1000 SF)
	ANNUAL RYEGRASS	50	2/1-4/30 8/15-11/1	¼-½	2 T/AC (100 LB/1000 SF)
	MILLET	50	5/1-8/14	½	

SITE ANALYSIS

TOTAL DISTURBED AREA:	12.47 AC.
CUT DISTURBED AREA:	0.20 AC.
FILL DISTURBED AREA:	12.27 AC.
TOTAL CUT:	158 CY.
TOTAL FILL:	1,000,000 C.Y.
CUT/FILL RATIO:	0.0015

STANDARD EROSION AND SEDIMENT CONTROL NOTES

1. THE CONTRACTOR WILL COMPLY WITH ALL REQUIREMENTS OF EROSION AND SEDIMENT CONTROL AS SET FORTH IN THE BALTIMORE CITY EROSION AND SEDIMENT CONTROL MANUAL.
2. CONTRACTOR MUST SUBMIT WRITTEN NOTIFICATION 72 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITY TO THE BALTIMORE CITY DEPARTMENT OF PUBLIC WORKS ENVIRONMENTAL SECTION CMB4 DRUID PARK DRIVE, ROOM 227, BALTIMORE, MD 21202, PHONE: 410-523-7941 STATING: A) WHEN CONTRACTOR INTENDS TO BEGIN CONSTRUCTION, B) SOURCE OF BORROW MATERIAL, C) DISPOSAL SITE FOR EXCESS MATERIAL, AND D) STAGING AND/OR STOCKPILE LOCATIONS.
3. INITIAL DISTURBANCE WILL BE LIMITED TO THAT NECESSARY TO GAIN ENTRANCE TO THE SITE AND INSTALL NECESSARY SEDIMENT CONTROLS AS PER THE APPROVED PLANS.
4. ALL SEDIMENT CONTROLS AND CRITICAL SLOPES MUST BE STABILIZED WITHIN SEVEN CALENDAR DAYS. ALL OTHER INACTIVE DISTURBED AREAS ON THE PROJECT SITE MUST BE STABILIZED WITHIN FOURTEEN CALENDAR DAYS.
5. ALL EXCAVATED MATERIAL SHALL BE PLACED ON THE HIGH SIDE WHENEVER POSSIBLE AND CONFINED TO AN AREA WHERE IT WILL NOT OBSTRUCT THE NORMAL COURSE OF DRAINAGE.
6. PUMPING OF SEDIMENT LADEN WATER WILL NOT BE ALLOWED UNLESS IT IS FILTERED BY AN APPROVED SEDIMENT TRAPPING DEVICE.
7. CONTINUOUS INSPECTION AND MAINTENANCE OF OF ALL SEDIMENT CONTROL DEVICES IS MANDATORY.
8. ANY SEDIMENT CONTROL DEVICES DISTURBED DURING UTILITY CONSTRUCTION MUST BE RESTORED IMMEDIATELY.
9. ALL POINTS OF INGRESS AND EGRESS SHALL BE PROTECTED TO MINIMIZE TRACKING OF MUD ONTO PUBLIC RIGHTS-OF-WAY.
10. ANY EARTH, GRAVEL AND/OR OTHER MATERIAL TRACKED, SPILLED OR WASHED ONTO ADJACENT ROADS MUST BE IMMEDIATELY REMOVED AND DISPOSED IN A PROPER MANNER. FLUSHING WILL N OT BE PERMITTED. ALL MATERIAL MUST BE REMOVED BY MEANS SHOVELING AND SWEEPING.
11. ON ALL SITES WITH DISTURBED AREAS IN EXCESS OF 5000 SQ.FT., THE CONTRACTOR SHALL HAVE A BALTIMORE CITY EROSION AND SEDIMENT CONTROL INSPECTOR INSPECT AND APPROVE THE WORK COMPLETED AT STAGES OF CONSTRUCTION SPECIFIED AS FOLLOWS: A) UPON COMPLETION OF THE INSTALLATION OF THE PERIMETER SEDIMENT CONTROLS, B) DURING ALL BUILDING AND GRADING OPERATIONS, C) UPON FINAL STABILIZATION OF ENTIRE SITE PRIOR TO REMOVAL OF SEDIMENT CONTROLS.
12. THE CONTRACTOR SHALL NOT DEVIATE FROM THE APPROVED EROSION AND SEDIMENT CONTROL PLAN WITHOUT FIRST RECEIVING APPROVAL FROM THE ENVIRONMENTAL ENGINEERING SECTION. VARIATIONS TO THE ORIGINAL PLAN MUST BE SUBMITTED IN WRITING WITH ALL PROPOSED MODIFICATIONS BEING NOTED. MINOR SUBSTANTIAL CHANGES WILL NECESSITATE AMENDEMENT OF THE GRADING /BUILDING PERMIT.

LEGEND

- PL = PL - PROPERTYLINE ALONG FENCELINE
- WS = WATERSHED BOUNDARY - SITE PERIMETER
- WS = WATERSHED BOUNDARY - INTERNAL
- = DRAINAGE FLOW PATH
- × = DRAINAGE RELATED SPOT ELEVATION
- 80 = PROPOSED GRADE/CONTOUR - CLAY STOCKPILE
- 40 = EXISTING GRADE/CONTOUR
- PSD-12 = PIPE SLOPE DRAIN W/SIZE IN INCHES
- SCE = STABILIZED CONSTRUCTION ENTRANCE (SEE SCHEDULE, DWG. 4 OF 4)
- RIP-RAP = ROCK OUTLET PROTECTION 1

WS-B1C = CLAY
WS-B1W = WASTE
WS-B1G = GRAVEL
WS-B1P = PAVED
WS-B1O = OUTER

SYMBOLS

- PDLE
- LIGHT POLE
- SIGN
- MANHOLE
- MAILBOX
- FIRE HYDRANT
- LOCATED OBJECT

PROFESSIONAL CERTIFICATION

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND

LICENSE NO. 19874
EXPIRATION DATE: 3-13-12

REV.	DATE	MODIFICATIONS
1	11-4-10	MODIFICATIONS PER WSCM LETTER 9-30-19

MILLENNIUM INORGANIC CHEMICALS

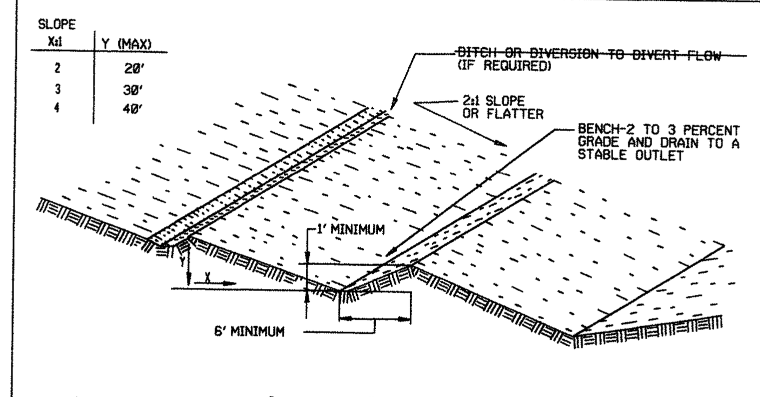
TME NGINEERING, INC.

HPP LANDFILL- 30 ACRE SITE
EROSION & SEDIMENT CONTROL
WATERSHED AREAS AND DRAINAGE

DATE OF DRAWING: 08-08-10
SCALE: 1" = 50' CONTOUR INTERVAL: 2'
DATE OF PHOTOGRAPHY: 12-14-08
PHOTOGRAMMETRY BY: WINES AERIAL MAPPING CO., INC.

DWG. No. 3 OF 4

DETAIL - BENCHED SLOPES



Construction Specifications

1. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence or other related problems. Fill intended to support buildings, structures and conduits, etc., shall be compacted in accordance with local requirements or codes.

2. All fill shall be placed and compacted in layers not to exceed 8" in thickness.

3. Except for approved landfills or nonstructural fills, fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris and other objectionable materials that would interfere with or prevent construction of satisfactory fills.

4. Frozen material or soft, mucky or highly compressible materials shall not be incorporated into fill slopes or structural fills. Fill shall not be placed on a frozen foundation.

5. All benches/berms shall be kept free of sediment during all phases of development.

6. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specification for Subsurface Drain or other approved methods.

7. All graded areas shall be permanently stabilized immediately following finished grading.

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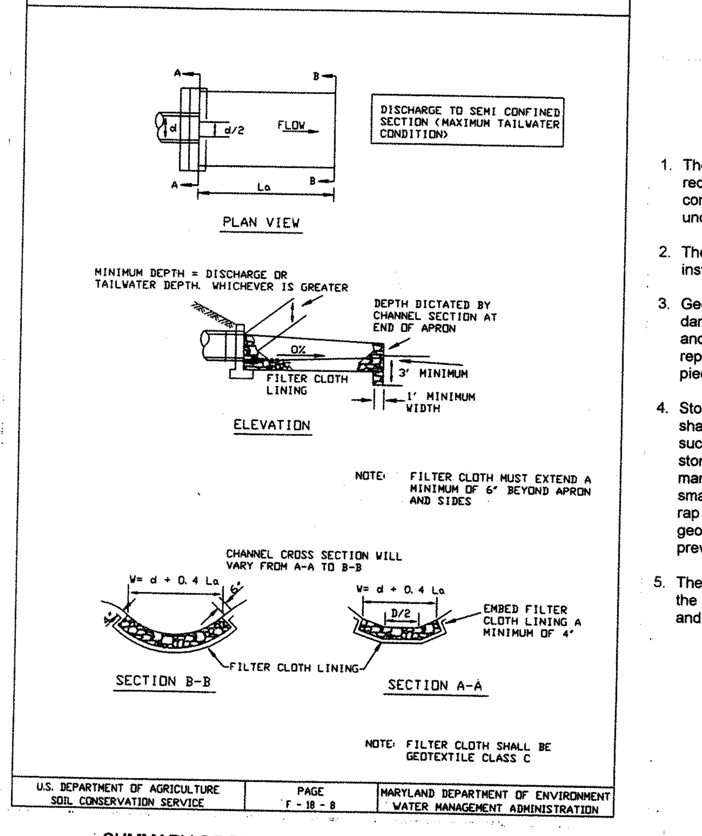
DETAIL 25 - ROCK OUTLET PROTECTION I



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ROCK OUTLET PROTECTION I

Construction Specifications

1. The subgrade for the filter, rip-rap or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grading limits when installed respectively in the rip-rap or filter.

3. Geotextile shall be protected from punching, cutting or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of geotextile over the damaged part or by completely replacing the geotextile. All overlaps whether for repairs or joining two pieces of geotextile shall be a minimum of one foot.

4. Stone for the rip-rap or gabion outlets may be placed by equipment. They shall be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The stone for rip-rap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogeneous with the smaller stones and spalls filling the voids between the larger stones. Rip-rap shall be placed in a manner to prevent damage to the filter blanket or geotextile. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

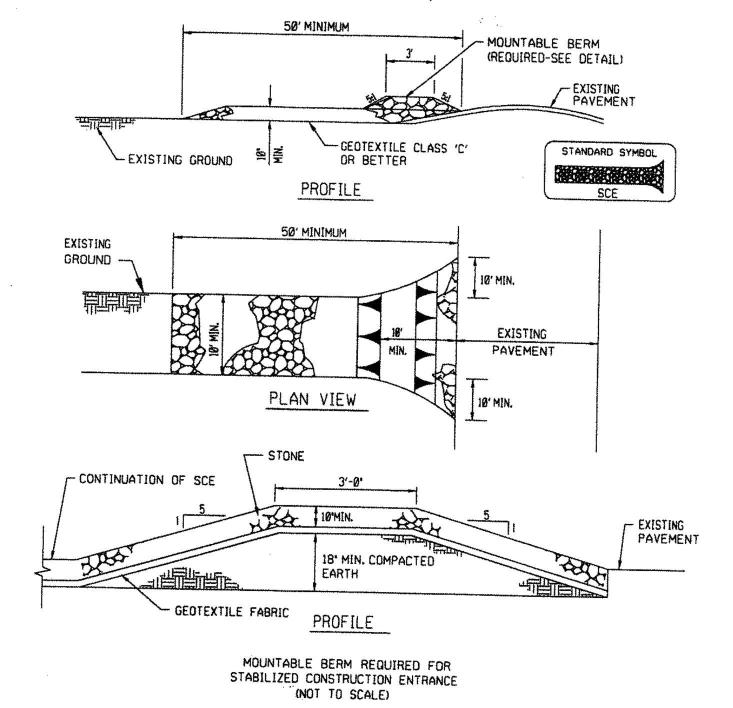
5. The stone shall be placed so that it blends in with the existing ground. If the stone is placed too high then the flow will be forced out of the channel and scour adjacent to the channel will occur.

SUMMARY OF ROCK OUTLET PROTECTION[1]

PIPE NO. (OUTLET)	DIAM. (in.)	Q_{10} (cfs)	V_{10} (fps)	D_{50}[1,2] (ft)	La (ft)	Wa[4] (ft)
A-1	12	3.42	<3[3]	0.1	5	3
A-2	12	5.33	4.89	0.2	15	7
A-3	12	7.13	9.28	0.3	22	9
A-4	12	8.47	7.77	0.4	26	11.4
A-5T	24	32.35	10.3	0.3	29	13.6
A-6	24	29.27	9.32	0.5	26	12.4

(1) Table 19, p F-18-6, Maryland E&S Manual, 1994.
(2) Class I Rip-Rap to be used for all outlets - exceeds all D_{50} requirements: D_{50} = 9.5" (0.79')
(3) Actual table value off-chart. Use estimated value.
(4) Full width of swale plus side slopes of swale to be lined with rip-rap.

HEAVY DUTY STABILIZED CONSTRUCTION ENTRANCE



CONSTRUCTION SPECIFICATIONS

1. STONE - CRUSHED AGGREGATE (2" TO 3") OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - AS REQUIRED, BUT NOT LESS THAN 50 FEET (EXCEPT ON SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WILL APPLY).
3. THICKNESS - NOT LESS THAN (6) INCHES.
4. WIDTH - TEN (10) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. GEOTEXTILE FABRIC CLASS 'C' OR BETTER SHALL BE PLACED OVER THE EXISTING GROUND PRIOR TO PLACING OF STONE. GEOTEXTILE FABRIC CLASS 'C' WILL NOT BE REQUIRED ON A SINGLE FAMILY RESIDENT LOT.
6. A MOUNTABLE BERM WITH 5:1 SLOPES IS REQUIRED FOR ALL SURFACE FLOWING OR DIVERTED TOWARDS CONSTRUCTION ENTRANCE.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WASHING - WHEELS MUST BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

HEAVY DUTY STABILIZED CONSTRUCTION ENTRANCE — NOT TO SCALE

DETAIL - PIPE SLOPE DRAIN

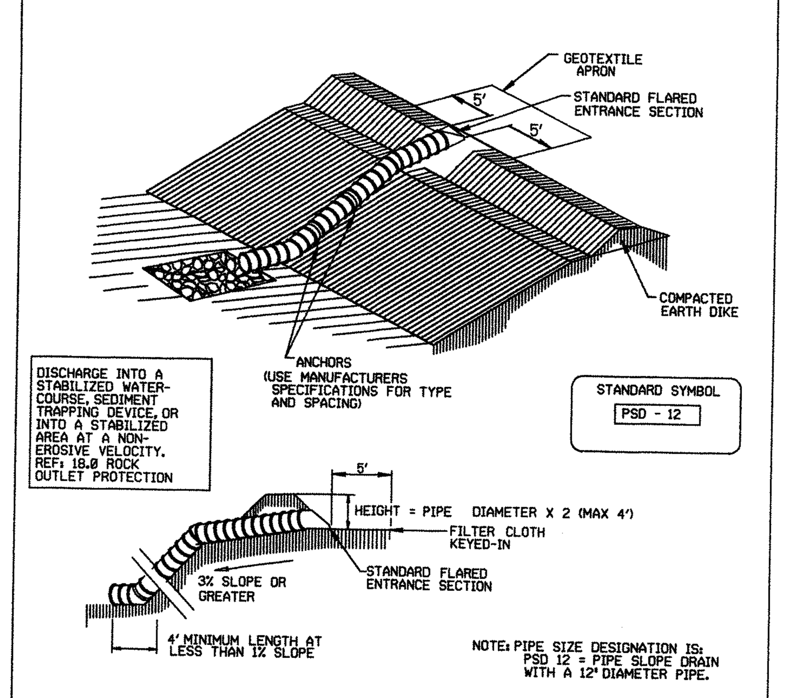


Table 6 Design Criteria for Pipe Slope Drain

Size	Pipe/Tubing Diameter (D) in	Maximum Drainage Area (Acres)
PSD-12	12	0.5
PSD-18	18	1.5
PSD-21	21	2.5
PSD-24	24	3.5
PSD-24 (2)	24	5.0

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PIPE SLOPE DRAIN

PIPE SLOPE DRAIN

Construction Specifications - Pipe Slope Drain

1. The Pipe Slope Drain (PSD) shall have a slope of 3 percent or steeper.

2. The top of the earth dike over the inlet pipe shall be as ~~least 2 times the pipe diameter measured at the invert of the pipe.~~ shown in Berm Detail above.

3. Flexible tubing is preferred. ~~However, corrugated metal pipe or equivalent PVC pipe can be used.~~ All connections shall be watertight.

4. A flared end section shall be attached to the inlet end of pipe with a watertight connection. Filter cloth shall be placed under the inlet of the pipe slope drain and shall extend out 5' from the inlet. The filter cloth shall be 'keyed in' on all sides.

5. The Pipe Slope Drain shall be securely anchored to the slope by staking at the grommets provided. Spacing for anchors shall be as provided by manufacturer's specification. In no case shall less than two (2) anchors be provided, equally spaced along the length of pipe. These details should be provided by pipe suppliers.

6. The soil around and under the pipe and end section shall be hand tamped in 4 inch lifts to the top of the earth dike.

7. All pipe connections shall be watertight.

8. Whenever possible where a PSD drains an unstabilized area, it shall outlet into a sediment trap or basin. If this is not possible then the slope drain will discharge into a stable conveyence that leads to a sediment trap or basin. ~~When discharging into a trap or basin the PSD shall discharge at the same elevation as the wet pool elevation.~~ The discharge from the PSD must be as far away from the sediment control outlet as possible.

9. When the drainage area is stabilized, the PSD shall discharge onto a stabilized area at a non-erosive velocity.

10. Inspection and any required maintenance shall be performed periodically and after each rain event.

11. The inlet must be kept open at all times.

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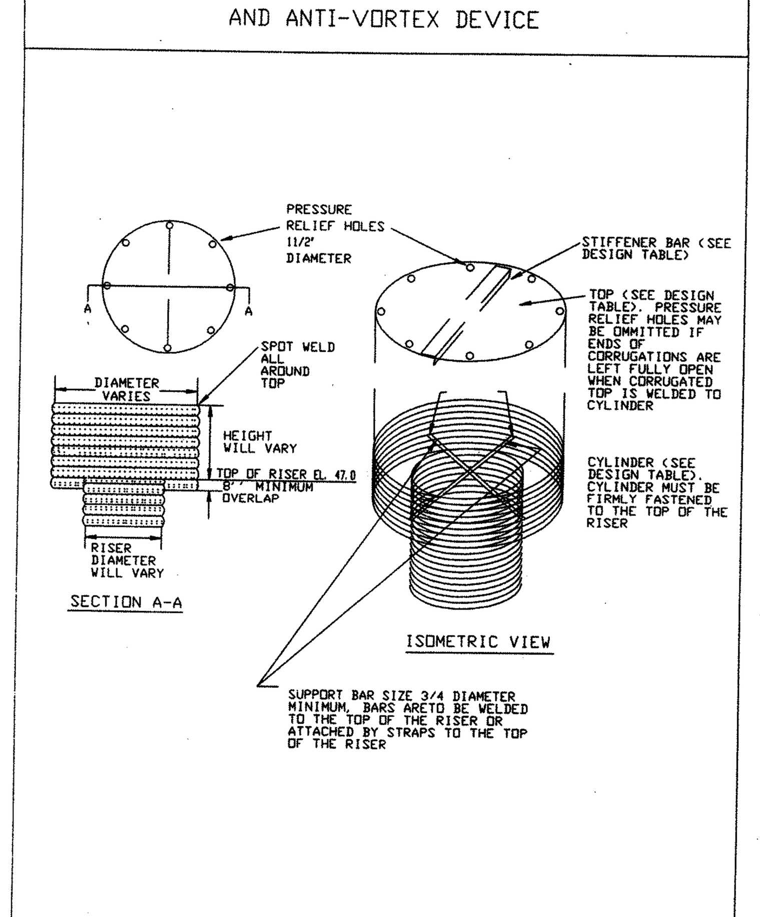
DETAIL 16 - CONCENTRIC TRASH RACK AND ANTI-VORTEX DEVICE



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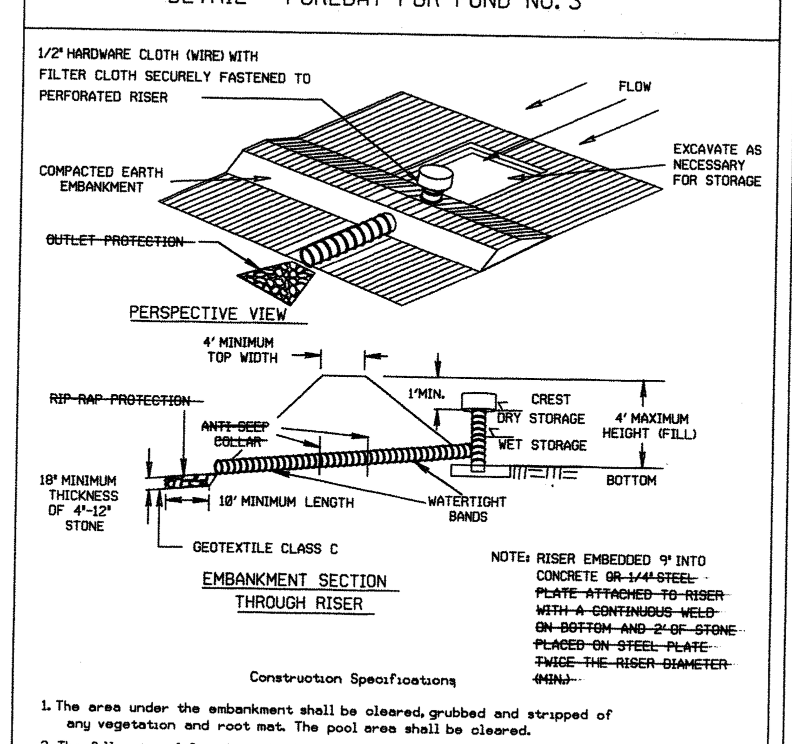
DETAIL - FOREBAY FOR POND NO. 3



Construction Specifications

1. The area under the embankment shall be cleared, grubbed and stripped of any vegetation and root mat. The pool area shall be cleared.

2. The fill material for the embankment shall be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. ~~The embankment shall be compacted by traversing with equipment while it is being constructed.~~ See Compaction Specification this Dwg.

3. The total trap volume as measured from the bottom to riser crest elevation shall be 3600 cubic feet per acre of drainage area (see Table 4). The top of embankment must be 1' above the riser crest elevation.

4. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one half of the wet storage depth of the trap (1800cf/ac). The sediment shall be deposited in a suitable area and in such a manner that it will not erode.

5. The structure shall be inspected periodically and after each rain and repairs made as necessary.

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FOREBAY FOR POND NO. 3

6. Construction operations shall be carried out in such a manner that erosion and water pollution are abated. Once constructed, the top and outside face of the embankment shall be stabilized with seed and mulch. Points of concentrated inflow shall be protected in accordance with Grade Stabilization Structure criteria. The remainder of the interior slopes should be stabilized (one time) with seed and mulch upon trap completion and monitored and maintained erosion free during the life of the trap.

7. The structure shall be removed and area stabilized when the drainage area has been properly stabilized and upon written approval of MIC.

8. All cut and fill slopes shall be 2:1 or flatter.

9. All pipe connections shall be watertight.

10. Above the wet storage elevation, the riser shall be perforated with 1/2" wide by 6" long slits or 1" diameter holes spaced 6" vertically and horizontally. No perforations will be allowed within 6" of the horizontal barrel.

11. The riser shall be wrapped with 1/2" hardware cloth (wire) then wrapped with Geotextile Class E. The filter cloth shall extend 6" above the highest slit and 6" below the lowest slit. Where ends of filter cloth come together, they shall be overlapped, folded and fastened to prevent bypass. Filter cloth shall be replaced as necessary to prevent clogging.

12. Straps or connecting bands shall be used to hold the filter cloth and wire fabric in place. They shall be placed at the top and bottom of the cloth.

13. Fill material around the pipe spillway shall be hand compacted in 4" layers. A minimum of 2' of hand-compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment.

14. The riser shall be anchored with ~~either~~ a ~~concrete~~ base ~~or steel plate base~~ to prevent flotation. Concrete bases shall be at least twice the riser diameter and 12" deep with the riser embedded 9". ~~Steel plate bases shall be at least twice the riser diameter, 1/4" minimum thickness and attached to the bottom of the riser by a continuous weld to form a watertight connection. Then place 2' of stone, gravel or tamped earth on the plate.~~

~~15. Anti seep collars shall be constructed in accordance with plans (ref. table 16 and Details 13 and 14).~~

16. Concentric trash rack and anti-vortex device design details are on Detail 16.

17. Refer to Section D for dewatering requirements of sediment traps.

18. Outlet - An outlet shall be provided, which includes a means of conveying the discharge in an erosion free manner to an existing stable channel.

19. Where discharge occurs at the property line, local ordinances and drainage easement requirements shall be met.

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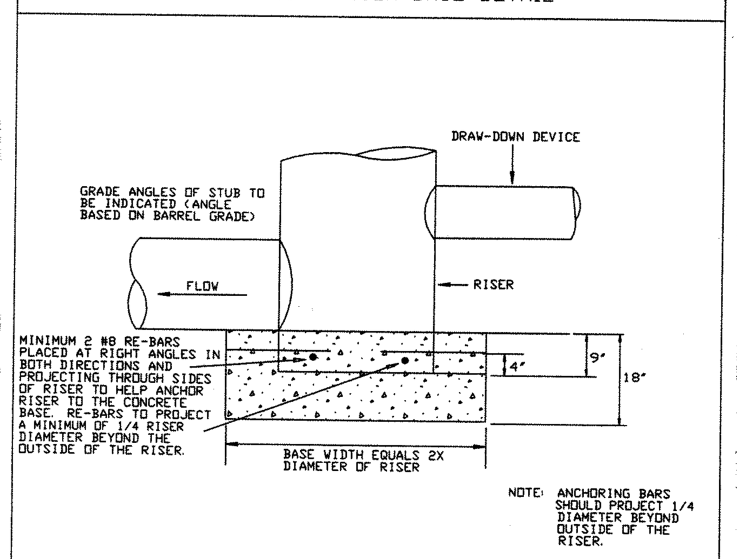
DETAIL 15 - RISER BASE DETAIL



Construction Specifications

The riser shall have a base attached with a watertight connection and shall have sufficient weight to prevent flotation of the riser. Two approved bases for risers 10' or less in height are:

1. A concrete base 18" thick with the riser embedded 9" in the base.

2. A 1/4" minimum thickness steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2' of stone, gravel, or compacted earth placed on it to prevent flotation. In either case, each side of the square base shall be twice the riser diameter.

Note: For risers greater than ten feet high computations shall be made to design a base which will prevent flotation. The minimum factor of safety shall be 1.20 (downward forces = 1.20 x upward forces).

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TECHNICAL SPECIFICATIONS

INTRODUCTION

Millennium Inorganic Chemicals, Inc. (MIC), a Cristal Global Company, currently operates an industrial waste landfill on the south side of Fort Armistead Road in the City of Baltimore, Maryland. The landfill property consists of two adjacent parcels of land separated by the CSX railroad track right-of-way. The first parcel on the east side of the tracks is thirty (30) acres in size and contains the operating landfill while the second parcel west of the tracks is sixty- five (65) acres upon which a clay stockpile is situated. Both parcels are permitted by the Maryland Department of the Environment (MDE) for landfill operations, and while the stockpile exists, the excavation and export of clay from the site is governed by an MDE surface mining permit.

MIC is allowing a portion of the stockpile to be relocated from the 65 acre parcel to the 30 acre parcel. The WORK under this contract consists of excavating clay from the stockpile, loading into trucks, transporting to the 30 acre parcel, placing and compacting to the line and grade designated on these drawings all in accordance with stormwater management and sediment and erosion control regulations. The landfill may be in continuous operation (from 7 A.M. until 5 P.M.) during the period of the Work and the contractor will coordinate his work with the MIC project manager and the MIC landfill manager to avoid any hindrance to landfill operations.

In order to maintain the existing stormwater collection function of the existing basin, the contractor will furnish and operate pumps of a sufficient capacity to keep the work area dry for the duration of the WORK.

SECTION I: CONSTRUCTION SURVEYS

The contractor will be responsible for layout of the WORK to be performed under these Technical Specifications. The survey work will consist of locating line and grade of clay fill, excavation and stormwater conveyance pipes. The contractor shall set and mark field stakes to clearly identify the WORK and will allow location and elevation checks by MIC's surveyor. The contractor shall submit work sheets showing contractor's baseline locations for MIC review and written approval.

The contractor is responsible for the proper field location and grade of all construction items within the WORK area as shown on these drawings and referenced in these Technical Specifications. The primary baseline for construction shall be the fence line along the 30 acre parcel northwest property boundary adjacent and parallel to the railroad. The primary baseline, actual dimensions specified on the drawings and scaled distances measured on the drawings, in lieu of specified dimensions, shall be used as the basis for construction layout. The primary baseline shall be marked in the field by the contractor.

SECTION II: SITE CONDITIONS

The WORK area consists primarily of open ground in both the topographically low and topographically high portions of the 30 acre parcel landfill over previously placed waste solids. Elevations in the WORK area, referenced to mean sea level Datum of 1929, range from approximately el. 20 to el. 80+. The low area was formerly a storm/contact water collection basin and runoff is still collected and pumped to the leachate conveyance system at the southeast corner of the 30 acre parcel. Soft sediments may be present in the low area. The contractor will be responsible to maintain the storm/contact water collection function as necessary during the WORK period and will pump water as necessary to keep the WORK area dry. Some scrub growth and small trees are present in the Work area which will need to be removed and disposed off-site by the contractor during clearing and grubbing operations prior to the placement of clay.

The only utilities in the WORK area are existing underground leachate collection pipes but these should be sufficiently deep so as not to be a factor in the placement of the clay stockpile. Existing twin HDPE pipes encased in twin 24-inch reinforced concrete pipes rise up-slope from a buried reinforced concrete sump box to the pump house at the top of, and midway along, the east perimeter road. The concrete pipes are near the ground surface and must be protected during the stockpile construction. Should uncharted, or incorrectly charted underground pipes or other utilities be encountered during excavation, consult MIC and utility owner for direction. Cooperate with MIC and utilities owners to keep services in operation. Repair damaged utilities to satisfaction of MIC and the utility owner.

Depending on the truck route selected by the contractor to transport clay to the 30 acre parcel, overhead utilities may be encountered which require protection or relocation. The contractor shall not interrupt any existing utilities serving facilities occupied by MIC or others at any time except when permitted in writing by MIC and then only after acceptable temporary utility services have been provided. After permitted by MIC, the contractor will provide 48 hours notice before interrupting any utility.

The contractor will provide protection necessary to prevent damage to existing improvements and natural features during the conduct of the work. Areas on the 65-acre stockpile parcel which contain active sediment and erosion control features, a wetland mitigation area along the southeast boundary adjacent to the CSX rail line and natural wetlands at other locations must not be disturbed or entered by the contractor. As previously indicated, the excavation of clay from the 65 acre parcel under this contract is governed by a surface mining permit issued by MDE. The surface mining activities, sediment and erosion control features and wetland locations which the contractor must protect are contained on drawings prepared by Morris-Ritchie Associates and Geo-Technology Associates which may be reviewed at MIC's Hawkins Point offices.

In order to transport excavated clay material from the stockpile site to the WORK area, trucks must traverse Fort Armistead Road and/or cross the CSX railroad tracks and enter the 30 acre parcel through the main gate on Fort Armistead Road or at alternative locations mutually agreed upon in writing by the contractor and MIC. Should dump truck traffic become sufficiently intense, as judged by MIC, the contractor will provide traffic control and flagmen as necessary.. Prior to using MIC internal roads, the contractor and MIC will jointly conduct a visual survey of the road surfaces and note any major deficiencies. During and at the end of construction, the contractor will repair and/or re-pave road surfaces damaged beyond the initial survey. Also, roadway crossings over the rail lines which have been damaged by contractor activities will be repaired to the satisfaction of MIC and the railroad.

SECTION III: SEQUENCE OF WORK

The following sequence of construction should be observed:

a. Obtain proper permits.
b. Submit written notification to the Baltimore City Department of Public Works Environmental Section (3001 Druid Park Drive, Room 227, Baltimore, MD 21202, Phone: 410-523-9047) 72 hours prior to any construction activities stating: A) When contractor intends to begin construction; B) Contractor's tentative closing date; C) Contractor's intended closing date and D) Disposal area of site material.
c. Provide and maintain access to the WORK area. Install and maintain stabilized construction entrance(s) and maintain existing erosion and sediment control devices. Access may include construction of temporary access roads, permits to cross the railroad, permits to use/close portions of Fort Armistead Road, removal and replacement of fence and gates and any other items needed by the contractor to convey clay from the 65 acre parcel. Currently, two haul roads on the 30 acre parcel landfill lead into and out of the WORK area and these roads may be used by the contractor upon coordination with the MIC landfill manager. As the WORK progresses, the contractor will be responsible for constructing and maintaining his own access roads to, from and within the WORK area. The contractor shall observe the following in locating and maintaining haul roads within the Work area: 1) Stabilized construction entrances (SCE) shall be positioned and used at all construction vehicle entrance and exit points over the LOD boundary 2) Haul roads shall not be surfaced with impervious materials and shall not interfere with the runoff flow patterns of completed swales on the berms and elsewhere on the site as applicable. Prior to start of construction, the contractor shall submit plans for haul roads for the life of the project demonstrating these requirements have been met and allow for any modifications to the Baltimore City Erosion and Sediment Control Permit which haul roads may trigger.
d. After removing soft sediments, place and compact clay in the topographically low area of the former storm water basin to approximate el. 47.0.
e. Construct Forebay for Pond No. 3 in accordance with the plan and detail on Drawing 3 of 4 and 4 of 4, respectively. Install pipe A-6-B and connect outlet pipe of Forebay to upstream end of A-6-B with "T" connection. Temporarily block upstream end of "T".
f. Continue to fill and compact clay to the line and grade on the drawings up to a uniform el. 60.
g. When el. 60 is attained, install 24-inch HDPE downslope pipe A-5 Temporary (A-5-T), ROPI and topsoil, fine grade and seed and mulch up to berm at el. 60 and all exposed clay surfaces below this elevation. Rough grade berm at el. 60.
h. Continue to place and compact clay up to el. 80 and direct all surface runoff from unstabilized (non-vegetated) areas to the downslope pipe entrance on the el. 60 berm, pipe A-5-T. Prevent sediment from entering onto the el. 60 berm to the extent possible by judicious grading.
i. When el. 80 is attained, install extension to 24-inch HDPE downslope pipe A-5-T beneath el. 60 berm and downslope between el. 80 berm and el. 60 berm. Bury pipe A-5-T at least one foot or more and restrict construction vehicle traffic from driving over pipe Topsoil, fine grade and seed and mulch berm at el. 60 and all exposed clay surfaces below el. 80. Rough grade berm at el. 80.
j. Install 24-inch HDPE downslope pipe A-5 Permanent and pipe A-6-A. Connect to "T" on upstream end of pipe A-6-B previously installed after removing temporary block.
k. Continue to place and compact clay up to el. 100 and direct all surface runoff from unstabilized (non-vegetated) areas to the downslope pipe entrance on the el. 80 berm, extended pipe A-5-T. Prevent sediment from entering onto the el. 80 berm to the extent possible by judicious grading.
l. When el. 100 is attained, install extension to 24-inch HDPE downslope pipe A-5 Temporary beneath el. 80 berm and downslope between el. 100 berm and el. 80 berm. Bury pipe A-5-T at least one foot or more and restrict construction vehicle traffic from driving over pipe. Topsoil, fine grade and seed and mulch berm at el. 80 and all exposed clay surfaces below el. 100. Rough grade berm at el. 100.
m. Install 12-inch HDPE downslope pipe A-4 and ROPI from berm at el. 80 to berm at el. 60.
n. Continue to place and compact clay up to el. 120 and direct all surface runoff from unstabilized (non-vegetated) areas to the downslope pipe entrance on the el. 100 berm, extended pipe A-5-T. Prevent sediment from entering onto the el. 100 berm to the extent possible by judicious grading.
o. When el. 120 is attained, install extension to 24-inch HDPE downslope pipe A-5-T beneath el. 100 berm and downslope between el. 120 berm and el. 100 berm. Bury pipe A-5-T at least one foot or more and restrict construction vehicle traffic from driving over pipe. Topsoil, fine grade and seed and mulch berm at el. 100 and all exposed clay surfaces below el. 120. Rough grade berm at el. 120.
p Install 12-inch HDPE downslope pipe A-3 and ROPI from berm at el. 100 to berm at el. 80.
q. Continue to place and compact clay up to el. 140 and direct all surface runoff from unstabilized (non-vegetated) areas to the downslope pipe entrance on the el. 120 berm, extended pipe A-5-T. Prevent sediment from entering onto the el. 120 berm to the extent possible by judicious grading.
r. When el. 140 is attained, install extension to 24-inch HDPE downslope pipe A-5 Temporary beneath el. 120 berm and downslope between el. 140 berm and el. 120 berm. Bury pipe A-5-T at least one foot or more and restrict construction vehicle traffic from driving over pipe. Topsoil, fine grade and seed and mulch berm at el. 120 and all exposed clay surfaces below el. 140. Rough grade berm at el. 140.
s. Install 12-inch HDPE downslope pipe A-2 and ROPI from berm at el. 120 to berm at el. 100.
t. Continue to place and compact clay up to el. 160 and to top of clay stockpile. Direct all surface runoff from unstabilized (non-vegetated) areas to the downslope pipe entrance on the el. 140 berm, extended pipe A-5-T. Prevent sediment from entering onto the el. 140 berm to the extent possible by judicious grading. When top level of stockpile is reached, fine grade, topsoil, seed and mulch exposed surfaces remaining below top of stockpile.
u. Install 12-inch HDPE downslope pipe A-1 from berm at el. 140 to berm at el. 120.
v. Remove downslope pipe A-5-T. Restore any areas disturbed by removal. Cut pipe in lengths of not less than 10 feet and place in laydown area designated by MIC.
w. Remove haul roads within LOD. Topsoil, fine grade and seed and mulch any areas which remain unstabilized. Restore all roads, fences and any other items installed by the contractor for completion of his WORK to the satisfaction of MIC.
x. Once contributory drainage areas to sediment and erosion control devices are permanently stabilized and with written approval from the Baltimore city sediment control inspector, remove sediment control devices.
y. Permanently stabilize all areas disturbed by removing sediment controls.
z. Demobilize from site after MIC acceptance of work.

SECTION IV: MILLENNIUM SAFETY REQUIREMENTS

All work shall be performed in accordance with Millennium Inorganic Chemicals, Inc. Contractor's Safety Manual, Hawkins Point Plant. Contractor's personnel shall have attended Millennium's safety training course, passed the safety test and received a contractor's badge before entering the site.

SECTION V: SITE CLEARING

The contractor shall remove all trees, shrubs, grass, phragmites and other vegetation as required to permit installation of new construction. "Removal" includes digging out and off-site disposal of stumps, roots and all vegetative debris within the WORK area.

SECTION VI: EARTHWORK

Excavation: All excavation for this project shall be unclassified and shall be excavated to the limits shown the Drawing 2 of 4 and as required in these Technical Specifications. Excavation shall be performed for general grading, removal of basin sediment and installing buried pipe. All excavations are anticipated to be in soil or in soil-like waste solids. Pipe trenches shall be excavated to the line and grade necessary to install the pipe to the invert elevations shown on Drawing 3 of 4. The pipe trench (and pipe) shall slope uniformly between the designated invert elevations.
Unauthorized Excavation: The contractor shall avoid removal of materials beyond indicated subgrade elevations or dimensions without the specific direction of MIC. Unauthorized excavation, as well as remedial work to correct the unauthorized excavation, shall be at the contractor's expense. The contractor shall backfill and compact unauthorized excavations with materials and methods as directed by MCH.

Stability of Excavations: The contractor shall comply with all local codes, ordinances, the requirements of the Maryland Occupational Safety and Hazard Administration (MOSHA) and the City of Baltimore regarding safe excavation conditions. Side slopes of excavations are to comply with local codes, ordinances and requirements of agencies having jurisdiction. Structurally shore and brace where sloping is not possible due to space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfill. The 2H:1V side slope configuration of the general landfill excavation and the stockpile side slopes is computed to be generally stable for clay compacted to the density requirements of this Specification. The contractor shall notify MIC immediately if instability is detected on any excavation or fill slope.
Cold Weather Protection: Protect excavation and embankment surfaces from freezing to the extent possible when atmospheric temperature is less than 35°F. Strip frozen ground before commencing fill operations. No frozen material shall be used as fill and no fill shall be placed on frozen or soft muddy subgrade.

Placement of Fill Materials: Place fill material to required grades in layers not exceeding 8 inches in loose thickness for heavy compaction equipment and not more than 4 inches in loose thickness for material compacted by hand-operated tampers. Over the WORK area, no fill lifts shall exceed ten (10) feet above the surrounding ground/fill surface. No slopes steeper than 2 horizontal to 1 vertical shall be created during the fill process. Clay received from the existing stockpile may occur as large blocks or chunks. These blocks and chunks must be pulverized to individual sizes not exceeding two (2) inches before placing this material onto the 30 acre parcel.

Moisture Conditioning: Moisten or aerate each layer as necessary to provide optimum moisture content for compaction. Compact each layer to required percentage of maximum dry density (see compaction section). Remove and replace or scarify and air dry soil which proves too wet to compact. Stockpile or spread wet soil which has been removed and promote drying by discing, harrowing, or pulverizing until moisture content is reduced sufficiently to allow compaction.

Balanced Backfill Pressures: Place backfill and fill materials in increments equal in elevation on opposite sides of structures, piping, or conduits to required finish elevations. Prevent wedging action of backfill against structures or displacement of piping or conduits by carrying material uniformly around structure, piping or conduits to approximately the same elevation in each lift.

Grading: Uniformly grade completed earthwork areas to the following tolerances: Finished clay surfaces: ± 0.1 ft. Smooth finished surfaces to within the tolerances specified, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades. Grade disturbed areas to prevent ponding of surface water. Finish surfaces are to be free from irregular surface changes.

Maintenance of Graded Areas: Protect newly graded areas from traffic, erosion and trash and debris collection. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances. Where completed compaction surfaces are disturbed by subsequent construction operations, adverse weather or settlement, scarify the surface, reshape, compact to required density and re-grade to specified tolerances before proceeding with construction.

Compaction: Compact all soil placed on 30 acre parcel including clay in new stockpile, pipe backfill and all sediment and erosion control structures to not less than 95 percent of maximum dry density achieved with ASTM D-698. Compact soil and fill material to the minimum specified density by providing sufficient compactive effort. Before placing subsequent lifts, correct improperly compacted areas or lifts as directed by MIC if soil density tests indicate inadequate compaction.
Testing Agency: MIC will employ and pay for a qualified independent geotechnical testing and inspection contractor to perform soil tests and inspection service during earthwork operations. The contractor will fully cooperate with testing contractor in the performance of all quality assurance testing. The contractor will allow testing contractor to inspect, test and approve each subgrade and fill layer before further backfill or construction work is performed. Earth fills for this project will be tested in the field in accordance with ASTM method of test D-1556, Sand cone Method, or D2922, Nuclear Method.

SECTION VII: DRAINAGE AND DEWATERING

The contractor shall prevent surface water and subsurface seepage (or groundwater) from flowing into excavations and/or low areas and flooding the WORK area to the extent possible with ordinary means such as selective grading and/or sump and pump. The contractor will not allow water to accumulate in the WORK area and will remove water to prevent softening of surfaces to receive fill, undercutting of pipe embedments, and soil changes detrimental to stability of subgrade soil /waste solids which will support finished slopes of the landfill. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from the WORK area. Any water that has come into contact with the industrial waste solids on the site (contact water) must be pumped to the leachate collection system. The downslope pipe A-5 Temporary will generally convey stormwater runoff from clay fill areas which are yet to vegetatively stabilized and the contractor should ensure that runoff (non-contact water) is trained and directed to the upstream end of this pipe at all times. The Forebay is intended to remove clay sediment before discharge of stormwater from the WORK area into the perimeter swale leading to the stormwater management Pond No. 3 in the southwest corner of the 30 acre parcel landfill. The contractor will maintain the Forebay, pipes and swale and keep them free of sediment build-up.

SECTION VIII: PIPES

All pipe for the project, with the exception of 1" and 1.5" PVC pipe in the stormwater detention dikes (SWDD) which shall be schedule 40, shall be high density polyethylene (HDPE) pipe Driscoplex 1000 SDR 32.5 provided by Performance Pipe, or equal. Minimum wall thickness shall be as follows:

12" O.D. - 0.392"
18" O.D. - 0.554"
24" O.D. - 0.738"

SECTION IX: TOPSOIL, SEED AND MULCH

All disturbed surfaces within the 30 acre parcel WORK area (basically the entire Work area) including erosion and sediment control features will receive at the designated time in the construction sequence eight (8) inches of topsoil prior to seeding and mulching. Topsoil shall be provided and placed in accordance with Section 703, Placing Furnished Topsoil, of the current edition of the Maryland State Highway Administration Standard Specifications for Construction and Materials with the exception of soil amendments, lime and method of payment.
Seeding and mulching, including soil amendments and lime, shall be performed in accordance with Drawing 3 and Section 20.0, Standards and Specifications for Vegetative Stabilization in the current edition of the Maryland Standards and Specifications for Soil Erosion and Sediment Control.

SECTION X: WORK SCHEDULE

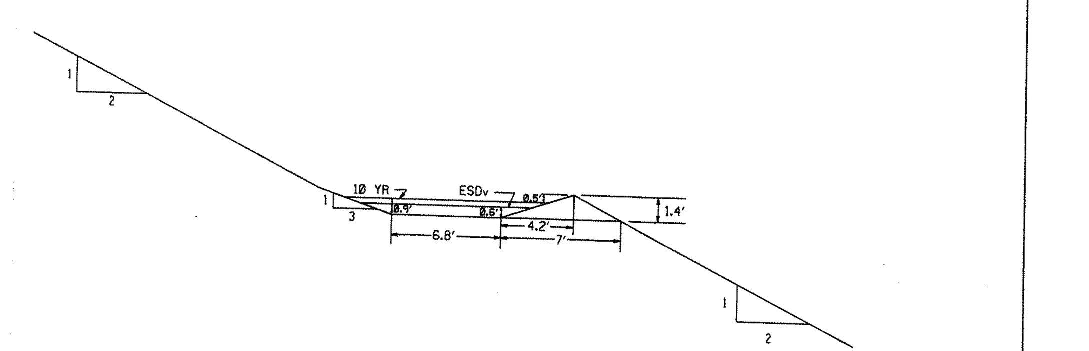
The contractor shall develop and submit a schedule for the WORK prior to beginning the work. The schedule shall be sufficiently detailed to include start and completion dates for all work items and order and receipt dates for materials. The daily work hours desired by the contractor are to be referenced in the schedule.

SECTION XI: CHANGED CONDITIONS

The contractor shall immediately notify the MIC project representative of any conditions differing from those described in these plans, specifications and agreement. Before commencing with any work deviation caused by a perceived changed condition, the contractor and MIC representative will determine: 1) If a changed condition exists, 2) If the contractor is entitled to additional compensation, and 3) The amount of additional compensation. The contractor must formally request a change order in writing to receive agreed upon additional compensation.

All work not affected by the perceived changed condition as determined solely by the MIC project representative shall proceed as scheduled. Any additional work performed by the contractor will be done at the expense of the contractor without the express prior written authorization by the MIC project representative.

MHLFCSS5.DOC Last Rev.:11-24-10



SLOPE BERM DETAIL
NO SCALE

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND

LICENSE NO. 11874
EXPIRATION DATE: 3-13-12

REV. 1	10-25-10	MODIFICATIONS FOR WCBM LETTER 9-30-10

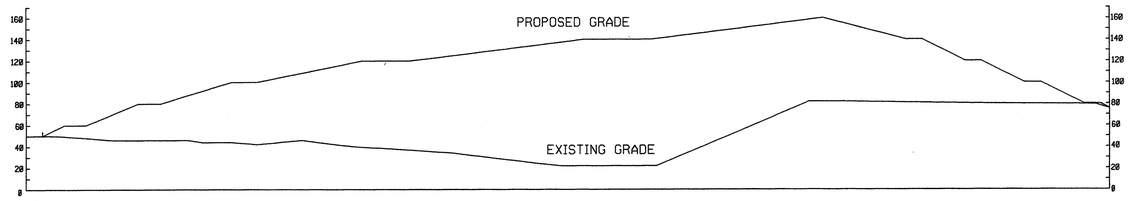
MILLENNIUM INORGANIC CHEMICALS, INC.

TMENGINEERING, INC.

HPP LANDFILL- 30 ACRE SITE
CLAY STOCKPILE RELOCATION
DETAILS AND SPECIFICATIONS

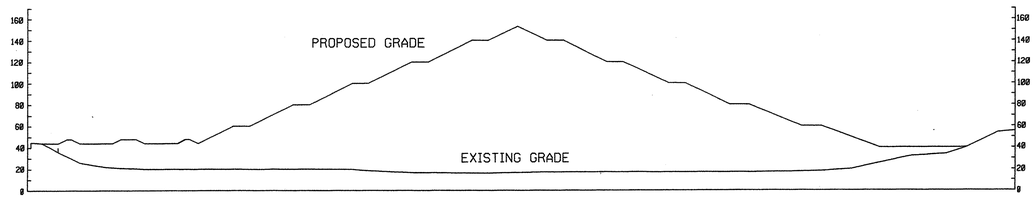
DATE OF DRAWING: 08-06-10
SCALE: AS SHOWN

DWG. No. 4 OF 4



SECTION A-A

SCALE: H: 1" = 50'
V: 1" = 50'



SECTION B-B

SCALE: H: 1" = 50'
V: 1" = 50'

SEE DRAWING 2 OF 4 FOR SECTION LOCATIONS

REV. 1	10-25-10	MODIFICATIONS FOR WCBM LETTER 9-30-10

MILLENNIUM INORGANIC CHEMICALS, INC.

TME NGINEERING, INC.

HPP LANDFILL- 30 ACRE SITE
CLAY STOCKPILE RELOCATION
CROSS-SECTIONS

DATE OF DRAWING: 08-06-10
SCALE: AS SHOWN

DWG. No. 4A OF 4

PROFESSIONAL CERTIFICATION

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND

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