FISHERS ISLAND
GARBAGE AND REFUSE DISTRICT

FINAL CLOSURE PLAN

Fisher Island Landfill
Fishers Island, New York

1998

Dvirka and Bartilucci
Consulting Engineers

NOVEMBER 1998

Dvirka
and
Bartilucci
CONSULTING ENGINEERS

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November 24, 1998

Gregory Thibodeau
Commissioner and Chairperson
Fishers Island Garbage and Refuse District
P.O. Box 22
Fishers Island, NY 06390

Re: Fishers Island Landfill
D&B No. 1468D

Dear Commissioner Thibodeau:

Please find enclosed one copy of the Closure Plan for the Fishers Island Landfill for your review and comment. Once you have had an opportunity to review the document, please contact me to discuss any comments you may have or to provide authorization to forward the document to the New York State Department of Environmental Conservation for review.

If you have any comments or questions, please do not hesitate to contact me.

Very truly yours,

Maria Wright for

Thomas F. Maher, P.E.
Vice President

TFM/MW/cmc
cc: Stephen Latham -Twomey, Latham, Shea and Kelly
♦1468\TFM98-35.LTR

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN

FISHERS ISLAND, NEW YORK

PREPARED FOR

FISHERS ISLAND GARBAGE AND REFUSE DISTRICT

BY

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
WOODBURY, NEW YORK

NOVEMBER 1998

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN

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Section 1

1.0 INTRODUCTION

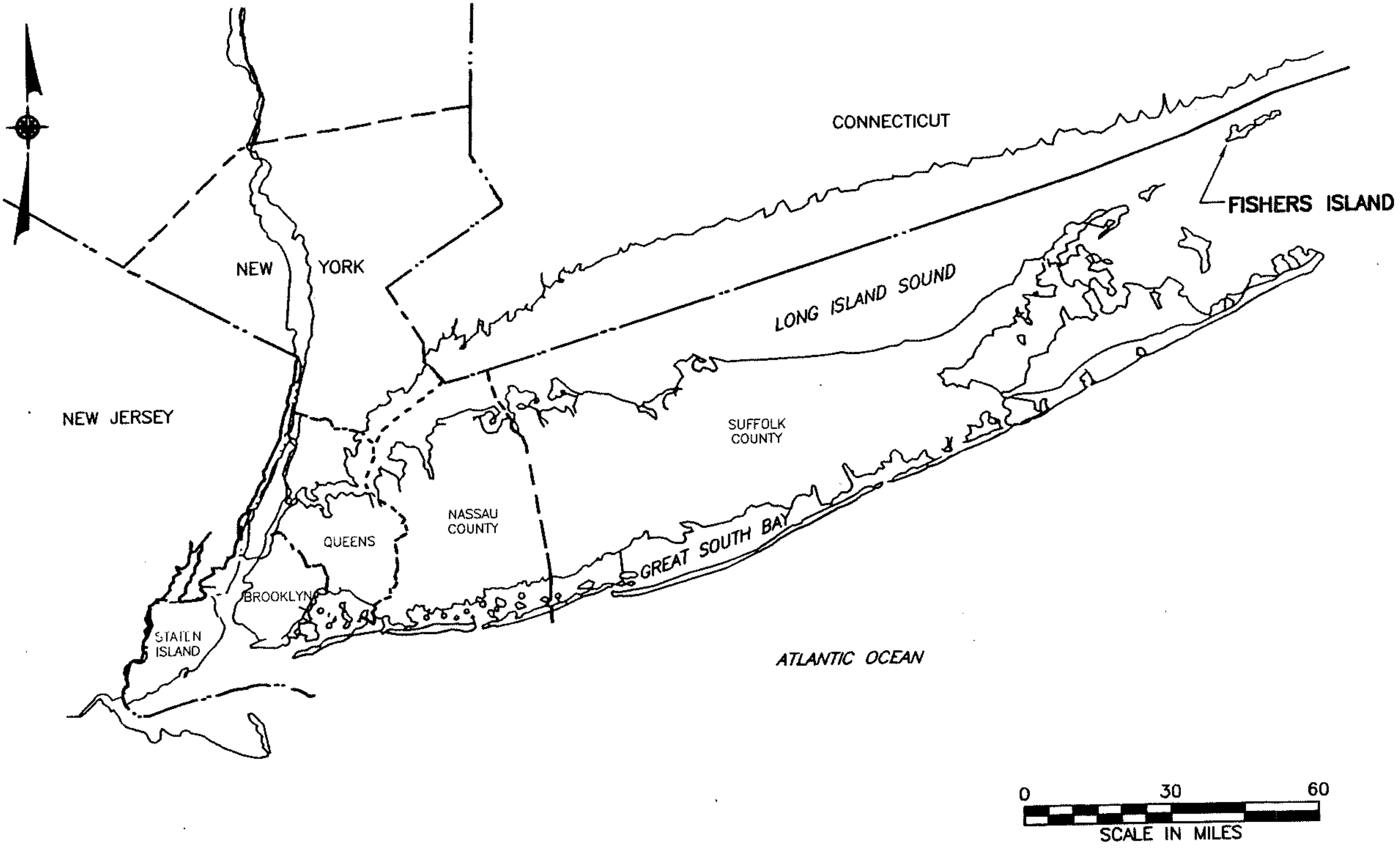
1.1 General

This Final Closure Plan has been prepared on behalf of the Fishers Island Garbage and Refuse District as the operator of the former Fishers Island Landfill, also referred to as the Pickett Landfill, Fishers Island, New York. The property on which the landfill is located is owned by Ruth Pickett and is leased to the Fishers Island Garbage and Refuse District. Purchase of this property by the District is currently being pursued. This plan is intended to address the engineering aspects of designing and constructing a landfill capping/closure system for the site. This document has been prepared in conformance with the requirements of 6 NYCRR Part 360 2.15(c), Final Closure Plan.

1.2 Site Description

The Fishers Island Landfill is located within the Town of Southold, Suffolk County, New York. Fishers Island is located approximately 4 miles south of Connecticut and 17 miles northeast of Long Island (see Figure 1-1). The Fishers Island Landfill is an inactive municipal solid waste landfill located between Oriental Avenue and Ferry Road on Fishers Island (see Figure 1-2).

The landfill property is approximately 10 acres of which approximately 5 to 6 acres have been used for landfilling (see Figure 1-2). Based on available information, the landfill was in operation from the early 1950s until 1991 when it was closed. Residents brought solid waste to the landfill until the early 1950's. During this period waste was burned to reduce the volume. In 1953, the Town of Southold contracted a private hauler to collect the solid waste on the Island. In 1958, the District was chartered and another private hauler assumed collection service. This hauler, Fishers Island Farm, Inc., also managed the landfill. The management techniques employed by Fishers Island Farm are unknown and are assumed to have been a combination of burning and area fill.



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FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

FISHERS ISLAND LOCATION MAP

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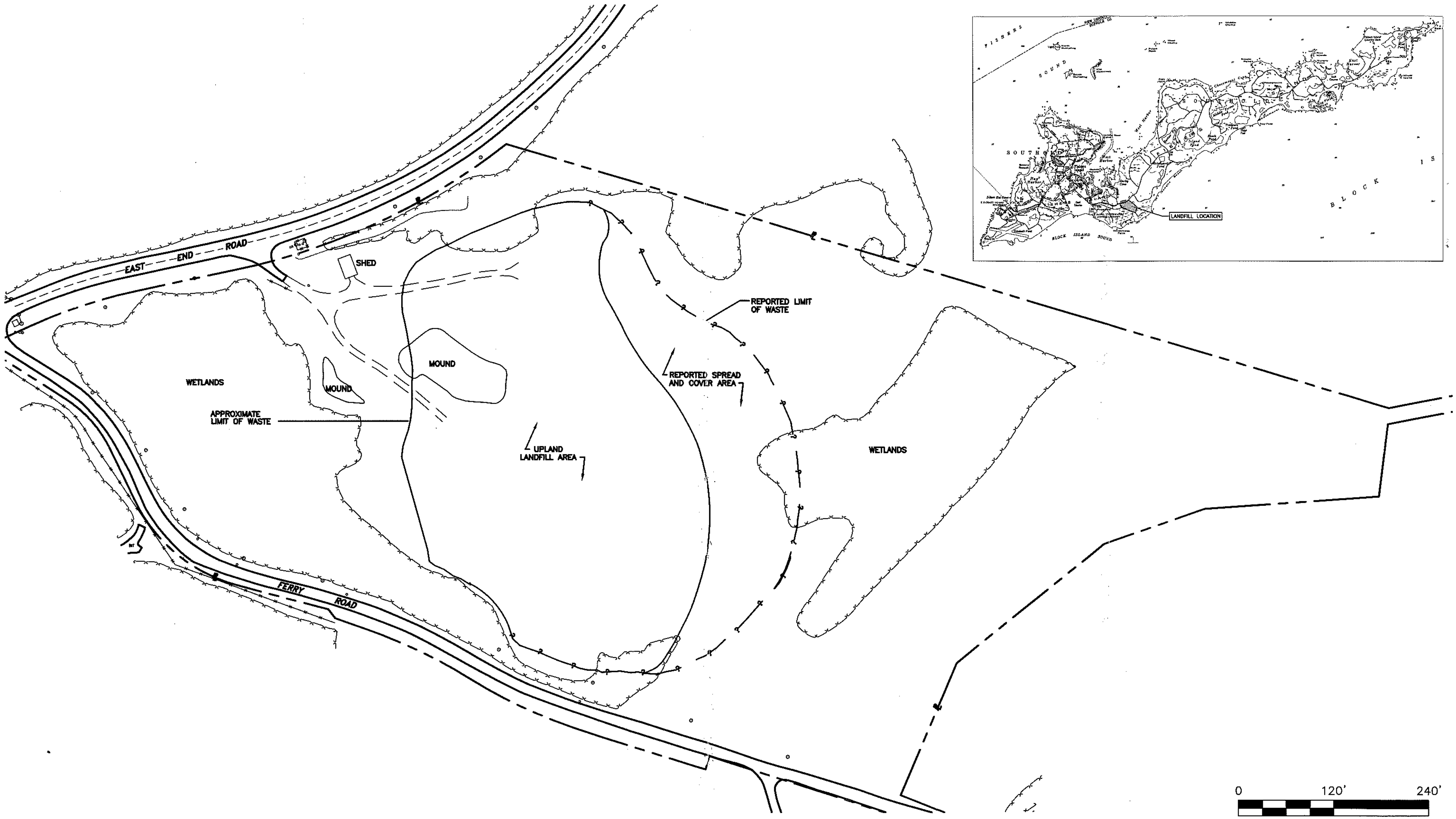
FIGURE 1–1



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FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

SITE LOCATION MAP

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FIGURE 1-2

Materials disposed at the landfill throughout its operating period are reported to be residential waste, white goods, scrap metal, construction debris, cars, tires and ash. In 1974, a separate metals dump was opened and metal goods were no longer placed in the landfill. Septage wastes were also disposed at the landfill. There is no indication of a septage lagoon having existed at the site, therefore, it is likely that the septage wastes were disposed within the solid waste mass. There are no records or other indications that hazardous waste was disposed at the landfill.

The main portion of the landfill was the upland area that was reported to be trenched and landfilled with municipal solid waste. A spread and cover waste fill area also existed and is located on the northern and eastern portions of the landfill (see Figure 1-2). The waste mass in the upland area of the landfill comprises an average thickness of approximately 6 to 7 feet with a maximum thickness of about 18 feet and an average soil cover thickness of 1 to 2 feet. The thickness of waste in the spread and cover area to the north of the main upland portion of the landfill is up to 8 feet. On the eastern slope of the upland landfill area, the waste grades into the adjacent wetlands.

The upland area is predominantly covered with vegetation consisting of grasses, goldenrod, ragweed and sumac. No landfilled refuse is exposed at the surface except on the eastern slope. Wetlands are located to the south, east and west of the landfill.

Section 2

2.0 EXISTING CONDITIONS

2.1 General Topography

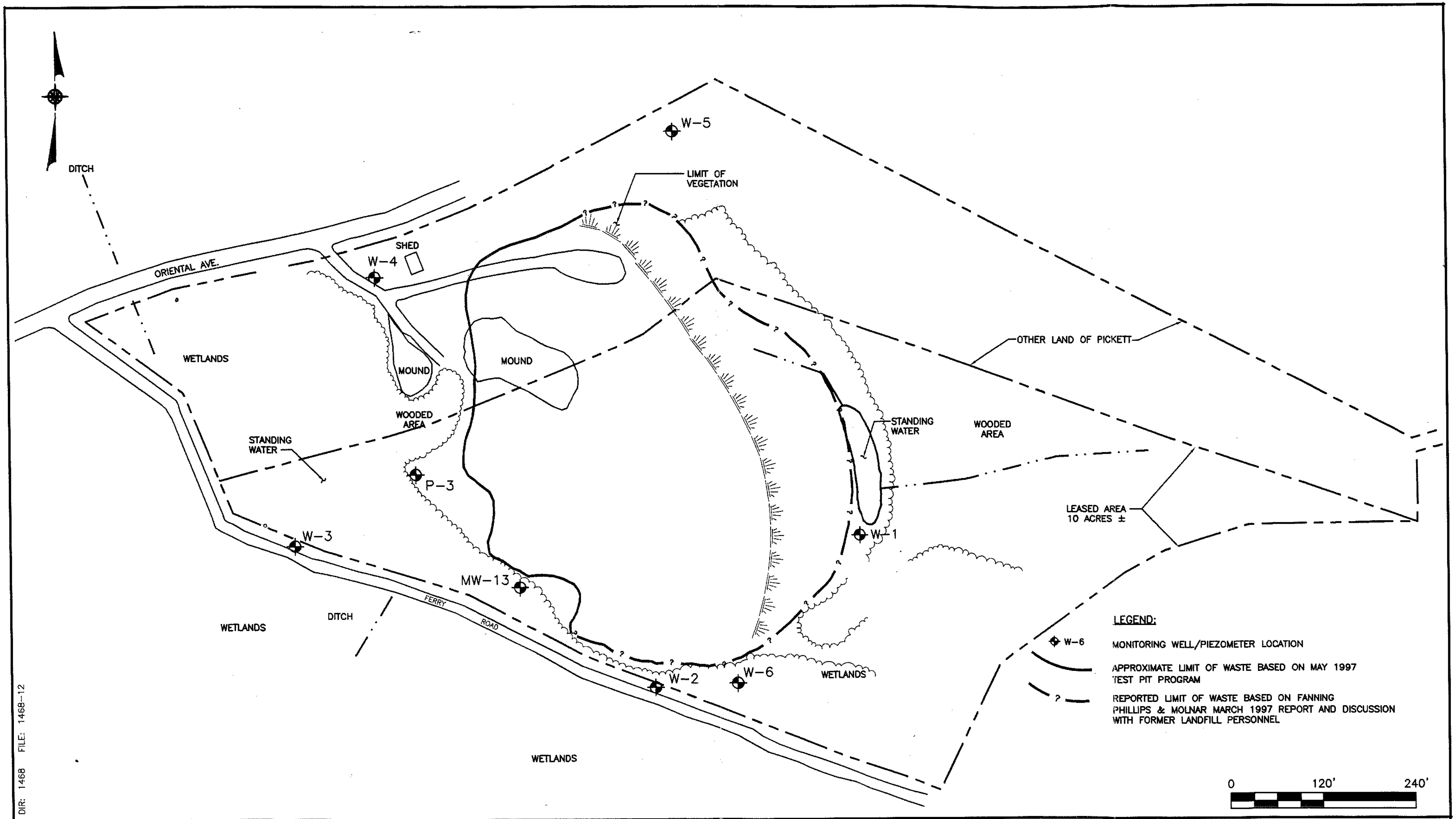
The topography of the Fishers Island Landfill is fairly flat but slopes steeply to the adjacent wetlands in the eastern portion of the landfill. A large mound of stockpiled soil is located in the northwestern portion of the landfill. The highest point on the landfill, exclusive of the soil stockpile, is approximately 30 feet above mean sea level (msl) and the wetlands adjacent to the landfill are approximately 10 feet above msl.

2.2 Limits of Waste

As described in Section 1.0, there were two areas of landfilling on the site, the upland area and the spread and cover waste fill area. The waste material in the main upland landfill area has been described as municipal solid waste deposited primarily in trenches and contains the majority of the landfilled waste. The spread and cover area, which is located north and east of the upland landfill area, contains the oldest landfill material. The following provides a discussion of each of these areas based on observations of the test pit program conducted to define the limits of waste. The Test Pit Program Report is contained in Appendix A.

2.2.1 Upland Landfill Area

Waste material encountered in the upland area consists of primarily household waste in plastic bags. Waste material in some areas was encountered during test pit excavations to groundwater, a depth of 18 feet below grade. The main body of concentrated waste mass comprises an average thickness of approximately 6 to 7 feet with an average soil cover thickness of about 1 to 2 feet. On the eastern slope of the upland landfill area, the waste grades into the adjacent wetlands. The extent of waste as determined as a result of the test pit program and available information is shown on Figure 2-1.



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FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

LIMITS OF WASTE

FIGURE 2-1

2.2.2 Spread and Cover Area

The waste material in the spread and cover area has been reported to have been deposited to a depth of 2 to 3 feet below grade, however, test pit excavations indicate waste as deep as 8 feet to the north-northeast of the upland landfill area. Test pits constructed in this area indicate that the lower lying land area to the north of the upland area is almost devoid of waste. Higher percentages of metal scraps compared to bagged waste were encountered in the lower lying land to the north-northeast of the upland area. The limits of waste for this area were primarily defined by information provided from interviews with personnel from the Fishers Island Garbage and Refuse District. It was also reported that waste was not deposited down onto the slopes on the south and west side of the upland area, and that wrecked cars were disposed on the northern side of the site.

2.3 Hydrogeology

A Hydrogeologic Investigation Report for the Fishers Island Landfill was prepared by Fanning, Phillips and Molnar (FP&M) in May 1994. The investigation characterized the hydrogeologic conditions at the landfill and established a groundwater monitoring network for the landfill.

Soil samples collected during the investigation indicated the presence of glacial deposits beneath the northern portion of the landfill and wetland deposits beneath the south and southeast portions of the landfill. The glacial deposits were described as light to medium brown fine sand interbedded with orange to light brown silt. The wetland material was described as black silt with abundant organic material and saturated. No clay layers or other low permeability layers were encountered.

Based on the Hydrogeologic Investigation Report, groundwater flow direction is generally to the southeast and no groundwater divide is present on site. The average hydraulic conductivity, based on the results of slug test data, was determined to be 5.25 feet per day and the average horizontal groundwater flow velocity was determined to be 0.16 foot per day.

2.4 Groundwater Quality

Groundwater samples were collected from seven groundwater monitoring wells (W-1 through W-6 and MW-13) in August 1993 (see Figure 2-1). Each of the samples was analyzed for 6 NYCRR Part 360 Baseline Parameters with the exception of the groundwater sample collected from W-5, which was only analyzed for hexavalent chromium, color and volatile organic compounds due to insufficient sample volume. Based on the results of the analysis, three volatile organic compounds were detected in the downgradient well, however, the concentrations of these compounds did not exceed the New York State Department of Environmental Conservation (NYSDEC) Class GA groundwater standards/guidelines. Exceedances of the NYSDEC standards/guidelines were noted only for color, turbidity, sodium, total dissolved solids, iron and manganese.

A second round of groundwater samples were collected in May 1995. Samples were collected from six of the monitoring wells (W-1 through W-4, W-6 and MW-13) and analyzed for Baseline Parameters. The results of the second round of sampling indicated similar results to the initial round with the exception of a slightly elevated level (above the groundwater standard of 5 ug/l) of ethylbenzene (19 ug/l) in MW-13.

One private well used for irrigation purposes is located downgradient of the landfill. The Suffolk County Department of Health Services (SCDHS) collected a sample from this well in June 1995. The results of the analysis did not indicate the presence of any parameters above NYSDEC Class GA groundwater standards/guidelines.

The results of the sampling indicated that there appears to be a minor impact to groundwater downgradient of the landfill. Many of the exceedances of the inorganic parameters were attributed to background levels and potential influences from the tidal wetlands adjacent to the landfill. The existing wells were constructed in accordance with Part 360 and were determined to be an appropriate monitoring network that documents both upgradient and downgradient groundwater quality relative to the landfill site.

2.5 Surface Leachate

According to the FP&M Closure Investigation Report dated March 1997, NYSDEC personnel performed a surface leachate investigation at the site in 1994. During the investigation, minor iron staining and minor sheening of the surface water in the wetlands adjacent to the landfill was noted. Although this staining/sheen could be attributed to landfilling activities at the site, the NYSDEC recommended that no further action regarding the possible leachate be taken.

2.6 Explosive Gas

The shallow water table and presence of wetlands to the east, south and west of the landfill act as barriers to landfill gas migration. During installation of groundwater monitoring wells W-4 and W-5 along the northern border of the landfill, negligible amounts of methane/landfill gas were detected. Air monitoring was performed to determine the percent of methane gas in relation to its lower explosive limit in the air during the excavation of test pits in the landfill. No readings above zero percent lower explosive limit were detected in the breathing zone. The only percent lower explosive limit reading measured during excavation of the test pits was a reading of 4 percent from directly over the waste. Based upon the information obtained during the field investigations, it appears that the landfill is not generating significant amounts of methane gas.

With respect to migration of any gases generated, the on-site investigations also did not identify any dead or dying vegetation that could be attributable to methane gas and any geologic conditions that would increase the potential for landfill gas migration.

2.7 Vectors

A vector inspection was performed by the SCDHS in February 1997. The results of the inspection indicated that there was no rodent activity at the landfill that was related to any landfilling activities. Visits to the site performed by Dvirka and Bartilucci Consulting Engineers (D&B) and FP&M personnel have never noted the presence of any vectors. Upon closure of the landfill in 1991, all waste material was covered.

2.8 Wetlands

The freshwater wetland boundary was delineated by NYSDEC personnel on July 14, 1998 and by D&B personnel on July 23, 1998. The delineation performed by D&B agrees with the delineation performed by NYSDEC. The delineation of the wetland boundary is presented on the attached drawings. The wetland boundary as delineated by NYSDEC Bureau of Habitat will be surveyed by a licensed surveyor. The following is a description of the observations made by D&B personnel.

The freshwater wetlands boundary generally follows the toe of slope of the upland portion of the landfill in the east. Vegetation on the landfill edge is generally quite dense and consists largely of common sumac, staghorn sumac and catbrier. Wetland vegetation approximately 40 feet to each side of monitoring well W-6 is dominated by common reed and occasional red maples.

Moving to the north around the perimeter of the landfill, the dominant vegetative type changes to jewelweed. These areas had no standing water at the time of the survey although the soils were very poorly drained and water would accumulate in footprints. A small ditched stream with very low flow traverses this wetland area and drains to the east/southeast, presumably toward the ocean. This area is less densely vegetated, probably due to the denseness of the tree canopy in the area. Several stands of cinnamon fern were noted in this area.

One area along the toe of slope, as shown on Drawing 5, is strewn with numerous glass bottles. The size and style of the bottles indicates that this accumulation is related to past landfill operations and the bottles were well over 15 years old. Beyond the glass strewn area is an area at the toe of slope that has an accumulation of metal debris. Items include the remnants of a refrigerator, galvanized well water tank, fuel storage tank, metal fence post, pulley systems, old radios and other appliances. Except for galvanized materials, all metals were rusted to the point of crumpling. There was no indication that the fuel oil tank had product in it at the time of disposal.

Construction of the cap will cause temporary disturbance of approximately 0.25 acres of New York State regulated freshwater wetland NL-1. Construction of a service/maintenance road around the eastern perimeter of the landfill will cause permanent disturbance of the wetlands. Because of the permanent disturbance of the wetlands, a service/maintenance road will not be constructed at the toe of slope along the eastern perimeter of the landfill. This road would only need to be utilized for repair of the cap since there are no groundwater or landfill gas monitoring wells located along the eastern perimeter of the landfill that will require access. Maintenance of the cap on the eastern portion of the landfill can be performed without an access roadway in this area.

Disturbance along the eastern edge of the landfill would involve the movement of construction equipment within 25 feet of the wetland/upland transition zone and possible partial excavation of some wetlands habitat at the wetland/boundary during the course of cap construction. No fill material would be placed into wetlands although some removal of material may be required to ensure cap integrity. Existing trees would be maintained at the wetland edge to the maximum extent possible with particular attention to trees with a trunk diameter greater than six inches. Equipment operators would be instructed to minimize operations in the wetlands to minimize the potential for soil compaction and possible releases of equipment fluids directly to the wetland. Once construction is complete, all wetland areas should be at or below pre-project grades. The disturbed wetland areas would be anticipated. Revegetation of the disturbed areas should occur after one full growing season. Slight decreases in elevation coupled with minor increases in water input due to the presence of a low permeability cap on the adjacent property could result in a wetland with a plant community of improved ecological value.

Section 3

3.0 PROPOSED CLOSURE SYSTEM

3.1 General

The proposed closure system for the capping of the Fishers Island Landfill will consist of a layered system of soils and geosynthetics to provide a cost effective low permeability hydraulic barrier which will mitigate the vertical percolation of precipitation into the underlying waste mass. The primary functions of the layered capping system are as follows:

- Mitigate the vertical percolation of precipitation into the underlying waste mass,
- Mitigate the generation of leachate resulting from contact between precipitation and the waste mass,
- Mitigate the release of leachate to the groundwater system by inhibiting the generation of leachate,
- Control the accumulation of landfill gas below the capping system and mitigate the potential for lateral migration,
- Mitigate the potential for direct contact with waste,
- Provide control of surface runoff and subsurface drainage to promote the efficiency of the hydraulic barrier,
- Resist the erosional forces of storm events,
- Provide physical protection to the hydraulic barrier layer of the capping system, and
- Provide for an aesthetically acceptable appearance of the completed system, suitable for its intended purpose.

The proposed capping system is intended to achieve the above objectives within the framework of the existing site conditions and constraints.

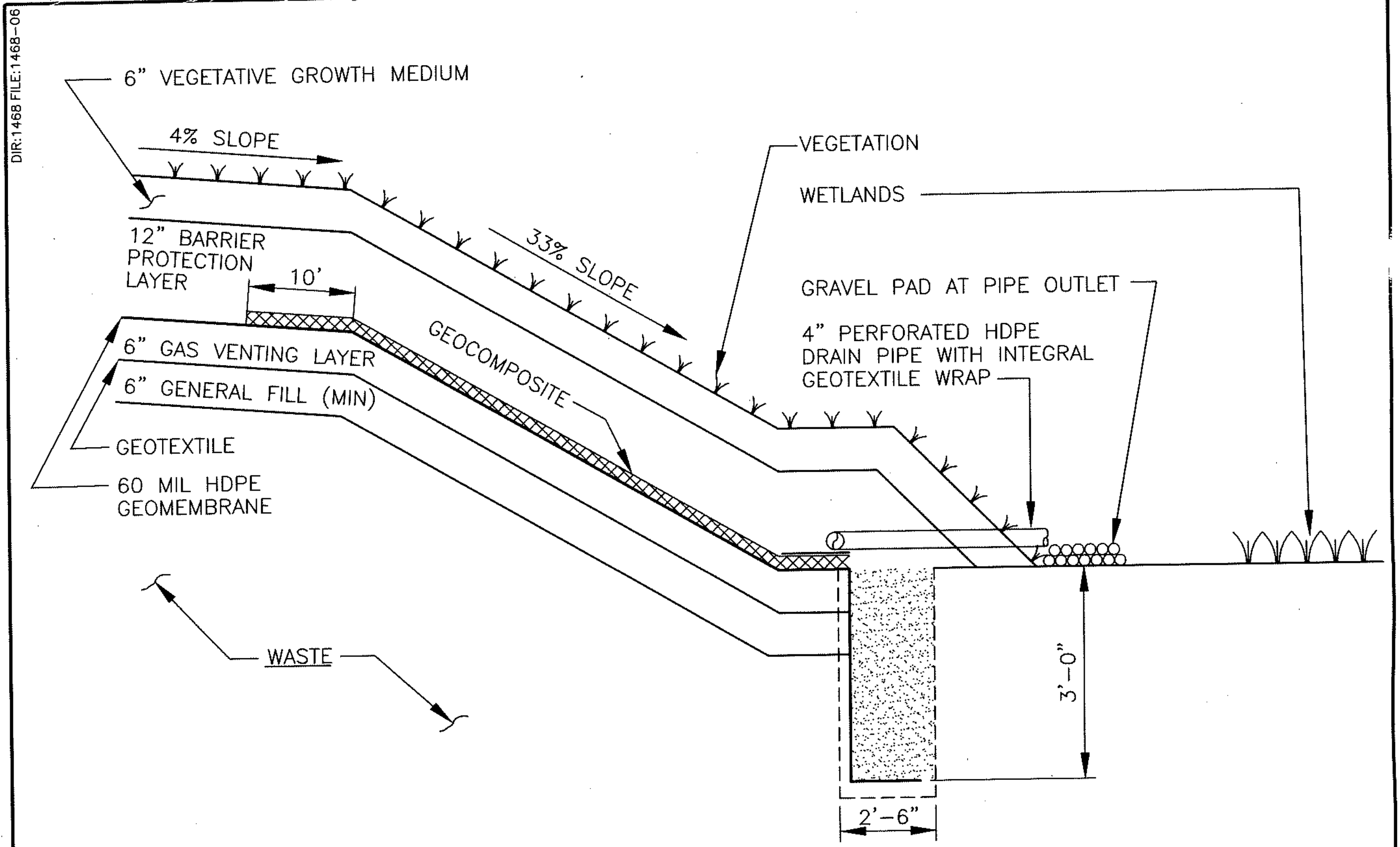
The proposed capping system is intended to provide general conformance to the regulations and performance criteria of 6 NYCRR Part 360 Solid Waste Management Facilities. The proposed capping system, described from bottom to top, will be as follows:

- Existing municipal solid waste.
- Contour grading material, thickness varies, minimum thickness of 6 inches.
- Geotextile separation layer
- Gas venting layer (6 inches)
- 60-mil textured high density polyethylene (HDPE) geomembrane.
- Geocomposite drainage layer (on 33% slope)
- Barrier protection layer of 12 inches.
- Topsoil or equivalent vegetative growth medium layer of 6 inches.
- Vegetation.
- Erosion control blanket.

A pictorial presentation of the proposed capping system is presented in Figure 3-1.

3.2 Proposed Area of the Cap

As previously discussed, a test pit program was conducted to establish the horizontal and vertical extent of the waste in order to establish the area of the landfill property which requires closure. The findings of this test pit program and information provided by Fishers Island Garbage and Refuse District personnel indicate that the waste mass is concentrated in trenches and most likely exists throughout the upland area. The waste mass comprises approximately 5.5 acres in the upland landfill area and a portion of the spread and cover area not in the wetlands.



FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

PLANNED CAP CROSS-SECTION

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FIGURE 3-1

Based on the location of the wetlands on the eastern portion of the landfill as delineated by NYSDEC, the area of the cap will not include the portion of the waste in the spread and cover area in the wetlands. Based on a meeting between the Fishers Island Garbage and Refuse District and NYSDEC on April 14, 1997, due to the age of the waste and the dense vegetation that has grown over the buried waste in the wetlands, and the damage to the wetlands that would occur if the waste was attempted to be removed, NYSDEC determined that the waste could remain in place. However, the metal debris and glass piles identified during delineation of the wetlands will be removed and either placed under the cap or removed off-site and properly disposed. The proposed area of the cap is presented on the attached drawings.

3.3 Proposed Grading Plan

The ground surface of the Fishers Island Landfill presents a fairly flat to steep sloping terrain on the north, south, east and west sides of the landfill. The proposed grading plan attempts to make use of the existing terrain to the greatest extent practical in order to minimize the need for gross reshaping and filling of the site. This approach proposes to make use of a minimum of 4 percent slope stipulated by 6 NYCRR Part 360 on the upper portion of the landfill. In areas of the site where the existing grades provide for slopes in excess of 4 percent, the proposed grades will attempt to parallel the existing shape. The proposed maximum slope is 33 percent which complies with the requirements of 6 NYCRR Part 360 for a maximum slope of 33 percent. The proposed subgrade grading plan is presented on Drawing 3.

The grading of the landfill will allow for sheet flow runoff of surface drainage from a large portion of the landfill to the wetlands located on the eastern side of the landfill. Drainage from the remaining portion of the landfill will be collected in drainage swales and directed to these same wetlands. Further discussion of site drainage is provided in Section 6.0.

The overall height of the landfill will increase by approximately 5 feet from the existing grade of 26 feet to 31 feet above mean sea level.

3.4 Site Preparation

The first step in preparing the site for construction of the proposed capping system will be the shaping and grading of the existing ground surface to develop a prepared subgrade. Prior to any grading, the existing vegetation within the area of the cap will be cleared. Woody vegetation such as trees will be cut down, chipped and used on-site in the perimeter areas not being capped. Tree stumps, will be excavated and reduced in size on site for on-site or off-site use.

Brush and ground cover will be cleared by thoroughly and completely tracking the areas with a bulldozer to grind up the vegetation and incorporate it into the loosened soil. The existing vegetation will be cleared prior to proceeding with any other aspects of the cap construction. However, the contractor will be permitted to phase the clearing and grubbing operation to make use of the existing vegetation for erosion control purposes. After clearing, the existing ground surface will be cut, graded and/or filled as required to achieve prepared subgrade elevations.

A service/maintenance roadway will be constructed around the landfill in order to provide access to the landfill during construction for cap installation and a portion of this roadway will remain after construction for cap maintenance. The roadway will be approximately 12 feet wide along the northern and western sides of the landfill. Along the eastern side of the landfill the contractor may need to place sand to stabilize the work surface during construction in this area. A silt fence, and if necessary, hay bails will be placed between the work and the wetlands to minimize sediment deposition.

Along the western and northern portions of the landfill, a geotextile will be placed will be placed at the bottom of the excavation and 12 inches of crushed stone will be place over the geotextile for construction of the road. Excavated waste materials resulting from cuts or excavations will be relandfilled on site in areas requiring fill. As previously discussed, the metal and glass debris piles noted during the wetlands delineation will be removed and placed under the cap (or removed off-site). Relandfilled waste will be spread in lifts up to 2 feet in thickness, for vertical separation of the two soils, allow for vertical migration of landfill gas from the waste mass up to the gas venting layer, allow for vertical percolation and prevent blending of the gas venting layer with the subgrade materials to maintain the 6 inch layer.

The geotextile will be a nominal 8 ounce per square yard continuous filament polyester or polypropylene, nonwoven, needlepunched fabric. The geotextile polymer composition will be at least 95 percent polypropylene or polyester by weight. The geotextile will conform to the properties listed in Table 3-1.

The geotextile will be deployed in the direction of the slope, overlap adjacent panels by 3 inches and will be seamed by a sewn, double thread lockstitch Type 401 or equivalent. The seam will be a "flat" or "prayer" seam. Geotextile deployment will be controlled to ensure that the placed geotextile is not exposed to sunlight for more than 14 days.

Prior to placing the geotextile, the prepared subgrade will be visually inspected to evaluate the suitability of the subgrade and ensure that the surface is properly compacted, smooth and uniform. The surface will be reasonably free of stones, organic matter, irregularities, protrusions, loose soil and any abrupt changes in grade that could damage the geotextile.

Quality control testing will be performed by the geotextile manufacturer. Conformance testing of the delivered material will be performed only if the need is perceived based upon an examination of the materials.

The proposed geotextile satisfies the filter criteria of 6 NYCRR Part 360. The geotextile has a permeability on the order of 100 times the permeability of the overly gas venting soil and therefore satisfies the requirement that it be at least 10 times the permeability of the soil. The retention criteria prescribed by 6 NYCRR Part 360 is also satisfied. The apparent opening size (O_{95}) of 0.212 mm is sufficient to retain a soil with 15 percent passing a No. 200 sieve with a multiplier of 3. The overlying gas venting layer is limited by regulation to a maximum of

Table 3-1

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
GEOTEXTILE

Fabric Property	Test Method	Unit	Specified Value	Qualifier(1)
Fabric Weight	ASTM D3776	oz/sq yd	7.9	MARV
Thickness, t	ASTM D1777	mils	90	MARV
Grab Strength(2)	ASTM D4632	lbs	210	MARV
Grab Elongation(2)	ASTM D4632	%	50	MARV
Trapezoid Tear Strength(2)	ASTM D4533	lbs	85	MARV
Puncture Resistance	ASTM D4833	lbs	100	MARV
Mullen Burst Strength	ASTM D3786	psi	320	MARV
Water Flow Rate	ASTM D4491	gpm/sq ft	100	MARV
Permitivity	ASTM D4491	sec^{-1}	1.3	MARV
Permeability	ASTM D4491	cm/sec	0.3	MARV
Apparent Opening Size (AOS)	ASTM D4751	sieve size mm	70 0.212	MARV
Transmissivity	ASTM D4716			MARV
@0.3 psi		gpm/ft	0.11	
@14.5 psi		gpm/ft	0.07	
@29.0 psi		gpm/ft	0.04	
UV Resistance	ASTM D4355	% strength retained	70	MARV
pH Resistance			2-13	Range

(1)MARV - Minimum average roll value.

(2)Values in the weakest principal direction.

10 percent passing the No. 200 sieve. Therefore, the d_{85} (15 percent passing) value of the gas venting soil will be a particle size larger than a No. 200 sieve (0.074 mm). The ratio of the apparent opening size (O_{95}) of the geotextile is between two and three times the d_{85} value of the soil as required.

3.6 Gas Venting Layer

In lieu of the 12-inch thick soil layer meant to collect gas produced by the landfill, a six inch layer with one gas vent per acre will be constructed. The gas venting layer will be installed as one continuous layer over the area to be capped. The gas venting layer will have a thickness of 6 inches and a coefficient of hydraulic conductivity (permeability) equal to or greater than 1×10^{-3} cm/sec. In addition to serving as gas venting medium, this 6 inch sand layer will also provide a cushion for the geomembrane. The soils used to construct the gas venting layer will be imported from off-site sources.

As discussed in Section 2.6, during installation of groundwater monitoring wells W-4 and W-5 along the northern border of the landfill, negligible amounts of methane were detected. In addition, air monitoring performed to determine the percent of methane gas in relation to its lower explosive limit in the air during the excavation of test pits in the landfill showed no readings above zero percent lower explosive limit. The only percent lower explosive limit reading measured during excavation of the test pits was a reading of 4 percent from directly over the waste. Therefore, due to the low levels of explosive gas detected during on-site investigations a 6-inch gas venting layer will be sufficient to passively vent gas from the landfill. As described above, a geotextile will be placed beneath the gas venting layer to preclude loss of the high permeability material into the underlying general fill.

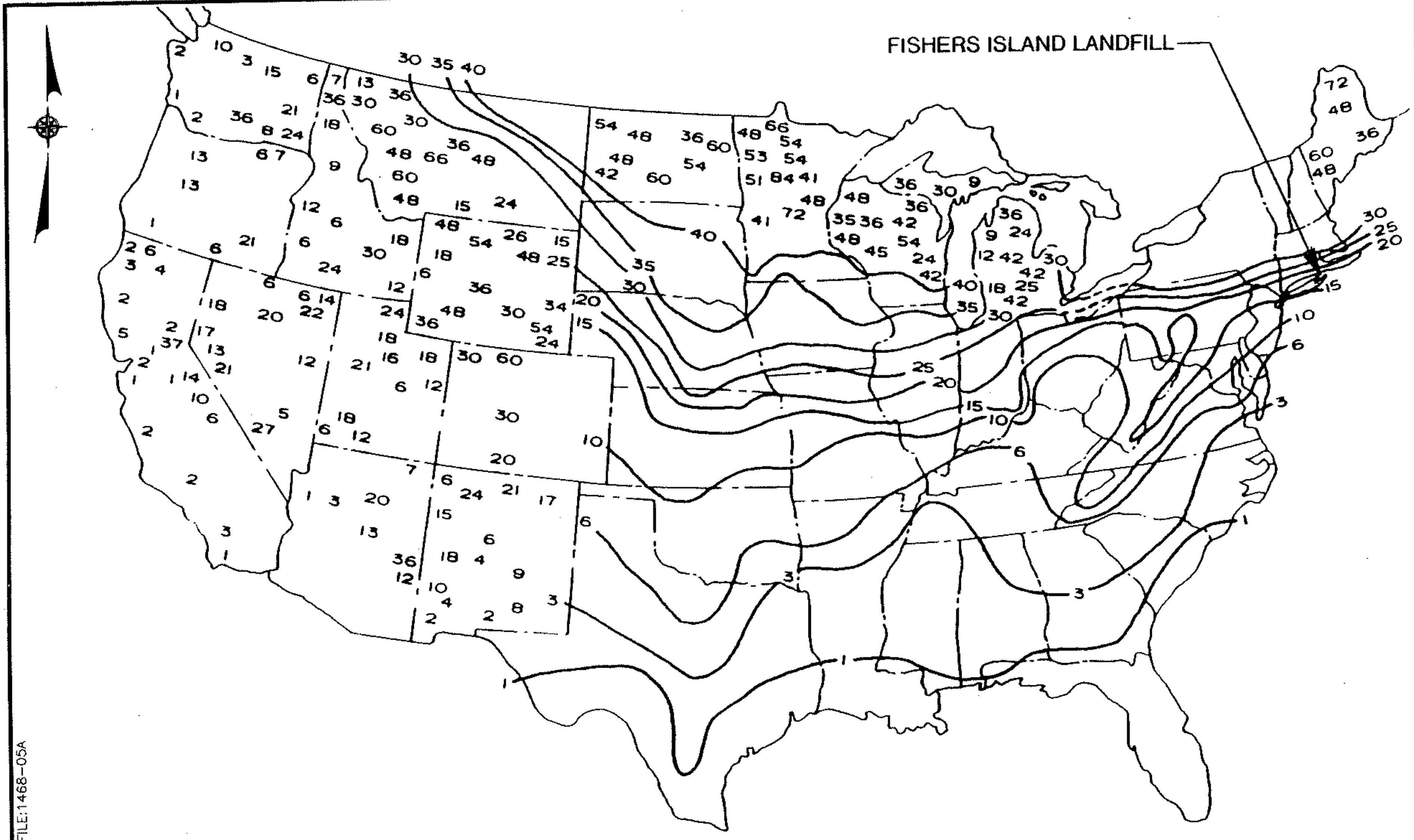
Seven gas vents will be installed over the landfill. Six vents will address the Part 360 requirement of one vent per acre on the landfill. The gas vents would be installed in order to provide for passive relief of landfill gas which has accumulated below the geomembrane. The relief vent includes a 10 foot 6 inch diameter Schedule 80 slotted PVC cross arm (slot size

0.12 inch) embedded in the gas venting layer. Immediately surrounding the screen will be 12 inches of washed rounded gravel. The vertical slotted riser pipe will extend downwards a minimum of 5 feet into the waste mass. The open end of the vent (above grade gooseneck fitting) will be constructed above grade with at least 3 feet of clearance to the ground surface. A gas vent schematic is provided on Drawing 9.

The vent will function based upon differential pressure between the underside of the geomembrane where positive gas pressure may accumulate and atmospheric pressure at the exposed open end of the vent.

The gas venting layer will serve as a permeable layer of soil which will allow for the lateral transmission of landfill gas which may accumulate below the geomembrane to points of removal at the landfill gas recovery wells. The gas venting layer serves several purposes in the function of the capping system and include the following:

- The uppermost surface of the gas venting layer provides for a smooth, uniformly sloped, well compacted surface for the installation of the overlying geomembrane.
- The gas venting layer serves as a permeable layer of soil which will allow for the lateral movement of landfill gas below the geomembrane. The gas venting layer, in combination with the vents, will allow for the passive relief of landfill gas which vertically migrates to the underside of the geomembrane. The relief of landfill gas via the gas venting layer will inhibit the formation of positive gas pressures below the geomembrane. In turn, the relief of these pressures will minimize vertical uplift forces on the geomembrane and reduce the potential for lateral migration of the landfill gas to areas beyond the cap and the property boundaries.
- The gas venting layer serves as a free draining, low fines content, permeable layer below the geomembrane which, in the event of deep frost penetration into the capping system, is not prone to frost heave which would impose stresses on the geomembrane. In general, the average depth of frost penetration for the Fishers Island area is on the order of 15 to 20 inches as reported by the U.S. Department of Commerce Weather Bureau (see Figure 3-2). Combining the 6 inch topsoil layer, the 12 inch barrier protection layer and the 6 inch gas venting layer, the 24 inch total depth exceeds the maximum frost penetration of 20 inches. The inherent nature of the gas venting layer as prescribed by 6 NYCRR Part 360 provides this added benefit as a conservative design condition.



AVERAGE DEPTH OF FROST PENETRATION (IN.)
SOURCE: U.S. DEPT. OF COMMERCE WEATHER BUREAU

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FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

AVERAGE FROST PENETRATION

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FIGURE 3–2

The gas venting layer will be installed directly on top of the geotextile separation layer as one single lift using low ground pressure machines. The gas venting layer will be placed at a rate corresponding to deployment of the geotextile to ensure that the geotextile is not exposed to the elements for more than 14 calendar days.

Wheeled vehicles will not be permitted to travel directly on the geotextile or on a layer of gas venting material less than 3 feet in thickness (temporary travel ways). Grade control for placement of the gas venting layer will utilize non-intrusive methods such as laser, stanchions, traffic cones, etc., with the selection to be at the discretion of the construction contractor. The in-place layer will have a compacted lift thickness of 6 inches. The layer will be compacted to achieve a minimum of 90 percent maximum dry density in accordance with ASTM D1557 (Modified Proctor) and will provide a smooth, regular surface free of protrusions, debris, loose soil, and other conditions which may be deleterious to the geomembrane and/or prevent intimate contact between the geomembrane and the surface of the gas venting layer. The moisture content of the soil will be controlled to facilitate compaction.

The gas venting soil will be natural sand and will consist of hard, strong, durable particles which are free from a coating or any injurious material or other deleterious substances. The soil will be virgin, select, clean, inert, well graded granular material, free of any organic materials, roots, stumps, chunks of earth or clay, shale or other soft, poor durability particles, construction and demolition debris, reprocessed or recycled soils, concrete or other foreign material and have less than 10 percent of the material by weight pass the No. 200 sieve. All other material will pass the 3/8-inch sieve. The minimum coefficient of permeability will be 1×10^{-3} cm/sec as determined by ASTM D2434 - Test for Permeability of Granular Soils (Constant Head).

The source of supply will be subject to prequalification testing and acceptance. During construction, the imported soils will be sampled at a frequency of once per 1,000 cubic yards and tested for gradation analysis (ASTM D422) and once per 2,500 cubic yards and tested for hydraulic conductivity (permeability) ASTM D2434.

The finished surface of the gas venting layer will be examined for its suitability for deployment of the geomembrane.

The in-place thickness of the gas venting layer will be confirmed on a 100-foot by 100-foot grid pattern by hand digging test holes to the geotextile surface. A straightedge or board will be used to span the holes to reference the grade surface. The average of three depth measurements will be recorded as the actual depth of the lift. The average thickness of the compacted lift will be no less than 6 inches.

3.7 Geomembrane

The proposed geomembrane to serve as the hydraulic barrier layer in the capping system will be a 60-mil, textured high density polyethylene (HDPE) sheet or equivalent as provided by 6 NYCRR Part 360. The HDPE geomembrane will conform to the physical properties listed in Table 3-2.

The geomembrane will be in contact with the underlying gas venting layer and the overlying geocomposite/barrier protection layer. The geomembrane will not be in direct contact with the waste or leachate generated by the waste. Therefore, the chemical compatibility of the geomembrane materials and the waste materials should not be at issue. Nonetheless, HDPE geomembrane is well documented for its use in landfill liner systems as both bottom liner systems and capping systems. For the purpose of this project, site-specific chemical compatibility of the proposed geomembrane is not warranted.

The geomembrane will be installed on the uppermost surface of the gas venting layer. The prepared surface will be inspected, corrected as necessary and accepted prior to the day's deployment of geomembrane.

Table 3-2

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
60-MIL TEXTURED HDPE GEOMEMBRANE

Property	**Test Method**	**Units**	**Specified Value**	**Qualifiers**[(1)]
Thickness	ASTM D751	Mils	54	Minimum
Density	ASTM D1505	g/cc	0.94	Minimum
Melt Flow Index	ASTM D1238 Condition E (190°C, 2.16 kg.)	g/10 minutes	0.4	Maximum
Carbon Black %	ASTM D1603	%	2-3	
Carbon Black Dispersion	ASTM D3015	Rating	A-1, A-2, B-1	
Tensile Properties	ASTM D638 Type IV, 2" gauge length Dumb-bell @ 2 ipm			
• Strength at Yield		PPI	140	MARV(2)
• Strength at Break		PPI	75	MARV(2)
• Elongation at Yield		%	13	MARV
• Elongation at Break		%	150	MARV
Tear Resistance	ASTM D1004 Die C	Pounds	45	MARV
Puncture Resistance	FTMS 101B Method 2065	Pounds	80	MARV
Environmental Stress Crack	ASTM D1693 10% Igepal, 50°C	Hours	1500	Minimum
Dimensional Stability	ASTM D1204 100°C, 1 hour	% change	±2	Maximum
Thermal Stability OIT	ASTM D3895 130°C, 800 PSI O_2	Minutes	2000	Minimum
Low Temperature Brittleness	ASTM D746 Procedure B	Degree F	-107	Maximum

Table 3-2 (continued)

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
60-MIL TEXTURED HDPE GEOMEMBRANE

Property	Test Method	Units	Specified Value	Qualifiers(1)
Coefficient of Linear Thermal Expansion	ASTM D696	$x10^{-4}$ cm/ cm°C	2.0	Maximum
Volatile Loss	ASTM D1203	%	0.3	Maximum
Water Absorption	ASTM D570	%	0.1	Maximum
Resistance to Soil Burial	ASTM D3083 (as modified in NSF 54 Appendix A)			
• Tensile Strength at Yield and Break		% change	10	Maximum
• Elongation at Yield and Break		% change	10	Maximum
Hydrostatic Resistance	ASTM D751	PSI	350	MARV
Seam Strengths	ASTM D4437			
• Peel Strength	(Wedge)	PPI	88 & FTB	Minimum
• Peel Strength	(Extrusion)	PPI	63 & FTB	Minimum
• Shear Strength		PPI	151 & FTB	Minimum

(1) MARV - Minimum average roll values.

(2) The values given correspond to a yield stress of 2,300 psi and a break stress of 1,250 psi for textured HDPE geomembrane.

FTB - Film tearing bond

The geomembrane will be furnished in standard roll widths and standard roll lengths. There will be no special requirements for extra long or custom roll lengths. Geomembrane panels will be deployed in the direction of the slope. Adjacent panels will be seamed by either the fusion weld or extrusion weld process. All seams will be nondestructively tested in total and destructively tested at a frequency no less than once per 500 feet of seam length.

Conformance samples will be obtained at a frequency of once per 100,000 square feet of geomembrane. Testing of the conformance samples will be performed, at the discretion of the certifying engineer based upon field observation, as well as the geomembrane fabrication quality control data.

Textured geomembrane is proposed to be used throughout the project rather than require that smooth sheet be used in the flatter areas and textured sheet in the steeper areas. The purpose of this approach is to avoid two types of liner material on the project site, confusion during construction over where each is to be used, avoid transition areas in the liner, as well as minimize the generation of scrap and partial roll excess associated with a two-product system. Of more importance is the fact that the use of textured geomembrane with an overlying geocomposite will not promote an interface between the geomembrane and the geocomposite which exhibits a low interface friction susceptible to sliding or displacement during construction. At face value, a smooth geomembrane would suffice on the proposed flat slopes, but its merits would be readily overshadowed by displacement during construction. The textured geomembrane also provides for enhanced interface friction with the underlying gas venting layer when compared to a smooth geomembrane.

Penetrations of the liner material for the construction of landfill gas vents will be sealed with a fabricated pipe boot. The flange of the pipe boot will be welded to the geomembrane. The barrel of the pipe boot will be secured with stainless steel band clamps or batten strips as appropriate and sealed with a neoprene strip.

All geomembrane panels will be uniquely identified with a panel number which is correlated to the roll number and fabrication (production) quality control test data. Quality control test data will be reviewed prior to deployment and any material with questionable or unacceptable test data or documentation will not be utilized. Upon completion, an as-built panel layout will be prepared identifying, as a minimum, panel numbers (correlated to roll numbers), seam numbers, destructive sample numbers and locations, repairs, patches, etc.

The free end of the in-place geomembrane which exists at the perimeter of the capped area will be secured in an anchor trench. The overlying geocomposite will also be secured in this anchor trench. The anchor trench will be backfilled with barrier protection layer material and tamped to provide a nominal 90 percent Proctor density with the emphasis on not damaging the geosynthetic materials.

3.8 Geocomposite Drainage Layer

A geocomposite drainage layer will be installed immediately above the textured geomembrane over the 33 percent sloped area and extending approximately 10 feet into the 4 percent slope area. The geocomposite drainage layer will serve as a lateral or horizontal drainage medium to relieve the potential for developing a significant hydraulic head of water above the geomembrane. As discussed in Section 4.0, the geocomposite drainage layer will mitigate the potential for the barrier protection layer and the topsoil layer from becoming saturated in the 33 percent slope area and compromising the stability and effectiveness of the overall capping system.

The geocomposite drainage layer will consist of a geosynthetic drainage layer (geonet) core with an 8-ounce per square yard geotextile heat fused to both the upper and lower surfaces. The upper geotextile will serve as a separation/filter layer to the overlying barrier protection layer. The lower geotextile will serve to secure the geocomposite to the textured geomembrane through interface friction. The geocomposite drainage layer will have the physical properties detailed in Tables 3-3 and 3-4.

Table 3-3

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
GEOCOMPOSITE PROPERTY VALUES

Fabric Property	**Test Method**	**Unit**	**Specified Value**	**Qualifier**
Geonet Component:				
Polymer Composition		%	95 polyethylene by weight	Minimum
Polymer Specific Gravity	ASTM D792		0.94	MARV
Polymer Melt Index	ASTM D1238	g/10 min	0.3	MARV
Carbon Black Content	ASTM D1603	%	2-3	Range
Foaming Agents	N/A	%	0.0	Maximum
Nominal Thickness	ASTM D374C	inches	0.20	MARV
Compressibility @ 20,000 psi		%	50	Maximum
Peak Tensile Strength (machine direction)	ASTM D638 modified	lbs/ft	575	MARV
Flow Capacity @ Gradient of 1 @ 500 psf	ASTM D4716	gpm/ft	9.5	
Geotextile Component:	See Table 3-4			
Geocomposite:				
Peel Strength	ASTM F904 or ASTM D413	gm/in	500	Minimum

Note: All values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the values in this table).

Table 3-4

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
GEOCOMPOSITE PROPERTY VALUES - GEOTEXTILE

Fabric Property	Test Method	Unit	Specified Value	Qualifier(1)
Fabric Weight	ASTM D3776	oz/sq yd	7.9	MARV
Thickness, t	ASTM D1777	mils	90	MARV
Grab Strength(2)	ASTM D4632	lbs	210	MARV
Grab Elongation(2)	ASTM D4632	%	50	MARV
Trapezoid Tear Strength(2)	ASTM D4533	lbs	85	MARV
Puncture Resistance	ASTM D4833	lbs	100	MARV
Mullen Burst Strength	ASTM D3786	psi	320	MARV
Water Flow Rate	ASTM D4491	gpm/sq ft	100	MARV
Permitivity	ASTM D4491	sec^{-1}	1.3	MARV
Permeability	ASTM D4491	cm/sec	0.3	MARV
Apparent Opening Size (AOS)	ASTM D4751	sieve size mm	70 0.212	MARV
Transmissivity	ASTM D4716			MARV
• @ 0.3 PSI		gpm/ft	0.11	
• @14.5 PSI		gpm/ft	0.07	
• @29.0 PSI		gpm/ft	0.04	
UV Resistance	ASTM D4355	% strength retained	70	MARV
pH Resistance			2-13	Range

Notes:

1. MARV - Minimum average roll value.
2. Values in the weakest principal direction.

The geocomposite drainage layer will be installed directly on top of the geomembrane, in the required area, after the prepared surface of the geomembrane has been inspected, tested and accepted. Deployment of the geocomposite drainage layer will be coordinated with the placement of the overlying barrier protection layer to ensure that the geotextiles will not be exposed to the elements for more than 14 calendar days.

The geocomposite drainage layer will be deployed in the direction of the slope. The lower geotextiles of adjacent panels will be overlapped. The drainage net cores will be overlapped and secured by tying with nylon cable ties. The upper geotextiles will be seamed by sewing using a double-thread lockstitch Type 401 or equivalent. The seam will be a "flat" or "prayer" seam. All terminal ends or edges of the geocomposite will be finished by seaming the upper and lower geotextiles by sewing as described above.

The geocomposite drainage layer will convey subsurface flow resulting from precipitation which has infiltrated the topsoil and barrier protection layers. The direction of flow will follow the direction of the slope and convey the water to toe drains. These drains will be constructed every 50 feet along the eastern side of the landfill at the base of the slope as well as the interface between the 4 percent and 33 percent slope. These toe drain will be constructed of a pipe extension which will be installed to protrude through the overlying soil layers to "daylight" the flow onto a gravel bed. At the base of the slope the gravel bed will be placed between the toe of slope and roadway (see attached Drawing 9).

3.9 Barrier Protection Layer

The barrier protection layer will be installed directly above the geomembrane over the entire area to be capped. The barrier protection layer will be installed as a compacted lift of 12 inches in thickness.

The barrier protection layer is intended to provide physical protection to the hydraulic barrier (geomembrane) against the effects of frost penetration, roots, erosion, burrowing animals and the elements. The proposed 12-inch thickness of the barrier protection layer combined with the proposed 6-inch thickness of topsoil and 6-inch thickness of the gas venting layer will provide adequate frost protection for the hydraulic barrier.

As discussed in Section 3.6, the Fishers Island Landfill is located in a zone where the average depth of frost penetration is determined to be between 15 and 20 inches. For this discussion, the average depth of frost penetration will be taken as 20 inches, however, Fishers Island being surrounded by water is likely in a more temperate area compared to inland and the average frost penetration depth is likely closer to 15 inches. The occurrence of frost penetration above the proposed geomembrane barrier is not considered to be detrimental to the integrity of the geomembrane given that it will not result in the displacement of the membrane. Six inches of free draining gas venting material will underlie the geomembrane. The underside of the gas venting layer will be 24-inches below the exposed ground surface. This 24-inch depth exceeds the average frost penetration of 20 inches and provides for additional protection during period of above average frost penetration.

The barrier protection layer material will be imported to the site from approved off-site sources. Each proposed source will be subject to prequalification testing and acceptance.

The barrier protection layer material will be clean, inert, well graded granular material free from any organic materials, roots, stumps, chunks of earth or clay, shale or other soft, poor durability particles, construction and demolition debris, reprocessed or recycled soils, concrete asphalt or other foreign material and shall conform to the following gradation.

Sieve Size	Percent Passing By Weight
1 inch	100
No. 40	0-70
No. 200	0-15

The minimum coefficient of permeability of the soil will be 1 x 10^{-3} cm/sec as measured in accordance with ASTM D2434 - Permeability of Granular Soils (Constant Head).

A coarse grained, granular soil has been selected for the barrier protection layer to provide a stable, non-yielding surface suitable for potential secondary uses of the site such as outdoor storage. Fine grained soils containing substantial quantities of silt and/or clay would be prone to moisture retention, capillary action and ultimately, pumping or displacement under load. Shifting of the barrier protection layer under load could then result in damage or stresses imposed on the underlying geosynthetics.

The barrier protection soil will be placed as a loose lift of 12 inches in thickness. The material will be placed by low ground pressure machines. Construction equipment will not be permitted to travel directly on the geocomposite drainage layer. Rubber tired vehicles will only be permitted to operate on a layer of soil at least 3 feet in thickness over the liner as a temporary access way. The lift of material will be compacted by making several passes with the low ground pressure spreading/placing equipment. The moisture content of the soil will be controlled to facilitate compaction, however, a minimum degree of compaction will not be specified for the lift.

Prior to placement of the barrier protection layer, the exposed surface of the geomembrane will be inspected to ensure that it is clean, free of defects and flat. Placement of the barrier protection layer in the flat areas may proceed either upslope or downslope with care taken to ensure that displacement of the geomembrane does not occur. Placement of the barrier protection layer in the steeper slope areas will only be permitted to progress upslope (pushing up the side slopes) to prevent undo stress from being imposed on the geomembrane.

Grade control for placement of the barrier protection layer will utilize non-intrusive means such as laser, stanchions, traffic cones, etc. to prevent damage to or penetration of the underlying geosynthetics.

Testing of the barrier protection layer material during construction will be performed at a frequency of once per 1,000 cubic yards for gradation analysis (ASTM D422) and once per 2,500 cubic yards for permeability (ASTM D2434). In-place moisture/density measurements of the second lift will be performed at a frequency of nine tests per acre per lift utilizing nuclear methods (ASTM D3017 and D2922, respectively).

The finished surface of the barrier protection layer will be surveyed for as-built conditions. The in-place thickness of the barrier protection layer will be confirmed by hand excavating a test hole on a 100-foot grid pattern. A board or straight edge will be used to reference grade and three measurements of the in-place depth will be made. The average of the three readings will be considered the depth of the material. The average thickness of the compacted barrier protection layer will be no less than 12 inches.

3.10 Topsoil and Vegetation

The topsoil layer will be the uppermost layer of soil in the capping system and will be suitable for establishing and growing surface vegetation. The topsoil layer will be 6 inches in thickness and will be placed over the entire area to be capped. For the purpose of this discussion, the term "topsoil" will refer to either a naturally occurring topsoil or a manufactured (processed) vegetative growth medium. If appropriate, the term "natural topsoil" will be used to differentiate between the two meanings.

A review of existing site conditions suggests that there is no appreciable or salvageable quantities of topsoil on-site which would serve to satisfy the need for cap construction. Therefore, all topsoil requirements for the site must be satisfied by the import of topsoil from approved off-site sources.

Natural topsoil will be defined as fertile, friable, natural topsoil of loamy character, without admixtures of subsoil and shall be uniform in quality. Natural topsoil will be free from debris and waste of any kind, clay, hard pan, rocks, pebbles larger than 2 inches in diameter, plants, sod, noxious weeds, roots, sticks, brush and other rubbish. Muck soils will not be considered natural topsoil.

Natural topsoil will have an organic content of no less than 5 percent nor more than 20 percent as determined by loss on ignition of oven-dried samples tested in accordance with ASTM D2974. The pH of the topsoil will not be less than 5.5 and not more than 6.8. The natural topsoil will have a gradation which conforms to the following:

Sieve Size	Percent Passing By Weight
2 inch	100
1 inch	85-100
1/4 inch	65-100
No. 200	20-80

Manufactured or processed topsoil will be defined as a blend of natural soils and yard waste compost material in prescribed proportions to provide an equivalent vegetative growth medium. The manufactured topsoil will be a mixture of sand or silty sand and screened yard waste compost. The approximate mixture will be on the order of 65 to 75 percent sand or silty sand and 25 to 35 percent compost. For this project, the source of yard waste compost is proposed to be obtained from facilities permitted or registered by NYSDEC or other appropriate regulatory agency.

The actual mixture of soil and compost will be proposed by the construction contractor. The contractor will retain the services of an experienced agronomist who will provide a written opinion of the proposed mixture, its suitability as an equivalent vegetative growth medium, its compatibility with the specified seed mixtures, any erosion control measures which differ from the specified requirements and are necessitated by the manufactured material and any soil amendments or fertilizers which may be required to provide a suitable material.

The yard waste compost will be mature and stable, not phytotoxic (not toxic to plants) and will be free of any traces of municipal solid waste, sewage sludge, construction and demolition debris, animal offal or manure, bulking agents or any other objectionable or deleterious materials. The compost material will be free of particles larger than 2 inches and will be generally free of plastics.

The topsoil layer will be placed as one lift 6 inches in depth over the exposed surface of the barrier protection layer (or general fill). The topsoil layer will be raked and cleaned and rolled with a roller weighing between 40 and 65 pounds per foot of width. During rolling, all depressions caused by settlement will be filled with topsoil and the surface shall be regraded and rolled until a smooth, even finished grade is achieved.

The placement and spreading of topsoil will be coordinated with the planting and seeding operation to allow for planting and seeding within 7 days of placement. Soil amendments such as fertilizer, lime, etc., will be applied as required based upon test data.

Testing of the topsoil material during construction will be performed at a frequency of once per 1,000 cubic yards for particle size (sieve and hydrometer analysis), pH and organic content.

The proposed vegetation for the capped area of the site will be a mixture of turf grasses which will provide for rapid establishment to minimize erosion, as well as slower growing species to minimize long-term maintenance. The seed mixture will include:

- Crown Vetch;
- White Clover;
- Palmer Perennial Ryegrass;
- Little Bluestone;

- Chewings Red Fescue;
- Kentucky 31 Tall Fescue;
- Redtop;
- or equivalent species.

The seed mixture will be applied by hydroseeding onto the loosened surface of the topsoil layer. The hydroseeding operation will include the application of a hydromulch and hydromulch adhesive to secure and protect the seeding sufficiently to allow for the placement of the overlying erosion control fabric.

The in-place depth of the topsoil will be confirmed using the procedures for test pits discussed for the barrier protection layer soils.

The finished surface of the topsoil layer will be surveyed for as-built conditions.

Section 4

4.0 SLOPE STABILITY

A critical element in the design of a landfill capping system is the assessment of the lining system to remain stable and to not impose undue stresses in the components of the system. These stresses may be imparted through the sliding action of one surface against another. Typically, the focus of concern is addressed to the interface or contact plane between the soil components of the systems against the geosynthetic components of the system and also the interface between two contacting geosynthetics.

The design requirements prescribed by 6 NYCRR Part 360 place restrictions on the maximum slope angle permitted. The maximum prescribed slope angle may be considered to be 1 vertical to 3 horizontal (1V:3H), 33 percent or 18.4 degrees and up to 50 percent for no more than a 20-foot vertical rise. In instances where the interface friction angle (resistance) is not sufficiently large to counteract the tendency of the lining materials to progress downslope (driving force) the difference in forces must be assumed by the tensile properties of the lining components. In instances where the resistive forces of friction exceed the driving forces, the forces acting across the interface are considered to be neutral and no tensile contribution is required of the geosynthetics.

The typical landfill capping system is constructed in a succession of layers, each of a generally uniform and definable cross section. Each layer may be equated to a thin veneer separated from underlying and overlying layers or veneers by identifiable boundaries or interfaces. An examination of the forces acting at the critical interfaces is referred to as a Veneers Stability Analysis.

For landfills, which project upwards as a mound above surrounding grades and impart unbalanced loads through the waste and/or underlying and adjacent soils, the issue of global or slope stability is an area of concern, as well as the effects of seismic loading conditions on stability.

A slope stability analysis was performed for the closure of the Fishers Island Landfill. The purpose of this analysis was to evaluate the stability of the final proposed closure slopes for the landfill. The analysis was performed by Tectonics Engineering Consultants, P.C. This section presents the findings of the analysis and recommendations for the design of the landfill closure slopes. The details of the stability analysis are provided in Appendix B.

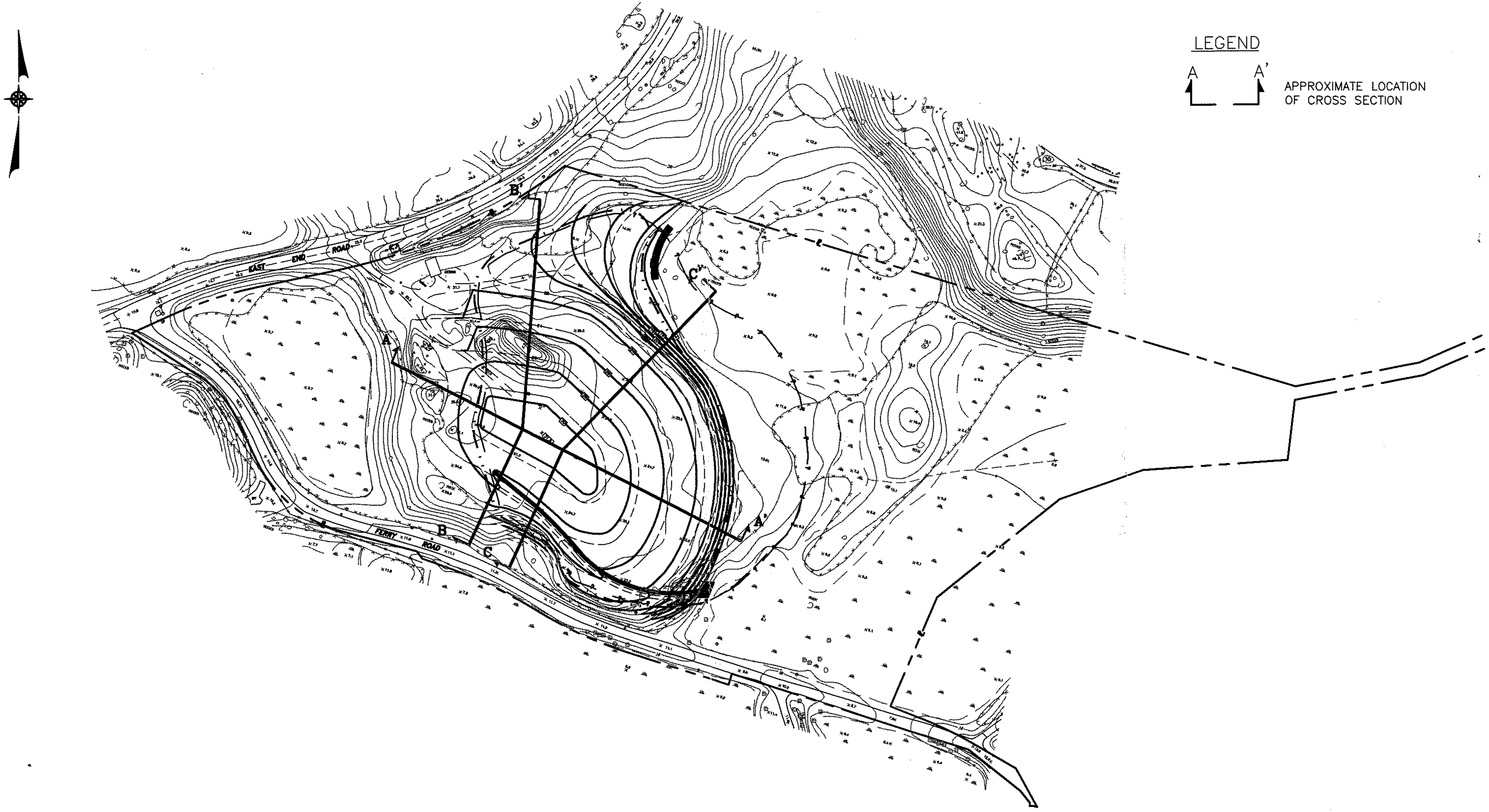
4.1 Slope Stability Analysis

Two geometric cross-sections designated as profile A-A' and C-C' were analyzed for overall slope stability. The location of these cross sections are provided on Figure 4-1 and the cross sections are provided as Figures 4-2 and 4-3.

Slope stability analyses were performed by the Simplified Bishop Method utilizing the PCSTABL 5M computer program. Failure surfaces along the cross sections were generated using the "Circle" searching algorithm and "Surface" for both static and pseudo-static (seismic) conditions. Iterations using these subroutines yielded the critical failure surfaces for the subject slopes.

The slopes were analyzed to evaluate the static slope stability, the effect of the design seismic effect on the gross stability of the subject slopes, and the surficial stability of the landfill cap material and underlying waste mass.

Table 4-1 presents the results of the static and pseudo-static slope stability analyses. Plots and design criteria are provided in Appendix B.



SCALE: 1"=150'

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FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

CROSS SECTION LOCATION MAP

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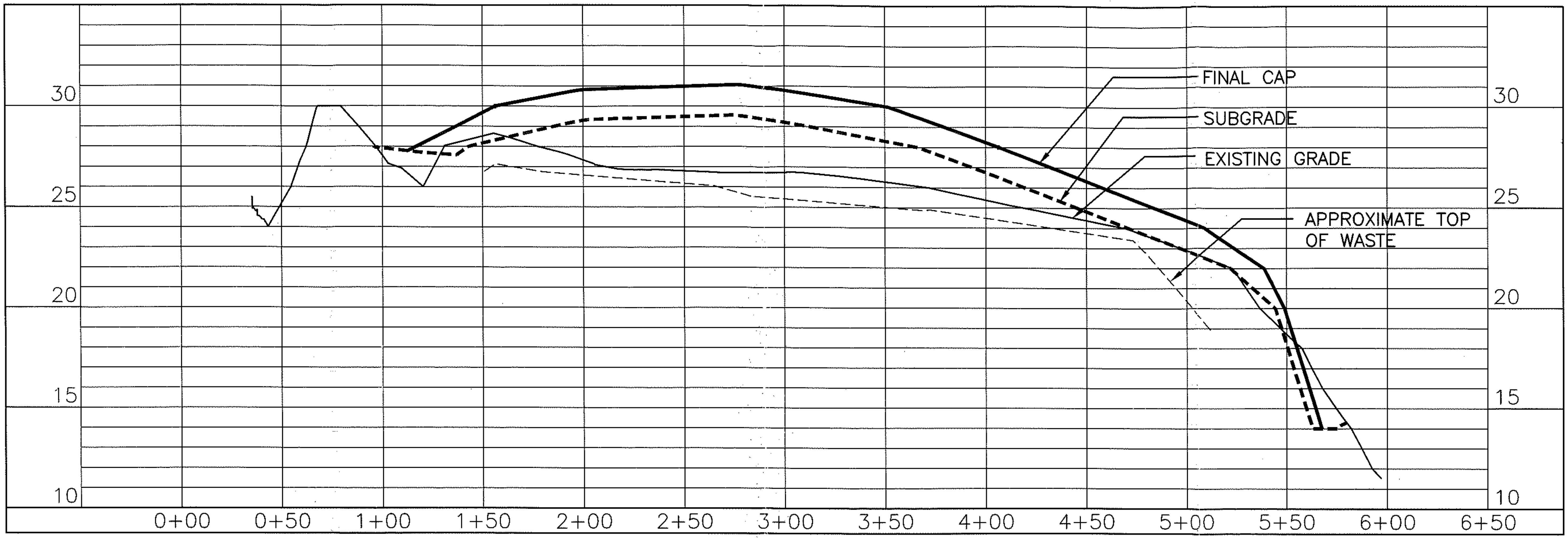
FIGURE 4-1



PROFILE A–A'

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=5'

DIR: 1468 FILE: 1468-13

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=5'

FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

PROFILE A–A

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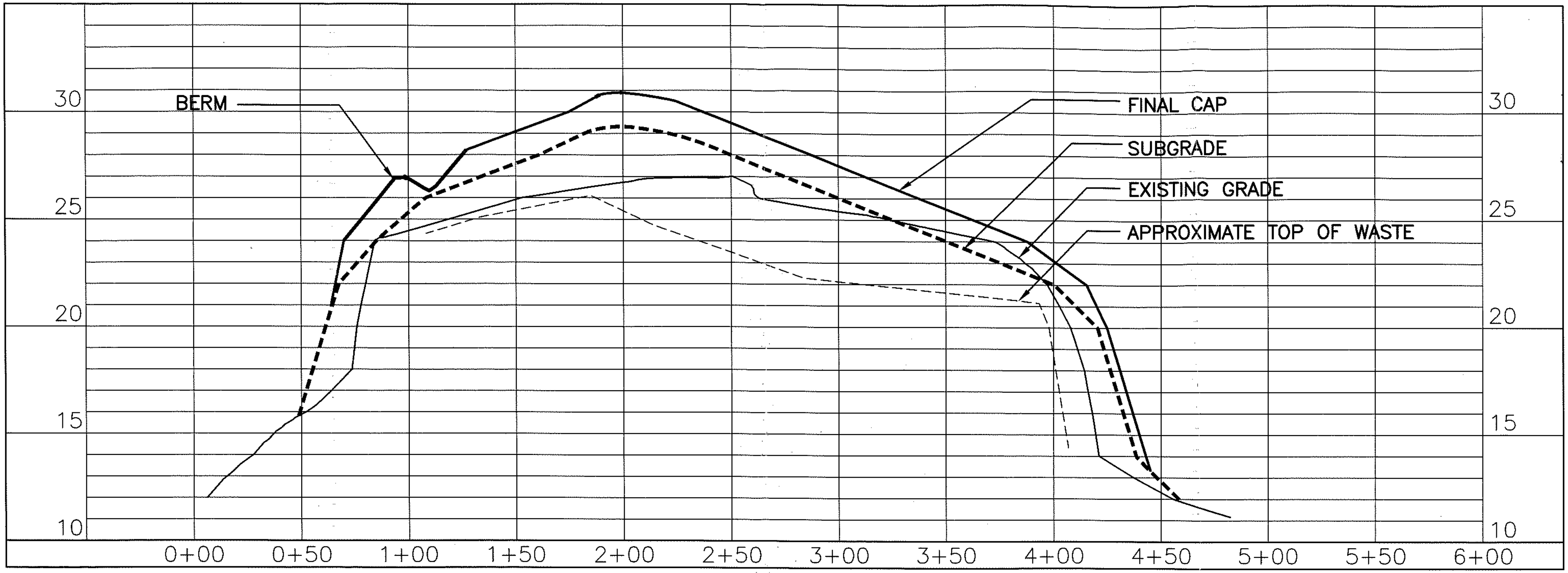
FIGURE 4–2



PROFILE C–C'

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=5'

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HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=5'

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FISHERS ISLAND LANDFILL
SUFFOLK COUNTY, NEW YORK

PROFILE C–C

FIGURE 4–3

Table 4-1

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
SHEAR STRENGTH PARAMETERS

SHEAR STRENGTH PARAMETERS				
Slope Material	**Moist Unit Weight (pcf)**	**Saturated Unit Weight (pcf)**	**Friction Angle (degrees)**	**Cohesion (pcf)**
Landfill Cap Soils	105	115	32	0
Landfill Solid Waste Materials	65	75	20	200
Wetland Materials	65	75	20	200

4.2 Veneer Slope Stability Analysis

The typical landfill capping system is constructed in a succession of layers, each of a generally uniform and definable cross section. Each layer may be equated to a thin veneer separated from underlying and overlying layers or veneers by identifiable boundaries or interfaces. An examination of the g-forces acting at the critical interfaces is referred to as a veneer stability analysis.

The interface between the geomembrane and the landfill cap was considered to be the critical slip surface. For the analysis, water was assumed to be 3 inches above the geomembrane at the top of the slope and increase to the total depth of the cap at the base of the slope. The slope was assumed to be inclined at 33 percent.

The veneer slope stability analysis yielded a factor of safety of 1.6 under static loading conditions and a factor of safety of 1.2 under seismic conditions.

4.3 Conclusions and Recommendations

The slope stability analysis indicates that, based on the grading plan and cap design planned for the Fishers Island Landfill, adequate factors of safety were obtained for the static gross stability condition, for the pseudo-static (seismic) conditions and for potential surficial failures through the landfill cap materials.

However, large equipment loads applied during construction may result in a localized failure of the slope, especially along the interface between the landfill cap soils and geomembrane. Therefore, adequate drainage should be designed into the landfill cap on the steeper slopes in order to prevent the development of a fully saturated condition within the landfill cap soil layer on these slopes.

Based upon the results of the analysis and concerns for localized failure of the slope, in particular, on the steeper slopes, a geocomposite will be incorporated into the cap design between the geomembrane and the overlying barrier protection layer on the 33 percent slopes. This geocomposite will also extend approximately 10 feet onto the 4 percent slopes. This will provide for adequate drainage of the cap and eliminate potential for fully saturated conditions on the steep slopes. Further details are provided in Section 5.0 - Hydraulic Efficiency.

Section 5

5.0 HYDRAULIC EFFICIENCY

The hydraulic efficiency of the proposed capping system is a measure of the ability of the cap to inhibit the percolation of infiltrated precipitation into the waste mass and the generation of leachate. In order to assess the hydraulic efficiency, the proposed capping system was modeled using the Hydrologic Evaluation of Landfill Performance (HELP) model developed by the U.S. Army Corps of Engineers Waterways Experiment Station. The HELP model, Version 3, September 1994, was utilized in this analysis.

The HELP model is a quasi-two dimensional model of water movement across, into, through and out of landfills. The model accepts weather, soil and design data, and uses solution techniques that account for the effects of surface storage, snow melt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, unsaturated vertical drainage and leakage through geomembrane liners. The model can be used to evaluate the efficiency of bottom lined landfills, as well as landfill caps over lined and unlined landfills. In the case of the Fishers Island Landfill, which is an unlined landfill, the evaluation is limited to the efficiency of the proposed cap.

In order to utilize the HELP model, certain variables must be selected or defined. Where appropriate, default values and data contained within the model may be utilized in lieu of developing site-specific data. For the Fishers Island Landfill, evapotranspiration and weather data for New Haven, Connecticut was utilized as being geographically representative of the landfill site. The evaporative zone depth was selected as 18 inches, which is representative of a humid area with surface vegetation. The maximum leaf area index was selected as 2.0, representing a fair stand of grass that is appropriate for a typical landfill cap which receives nominal maintenance. The start and end of the growing area was selected to coincide with the period of the middle of March through the end of October.

In order to provide an accurate evaluation of the proposed capping system, a finite number of defects were assumed to exist in the completed geomembrane hydraulic barrier. The size and frequency of the defects is considered consistent with good construction quality assurance/ quality control (CQA/CQC). For a good installation, the geomembrane defects are defined as one pinhole per acre and three installation defects per acre, again being consistent with good CQA/CQC. The HELP guidance document suggests that an excellent installation quality (one defect per acre) is achieved only 10 percent of the time, as opposed to a good installation, which is routinely achieved 40 percent of the time. The geomembrane placement quality was also selected as "good," representing a good field installation with a well prepared, smooth soil surface and geomembrane wrinkle control to ensure good contact between the geomembrane and the underlying soil.

The following discussion of the HELP model results relates to the proposed use of a 4 percent slope on the plateau portion of the landfill and 33 percent slope on the eastern side slopes adjacent to the wetlands, and also the proposed capping system and hydraulic efficiency.

For this hydraulic efficiency evaluation, four separate runs of the HELP model were prepared to represent the following conditions:

- 4 percent slope, no geocomposite drainage layer
- 4 percent slope, with a geocomposite drainage layer
- 33 percent slope with no geocomposite drainage layer
- 33 percent slope with a geocomposite drainage layer

The output from these four model runs is included as Appendix C. With the exception of the variables noted above, all other parameters remained the same for this analysis. The period of analysis was selected as five years to coincide with the climate data available from the model for the calendar years 1977 through 1981. For each of the four runs, the section "Average Annual Totals for Years 1977 through 1981" has been excerpted and presented as Tables 5-1 through 5-4.

Table 5-2

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
HELP MODEL
33% SLOPE, NO GEOCOMPOSITE DRAINAGE LAYER
AVERAGE ANNUAL TOTALS FOR YEARS 1977 THROUGH 1981

	Inches	**Percent**
Precipitation	49.71	100.00
Runoff	3.68	7.39
Evapotranspiration	27.87	56.08
Lateral Drainage Collected from Layer 2 (Barrier Protection Layer)	17.83	35.88
Percolation/Leakage Through from Layer 3 (Geomembrane)	0.25	0.50
Average Head Across Top of Layer 3 (Geomembrane)	0.55	

Hydraulic Efficiency = 99.50%

For a 4-percent slope without a geocomposite drainage layer, the hydraulic efficiency is calculated to be 93.00 percent. For a 33-percent slope without a geocomposite drainage layer, the hydraulic efficiency is calculated to be 99.50 percent. The 4-percent slope without a geocomposite drainage layer will basically provide an overall system efficiency which meets the efficiency presented by NYSDEC (94.40 percent) in the DEIS. As described previously, the cap simulated in the DEIS did not account for any defects. The 4 percent slope without a geocomposite analysis does account for defects which is a more realistic approach. Therefore, the slight difference in efficiency (less than 1.4%), should be acceptable.

As discussed in Section 4.0, the proposed capping system will incorporate the use of a geocomposite drainage layer above the geomembrane on the 33% slopes to facilitate lateral drainage and minimize the accumulation of head on the hydraulic barrier to provide for improved slope stability. Tables 5-3 and 5-4 present the results for a 4 percent slope with a geocomposite drainage layer and a 33 percent slope with a geocomposite drainage layer, respectively.

The benefit of incorporating a geocomposite drainage layer into the system is reflected in the improvement of the hydraulic efficiency for the 4-percent slope example. In the 4-percent slope example with a geocomposite drainage layer, the calculated hydraulic efficiency has been increased to at least 99 percent, which exceeds the NYSDEC criteria of 94.40 percent. However, as discussed above, the 4-percent slope without a geocomposite meets the cap efficiency as presented by NYSDEC, and therefore, a geocomposite is not necessary on the 4-percent slopes.

Table 5-3

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
HELP MODEL
33% SLOPE WITH GEOCOMPOSITE DRAINAGE LAYER
AVERAGE ANNUAL TOTALS FOR YEARS 1977 THROUGH 1981

	Inches	**Percent**
Precipitation	49.71	100.00
Runoff	3.68	7.41
Evapotranspiration	25.67	51.64
Lateral Drainage Collected from Layer 3 (Geocomposite)	20.09	40.42
Percolation/Leakage Through from Layer 4 (Geomembrane)	0.00004	0.00007
Average Head Across Top of Layer 4 (Geomembrane)	0.00	

Hydraulic Efficiency = 99.99%

Table 5-4

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
HELP MODEL
4% SLOPE WITH GEOCOMPOSITE DRAINAGE LAYER
AVERAGE ANNUAL TOTALS FOR YEARS 1977 THROUGH 1981

	Inches	**Percent**
Precipitation	49.71	100.00
Runoff	3.01	6.05
Evapotranspiration	25.78	51.86
Lateral Drainage Collected from Layer 3 (Geocomposite)	20.73	41.70
Percolation/Leakage Through from Layer 4 (Geomembrane)	0.003	0.005
Average Head Across Top of Layer 4 (Geomembrane)	0.002	

Hydraulic Efficiency = 99.99%

Section 6

6.0 DRAINAGE AND EROSION CONTROL

6.1 General

The topography of the Fishers Island Landfill is, in general, gently sloping approximately 4 percent from west to east direction. The landfill site is, in general, approximately 25 feet above mean low tide elevation. At present, the site drainage consists of surface runoff in the form of sheet flow primarily into well established wetlands adjacent to the landfill. These wetlands bound the Fishers Island Landfill on three sides—east, south and west. The wetland areas are predominantly covered with heavy vegetation consistent with wetland species. Existing wetlands are presently providing a natural water quality system for the existing surface water.

At present, some precipitation will not be in the form of surface runoff, but will infiltrate and percolate through the waste mass. With the construction of the proposed capping system, the opportunity for infiltration to occur will be mitigated by the cap. Therefore, management of increased storm water runoff after cap construction will require evaluation. It appears the best opportunity to manage storm water runoff from the completed landfill cap would be to utilize the existing wetland area, primarily east of the landfill, for quantity and quality control.

6.2 Design Parameters

In order to assess if the wetland areas can accommodate the surface runoff with a cap in place, a hydraulic analysis of the Fishers Island Landfill was conducted. This hydraulic analysis generates flow per drainage area which would discharge into the existing wetlands. This time of concentration path is in the form of sheet flow or swale conveyance. In accordance with the Part 360 requirements, the storm water management system must be sufficient to accommodate a 25-year storm event with a 24-hour duration. For the Fishers' Island area, this storm event is equivalent to 6 inches of rainfall in a coastal setting.

The following hydraulic analysis utilizes the Soil Conservation Service watershed models TR-55 and TR-20 in the computer program, HydroCad. Site design parameters consist of a (RCA) number of 56, which is equivalent to a surface having brush, weeds and a fair stand of grass. The vegetative growth medium was determined by the U.S. Geological Survey soil classification to be Group B. A 25-year storm event with a 24-hour duration yielding 6 inches of rainfall is routed through the landfill watershed to provide a water surface elevation increase in the existing wetlands and proposed flow rates per drainage area.

6.3 Storm Water Disposal

A review of the proposed final grading plan indicates that there are four subareas with definable flow paths. These areas are identified as areas FIL-1 through FIL-4 on Drawing 6. The analysis of the storm water discharge from each of these areas was performed using HydroCad 4.0. A copy of this analysis is provided in Appendix D.

The northern portion of the drainage area, FIL-1, consists of 1.61± acres. The design flow path for this drainage area travels northerly along the perimeter of the cap landfill which terminates at the eastern wetlands. The runoff generated from this area was calculated to yield 3.6 cfs.

The drainage areas FIL-2 and FIL-3 consist of 0.95 and 0.88 acres respectively, which will produce 2.3 and 2.1 cfs in flow. These areas are located on the eastern portion of the landfill. Storm water runoff from these drainage areas will be in the form of sheet flow to the wetlands.

The southern half of the landfill, FIL-4 having a drainage area of 1.12± acres, is tributary to the eastern wetlands. The time of concentration path for this contributing storm water discharge is by a constructed berm on the top of the existing embankment, since the proposed capping system will terminate at the top/landfill plateau because the waste is not present on the slopes in this drainage area. A flow of 3.1 cfs is generated as runoff over this surface area.

Under the design storm event, the combination of all three drainage areas will generate 11.1 cfs in surface runoff.

As discussed previously, the opportunity for on-site disposal exists due to the large area of existing well established wetlands located east of the proposed capping system. As part of this analysis, this wetland area, labeled "existing wetland" in the HydroCad model, will be the design point to which all tributary drainage area will flow. In order to provide on/adjacent site disposal capacity, the analysis will have to demonstrate that the water level in the existing wetlands will not rise significantly and that the velocity of surface water runoff will not adversely impact the wetlands. Also, during construction of the proposed capping system, adequate sediment control measures, as described below, will be provided to protect the wetlands.

As determined by the HydroCad model, under a design storm event, the rise in the water level of the eastern wetland is insignificant due to the large area of the receiving wetland. Therefore, the eastern wetland area should provide sufficient assimilative capacity to allow for all storm water to be disposed adjacent to the site. In addition, there is an outlet to the east of the wetlands that drains to the ocean.

6.4 Erosion Control Practices

Erosion and sedimentation from areas undergoing cap construction must be properly controlled to ensure that the disturbed areas will not adversely affect the surrounding wetlands. The erosion potential will be evaluated by specific conditions, such as soils, drainage, vegetative cover, and proposed clearing and grading, so that the most effective erosion and sediment controls can be implemented. The implementation of these erosion and sediment controls will occur during certain phases of construction and have been organized into three functional categories: temporary practices, permanent practices and vegetative practices. Under each category, a list of specific devices which will be incorporated into the final design for capping of the Fishers Island Landfill is discussed below. Also, the effectiveness of the devices and the approximate location around the limit of disturbed area of the capping systems is addressed.

Temporary erosion and sediment control practices are those used for a relatively short period of time. These practices should not be used for longer than the periods of time prescribed and must be properly maintained during the course of construction. The following is a list of temporary measures that will be placed around the perimeter of the landfill.

A silt fence, which is a temporary barrier of geotextile fabric, will be positioned at the toe of the fill area on the east side of the final cap construction. The purpose of a silt fence is to reduce runoff velocity and intercept sediment-laden runoff from small drainage areas of disturbed soil. This device will be used to protect the existing wetland from soil erosion caused by rainfall and surface runoff.

Construction site tracking pads, which consist of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site, will be used to stabilize the construction entrance to reduce the tracking of soil onto a public right-of-way.

Stockpiling of erodible material will be achieved by the placement of an anchored straw bale barrier to intercept sediment-laden runoff around the stockpiles. Sediment traps will be excavated to receive sediment-laden surface runoff from the two proposed grassed waterways/swales located north and south of the landfill site. The sediment trap retains the sediment until the suspended particles settle to the bottom of the excavated area and sediment-free runoff will proceed into the existing wetlands.

Permanent practices are designed to remain in place and function following completion of construction. Such controls are constructed to control the flow of water or to trap sediment so that off-site sedimentation will not occur. A grassed berm/swale combination with a trapezoidal cross-section will be graded to convey surface runoff to stable outlets at nonerosive velocities. These drainageways will be constructed north and south of the Fishers Island Landfill in order to transport the flow into the adjacent natural water course. Located at the north discharge point will be a level spreader constructed of an excavated area short in width compared to its length, placed perpendicular to the slope. This device will spread out storm water runoff uniformly over the ground surface as sheet flow thus preventing concentrated, erosive flow from occurring in the eastern wetlands.

A riprap lined downchute channel will be constructed at the southerly discharge point to discharge concentrated runoff without damage from erosion due to steep grades and high runoff velocities. After the downchute section, the drainageway will terminate into an energy dissipater, utilizing large rocks as an outlet protection to reduce the depth, velocity and energy of surface water, such that the flow will not erode the receiving downstream wetlands.

Lastly, vegetative practices concern the stabilizing of soil surface to prevent erosion. The establishment and maintenance of vegetation are the most important factors in minimizing erosion during development. Erosion control blankets will be installed on the seeded landfill surface to provide temporary soil erosion resistance. Erosion control fabric will be installed in the seeded drainage channels to provide permanent soil erosion resistance and vegetation reinforcement. Each material will assist in establishing the permanent vegetation by shielding the seeded areas from direct impact by precipitation, direct exposure to sunlight and surface runoff, as well as improving the moisture conditions of the seed bed which is necessary for proper germination.

A distinction is made between the erosion control blanket and the erosion control fabric based upon its materials, construction, durability and permanence.

The erosion control blanket will be a fabricated machine-produced mat consisting of 70 percent agricultural straw and 30 percent coconut fiber. The upper surface of the mat will be covered with UV stabilized black polypropylene netting having approximately a 5/8 inch by 5/8-inch mesh size. The bottom surface of the mat will be a lightweight, photodegradable netting with approximately 1/2 by 1/2-inch mesh size. The components of the blanket will be factory sewn together using biodegradable thread.

The erosion control blanket will be installed directly over the prepared seed bed and secured in place using heavy duty staples. Anchor trenches and check slots will be installed as appropriate to anchor the material and minimize erosion from occurring below the blanket. The erosion control blankets will be installed in the direction of the slope. The erosion control blanket will remain viable for two to three growing seasons.

The erosion control fabric will be a fabricated machine-produced mat suitable as a permanent channel lining and turf reinforcement mat. The mat will be fabricated from 100 percent UV stabilized polypropylene. The fiber matrix core will have a minimum of 0.70 lb./sq. yd. of high denier UV stabilized polypropylene fiber. The top netting and bottom netting will be UV stabilized polypropylene netting with approximately 1/2 inch by 1/2-inch and 5/8 inch by 5/8-inch mesh, respectively. The netting and core will be secured in relative position by sewing using UV stabilized polypropylene thread.

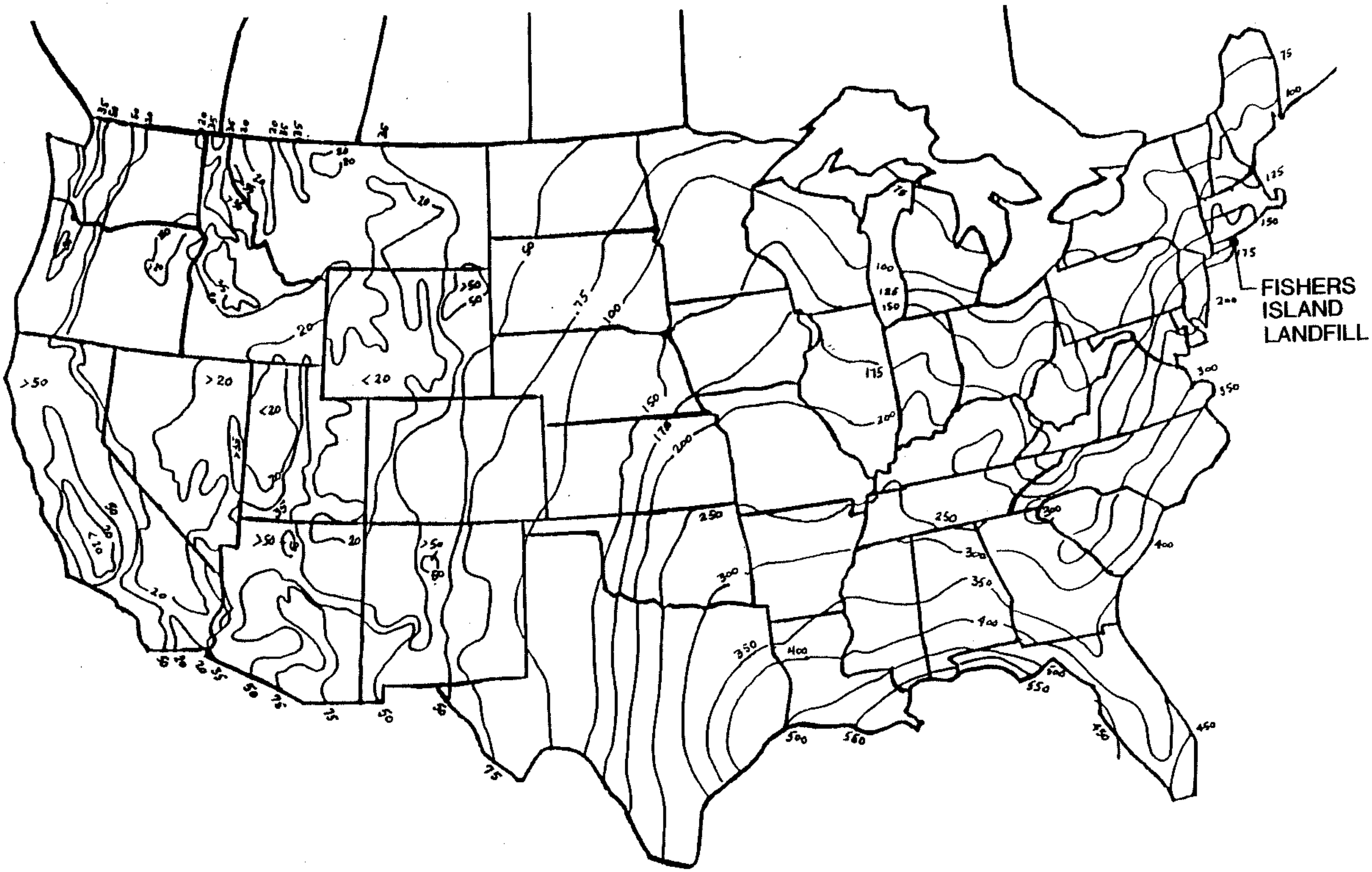
The erosion control materials will serve to protect the site, promote the establishment of the vegetation layer and minimize the loss of topsoil due to the erosional forces of surface runoff. During construction, a bare, exposed topsoil surface presents the most susceptible condition for erosion prior to establishment of the vegetation. During the period of establishing the vegetation from seed, erosion of the topsoil surface will disturb the prepared seedbed and transport the seeds from their intended location. Repair efforts requiring heavy equipment will typically disturb additional areas while accessing the area of concern thereby further setting back the overall establishment of vegetation. In addition, landfill capping construction projects typically near completion toward the latter part of the construction season, considered late fall to early winter. It is possible that seeding of the topsoil surface will not occur during the normal windows of the growing season, suggesting that the topsoil surface may lay bare and exposed for an extended period.

The Erosion Control Material Design Software V4.1 Slope Module (published by North American Green), which uses the Universal Soil Loss Equation (USLE) provides an opportunity to assess the impacts of erosion to the topsoil surface, as well as gauge the apparent effectiveness of an included erosion control material. The USLE is used to calculate the loss of topsoil in terms of tons per acre per year. The loss of surface soils is most directly dependent on the texture and erodability of the surface soil, the geographic location of the site in terms of rainfall events, the slope angle or gradient, and the unbroken length of slope. The following input data was used in estimating potential topsoil loss due to erosion:

- Annual R Factor or Rainfall Intensity Factor. For the Fishers Island Landfill, the R value is taken as 175. See Figure 6-1.
- Slope Gradient - 33 percent.
- Total slope length - 18 feet (the approximate length of 33 percent slope).
- Soil type - sandy loam.

The predicted maximum loss of bare topsoil is 0.12 inches over a 6 month period based on the input data presented above. This value represents the potential loss of soil from the mildest slopes on the project at a point in time where the slopes have been constructed but the vegetation has not become established (i.e., bare ground). The addition of the erosion control materials allows for a reduction in soil loss. Using the proposed erosion control blanket, no soil loss is anticipated.

The proposed erosion control blanket should provide 2 to 3 years of surface protection before it naturally decomposes. This period should be more than ample to allow the ultimate vegetation to establish. The proposed erosion control fabric for the drainage swales is considered a permanent material and should provide long-term utility.



SOURCE: NORTH AMERICAN GREEN

FISHERS ISLAND LANDFILL
CLOSURE PLAN

RAINFALL INTENSITY "R" FACTORS

FIGURE 6–1

Dvirka and Bartilucci
Consulting Engineers
A Division of William F. Cosulich Associates, P.C.

Erosion control devices will be implemented during construction of the capping system and incorporated as part of the final capping system. During construction, the contractor will be required to install and maintain erosion control measures for temporary, permanent and vegetative practices. A detailed construction erosion control plan will be provided in the construction plans and specifications. Typical details to be used in formulating the erosion control plan are presented in Drawing 10.

Section 7

7.0 GROUNDWATER MONITORING

The existing groundwater quality in the area of the Fishers Island Landfill has been documented in the following:

- Hydrogeologic Investigation Report for The Picket Landfill, Fishers Island, New York, prepared by Fanning, Phillips & Molnar, May 1994.
- Second round of groundwater sampling results, letter to New York State Department of Environmental Conservation, from Fanning, Phillips & Molnar, dated October 20, 1995.
- Draft Closure Investigation Report for the Picket Landfill, Fishers Island, New York, prepared by Fanning, Phillips & Molnar, March 1997.

The above referenced documents are on file with the New York State Department of Environmental Conservation (NYSDEC), Region I.

As discussed in Section 2.4, groundwater samples were collected from seven groundwater monitoring wells (W-1 through W-6 and MW-13) in August 1993. Each of the samples were analyzed for baseline parameters with the exception of the groundwater sample collected from W-5 which was analyzed for hexavalent chromium, color and volatile organic compounds due to insufficient water volume. No other analysis was performed due to insufficient water volume. Hexavalent chromium and total chromium are analyzed by two different analytical method and therefore require different sample containers. There was not sufficient water volume to analyze for chromium or the remaining metals. Based on the results of the analysis, three volatile organic compounds were detected in the downgradient wells; however, the concentrations of these compounds did not exceed the NYSDEC Class GA groundwater standards/guidelines. Exceedances of the NYSDEC standards/guidelines were noted only for color, turbidity, sodium, total dissolved solids, iron and manganese.

A second round of groundwater samples was collected in May 1995. Groundwater samples were collected from six of the monitoring wells (W-1 through W-4, W-6 and MW-13) and analyzed for baseline parameters. The results of the second round of sampling indicated similar results to the previous round with the exception of a slightly elevated level of ethylbenzene (19 ug/l) in MW-13.

One private well used for irrigation purposes was located downgradient of the landfill. The Suffolk County Department of Health Services collected a sample from this well. The results of the analysis did not indicate the presence of any contaminants above NYSDEC Class GA groundwater standards/guidelines.

The results of the sampling indicate that there appear to be no significant impacts to groundwater in the wells downgradient of the landfill. Many of the exceedances of the inorganic parameters were attributed to background levels and potential influences from the tidal wetlands adjacent to the landfill. The existing wells were constructed in accordance with 6 NYCRR Part 360 and were determined to be an appropriate monitoring network that documents both upgradient and downgradient groundwater quality relative to the landfill site.

The proposed monitoring program will consist of sampling one upgradient monitoring well (Well No. 4) and two downgradient wells (Well No. 2 and Well No. 6). These wells will be sampled semiannually and groundwater samples will be analyzed for routine parameters once a year and baseline parameters once a year.

In the event that the proposed sampling program documents a new or increased contravention of the groundwater standards/guidelines, the Fishers Island Garbage and Refuse District will determine whether the contravention is material or nonmaterial and present its findings to the NYSDEC. Subsequent modification of the groundwater monitoring program, if required, will be discussed with the NYSDEC.

Section 8

8.0 CONSTRUCTION COST ESTIMATE

A cost estimate for the construction of the Fishers Island Landfill capping system is presented in Table 8-1. The estimate has been prepared based upon the closure plan described in this document. The unit costs used to develop this estimate are representative of comparable work performed and material supplied in the Long Island and Eastern Connecticut areas.

The total cost for the construction of the landfill capping system and appurtenances as presented is estimated to be approximately $1.3 million.

Table 8-1

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
CONSTRUCTION COST ESTIMATE

				Engineer's Estimate	
Item No.	Description	Estimated Quantities	Unit	Unit Price	Total Price
1.	Pre-Mobilization (not to exceed four percent (4%) of the Total Amount of Estimate)	LS	LS	LS	$40,990.00
2.	Mobilization, Maintain and Demobilize (not to exceed two percent (2%) of the Total Amount of Estimate)	LS	LS	LS	$20,500.00
3.	Clearing and Grubbing	5	acre	$2,800	$14,000.00
4.	Contour Grading Material	600	cu. yd.	$6.00	$3,600.00
5.	Unclassified Excavation and Relandfilling	6,000	cu. yd.	$6.00	$36,000.00
6.	Geotextile – Type 1	190,000	sq. ft.	$0.25	$47,500.00
7.	Gas Venting Layer (6")	4,000	cu. yd.	$18.00	$72,000.00
8.	60-Mil Textured HDPE Geomembrane	190,000	sq. ft.	$0.75	$142,500.00
9.	Landfill Gas Vents	7	each	$3,300	$23,100.00
10.	Geocomposite	23,540	sq. ft.	$0.65	$15,300.00
11.	Barrier Protection Layer (12")	7,500	cu. yd.	$12.00	$90,000.00
12.	Topsoil Layer (6")	4,000	cu. yd.	$21.00	$84,000.00
13.	Erosion Control Blanket: crown and sideslopes	21,120	sq. yd.	$1.50	$31,680.00
14.	Erosion Control Fabric	550	sq. yd.	$5.00	$2,750.00
15.	Silt Fence	1,650	lf	$1.22	$2,010.00
16.	Seeding (hydro)	30,230	sq. yd.	$0.90	$27,200.00
17.	Culverts	0	---	$0	$0.00
18.	Rip-Rap	230	cu. yd.	$81.00	$18,860.00
19.	Fencing and Gating	800	lf	$18.75	$15,000.00
20.	Perimeter Road	670	lf	$19.63	$13,150.00
21.	Abandon Existing Groundwater Monitoring Wells	4	each	$3,000	$12,000.00

Table 8-1 (continued)

FISHERS ISLAND LANDFILL
FINAL CLOSURE PLAN
CONSTRUCTION COST ESTIMATE

				Engineer's Estimate	
Item No.	**Description**	**Estimated Quantities**	**Unit**	**Unit Price**	**Total Price**
22.	4" Diameter Slope Drains and Toe Drains	1,100	lf	$4.00	$4,400.00
23.	Metal Pile	141	cu. yd.	$15.00	$2,115.00
24.	Glass Pile	17	cu. yd.	$15.00	$255.00
25.	Shipping (Ferry Cost and Truck Time)	LS	LS	LS	$367,380.00
26.	Expenses Related to Island Construction 15%				$162,950.00
27.	Contingency 10%				$108,630.00
	Total Amount of Estimate				**$1,357,870.00**

Section 9

9.0 CONSTRUCTION SCHEDULE

A schedule for the construction of the Fishers Island Landfill capping system is presented as Figure 9-1. The schedule addresses the physical construction effort for the project and would follow the preparation of plans and specifications, reviews, competitive bidding, award of bid and execution of contracts.

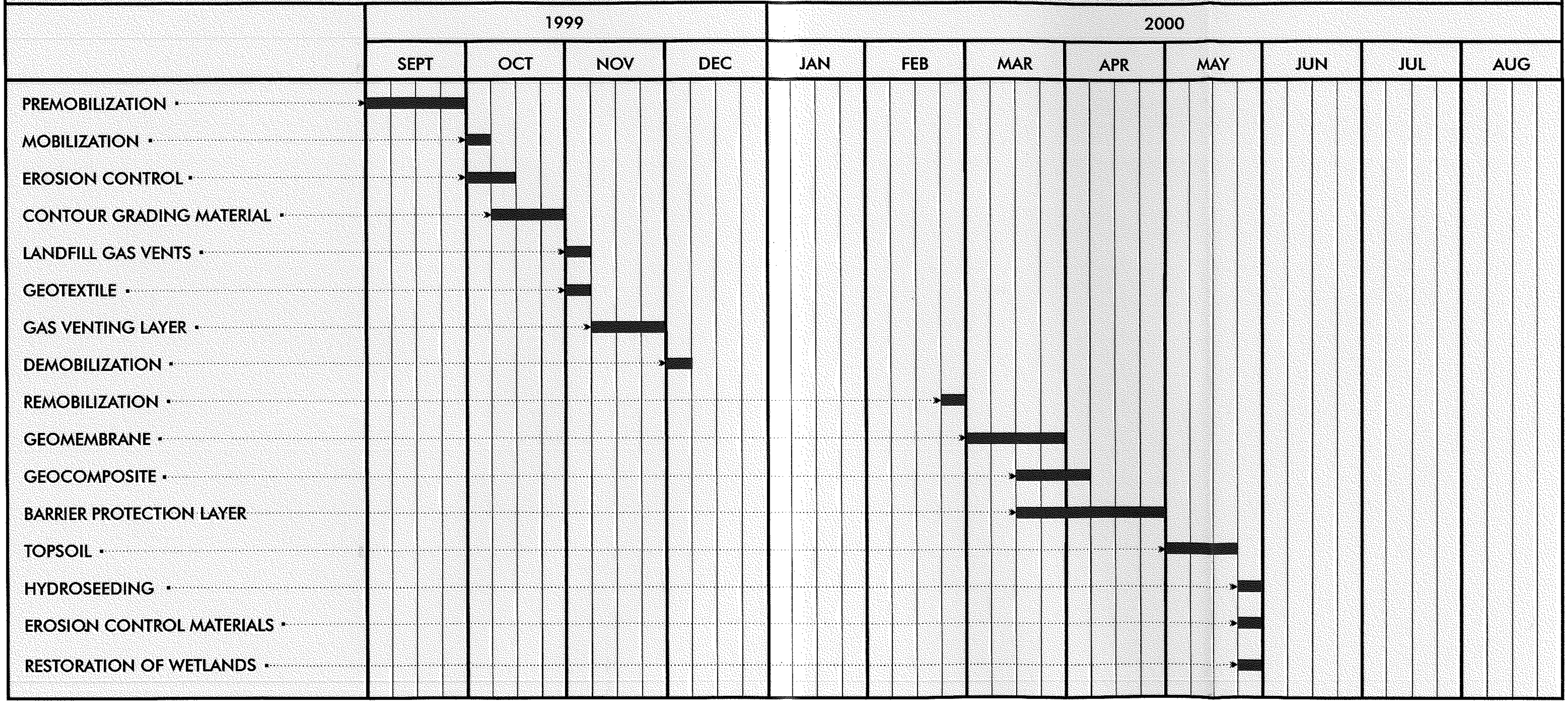
As shown on the attached Construction Schedule, a significant impact on the overall construction schedule is trying to accomplish closure of the landfill prior to the summer season. Transportation to the island utilizing the ferry service is extremely limited (one to two trucks per day with advance reservations) during the months of May through October. During the remaining late fall, winter and early spring months, charter ferry service is available to allow for transport of up to 18 trucks per day. Based on the transportation restrictions, delivery of the necessary materials and supplies to the Island will be difficult. In addition, there is little space available on-site to stock pile material, therefore, all material must be delivered just prior to the time it is being placed/utilized on-site.

The schedule has been developed to complete the work before the summer season. In order to complete the closure work in the Spring of 2000, work must be performed in September and October. The schedule assumes that materials may need to be delivered in the spring and stockpiled on-site until they are utilized in the spring. It should be noted that, even if materials and equipment can be delivered to Fishers Island by barge, it is the District's and the community's preference that closure construction not take place in the peak summer season. (The summer population increases from the permanent population of about 350 to 3,500.)

FISHERS ISLAND GARBAGE AND REFUSE DISTRICT
FISHERS ISLAND LANDFILL - FINAL CLOSURE PLAN

FIGURE 9-1

CONSTRUCTION SCHEDULE



RLA/SH1314(8/6/98)

Dvirka
and
Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Appendix A

APPENDIX A

TEST PIT PROGRAM REPORT

Fishers Island Landfill
Test Pit Program
Fishers Island, New York

Prepared for:

Fishers Island
Garbage and Refuse District

JUNE 1997

FISHERS ISLAND LANDFILL
TEST PIT PROGRAM

FISHERS ISLAND, NEW YORK

Prepared For

FISHERS ISLAND GARBAGE AND REFUSE DISTRICT

By

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
WOODBURY, NEW YORK

JUNE 1997

FISHERS ISLAND LANDFILL
TEST PIT PROGRAM

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1.0 INTRODUCTION

Between May 5 and 9, 1997, 25 test pits were excavated within the Fishers Island Landfill property boundary. Dvirka and Bartilucci Consulting Engineers (D&B) provided oversight during excavation of the test pits.

The objective of the test pits was to gain subsurface information for delineation of the horizontal and vertical extent, and characterization of buried waste in the main upland landfill area, and the spread and cover waste fill area to the north. Delineation of the waste will be utilized by the Fishers Island Garbage and Refuse District (District) for development of a closure plan for the landfill, including the feasibility of consolidation of waste as part of landfill closure and evaluation of closure alternatives (capping and reclamation). Fanning, Phillips and Molnar (FP&M) prepared a draft Closure Investigation Report for the Fishers Island Landfill (also known as the Pickett Landfill) for the District in March 1997. D&B utilized FP&M's site plan (Figure 1.1.2) from this report as the basis for the test pit program.

2.0 TEST PIT PROGRAM DESCRIPTION

A total of 25 test pits were excavated (TP-1 through TP-25) based primarily on a 100 by 100-foot grid which was surveyed by Mr. Richard Strauss of Chandler, Palmer & King prior to the test pit program (see Figure 1). Test Pits TP-1 through TP-12 and TP-14 through TP-19 were constructed adjacent to staked grid locations, however, TP-13 and TP-20 through TP-25 were constructed primarily to the north of the general grid area. These latter points were surveyed by Chandler, Palmer & King subsequent to the completion of the test pit program and are located on Figure 1.

The test pits were constructed by Hewitt, Inc. (Mr. Carl Hewitt) subcontracted by the District. All test pits were constructed with an Insley Model H-1000-C track mounted backhoe with a bucket reach of slightly less than 20 vertical feet. The test pits ranged from 7 to 18 feet in depth and from 12 to 60 feet in length, and typically were a backhoe bucket width wide (approximately 3-4 feet). The test pits were excavated to at least seven feet below grade to native material or groundwater, whichever was encountered first. Depth in several of the test pits was limited due to boulders. During the excavations, the clean surface soil was placed separately from the waste material to the best extent possible and replaced during backfilling in the reverse order. However, the cover material was very thin (less than 0.5 feet thick) in some of the test pits and additional cover material was taken from the area surrounding these test pits. In addition, a payloader was used to place some of the on-site stockpiled soil to ensure that no waste was exposed at the surface of each of the test pits after backfilling.

During each test pit excavation, logging was conducted to document the waste and geologic characteristics of each test pit (see Test Pit Logs in Appendix A), and included a sketch of a cross section with a description of the test pit contents and dimensions (see Test Pit Profiles also in Appendix A after each Test Pit Log). A description of the work performed daily was maintained on Daily Activity Reports which are contained in Appendix B. In addition, photographs were taken to record the contents of the test pits and excavated soil and waste after each excavation. The test pits excavated outside of the initial grid system (staked locations) were sketched on Location Sketches (see Appendix C) and subsequently surveyed by Chandler, Palmer & King and incorporated on the site plan (Figure 1). Table 1 provides a summary description of each test pit, including dimensions, contents and depth of groundwater (if encountered).

Air monitoring was performed during the test pit excavations with a portable Gastech GT402 combustible gas meter which measures the percent of methane gas in relation to its lower explosive level (% LEL). The lower explosive level of methane is 5% by volume in air. Total organic vapors were monitored with a photoionization detector (PID). Readings were measured from the open test pits and above the test pits in the breathing zone. No total organic vapor or % LEL readings above zero from the test pits or excavated material were observed with the exception of test pits TP-2 and TP-3. Total organic vapor readings of 2.8 parts per million (ppm) and 4.8 ppm were measured directly above the waste generated from TP-2 and TP-3, respectively. It should be noted that no odors or substances were observed in the material removed from these test pits that would indicated the presence of hazardous waste. The only % LEL reading measured during excavation of the test pits was a reading of 4% from directly over the waste in TP-2. No readings were measured in the breathing zone (total organic vapors or % LEL) during excavation of the test pits. Measurements are documented on the Air Monitoring Form contained in Appendix D. The PID and combustible gas meter were calibrated daily, and calibration times and results are documented on the Daily Equipment Calibration Log included in Appendix E.

Table 1

FISHERS ISLAND LANDFILL
TEST PIT PROGRAM
SUMMARY DESCRIPTION OF TEST PITS

Test Pit Number	Dimensions (feet) Length by Depth by Width	Depth of Main Body of Waste (feet below grade, if present)	Description of Waste in Test Pit (with Depth and Type of Waste in Approximate Percentages)						Depth to Groundwater (feet below grade, if present)
			Soil	Bagged Waste*	Free Glass	Free Metal	Free Paper	Other	
TP-1	27' x 9' x 4'	2 - 5	75	5	5	15	T		NE
TP-2	28' x 10' x 5'	3 - 5.5	30	45	10	10	5		NE
TB-3	20' x 14' x 4'	4 - 10	30	50	10	5	5		14
TP-4	25' x 7' x 4'	0.5 - 2	95	5	T	T	T		NE
		5 - 6	10	90	T	T	T		
TP-5	20' x 18' x 4'	1 - 5	60	40	T	T	T		18
		5 - 18	20	80	T	T	T		
TP-6	22' x 12' x 4'	0.5 - 2	70	30	T	T	T		NE
TP-7	30' x 11' x 4'	0.5 - 1.5	20	75	5	T	T		NE
		1.5 - 6	70	T	T	T	T	30 (Tree mat'l)	
TP-8	22' x 15' x 4'	0.5 - 11	50	30	10	5	5		NE
TP-9	22' x 10' x 6'	0.5 - 4	70	30	T	T	T		NE
TP-10	18' x 17' x 4'	0.5 - 10	10	80	5	T	5		15.5
TP-11	20' x 10' x 5'	None	100						NE
TP-12	25' x 9' x 4'	None	100						NE
TP-13	25' x 9' x 4'	2	100	T					NE
TP-14	24' x 15' x 4'	0 - 2	90					10 (C&D)	15
		2 - 10	50	45	<5	<5	T		

Table 1 (continued)

FISHERS ISLAND LANDFILL
TEST PIT PROGRAM
SUMMARY DESCRIPTION OF TEST PITS

Test Pit Number	Dimensions (feet) Length by Depth by Width	Depth of Main Body of Waste (feet below grade, if present)	Description of Waste in Test Pit (with Depth and Type of Waste in Approximate Percentages)						Depth to Groundwater (feet below grade, if present)
			Soil	Bagged Waste*	Free Glass	Free Metal	Free Paper	Other	
TP-15	26' x 15' x 4'	0.5 - 3	80	15	<5	<5	<5		NE
		3 - 7	20	80	T	T	T		
TP-16	15' x 15' x 4'	1 - 10	15	75	5	<5	T		NE
TP-17	58' x 7' x 6'	None	100						NE
TP-18	30' x 13' x 4'	0.5 - 6	60	30	<5	<5	<5		NE
TP-19	22' x 15' x 4'	3.5 - 5	85	10	<5	<5	T		14
TP-20	26' x 11' x 4'	0.5 - 3	70	25	<5	<5	<5		10.5
		3 - 7	80	10	5	5	T		
TP-21	15' x 7' x 4'	0.5 - 2	90	T	T	10	T		7
		2 - 7	75	T	5	20	T		
TP-22	20' x 13' x 4'	0.5 - 6	70	T	T	T	T	30 (C&D)	NE
TP-23	18' x 12' x 4'	None	100						NE
TP-24	21' x 9' x 4'	2 - 8.5	70	15	10	5	T		8.5
TP-25	12' x 7' x 4'	4 - 7	80	5	5	T	T	10 (cobbles)	7

Notes:

*Plastic bags containing household wastes.
T - Trace
C&D - Construction and demolition debris.

3.0 CHARACTERIZATION AND DELINEATION OF WASTE

The waste material in the main upland landfill area was described in FP&M's March 1997 report as solid waste deposited primarily in trenches. These reported trenches are depicted on FP&M's site plan (Figure 1.1.2) which is contained in Appendix F. The upland landfill area contains the majority of landfilled waste at the Fishers Island Landfill. FP&M reported that the landfilled waste in the spread and cover area exists north of the main landfill area and east within the wetlands area, and occurs to a depth of two to three feet below grade.

3.1 Upland Landfill Area

On FP&M's site plan, two generally north-south trending trenches and three generally east-west trending trenches are indicated. Based on an interview with Mr. Richard Grebe, who was the primary operator at the landfill for approximately 15 years, a somewhat different layout of the trenches was indicated. Mr. Grebe indicated that two additional trenches trending generally north-south exist beyond the two shown on Figure 1.1.2 and two generally east-west trending trenches exist. According to Mr. Grebe, the two north-south trenches on Figure 1.1.2 were the first two constructed and these were the deepest trenches (down to groundwater). The layout of the trenches according to Mr. Grebe is represented on Figure 1. Mr. Grebe also indicated that dredged sediment from a pond was also disposed at the landfill and that the material underlying the waste and dredge material consists of a hard pan clayey soil. The dredge material may account for the reworked nature of the soil underlying the water.

The following observations are based on the inspection of material excavated from the test pits in the interior portion of the upland landfill area:

1. Waste material, where encountered, consisted primarily of household waste contained in plastic bags.
2. The percentages of observable, potentially recyclable materials contained in the waste (exclusive of the bagged contents), including glass, metal and paper, was typically

low. No attempt was made to determine the contents/potentially recyclable materials in the plastic bags.

3. In general, the test pits constructed in the upland landfill area contained variable percentages of bagged waste ranging from 0.5 to 11 feet below grade. However, waste was identified in one interior test pit (TP-5) down to groundwater at a depth of 18 feet below grade. Test pit TP-5 may be the only test pit constructed which actually coincides with the two reported deep trenches, since the locations of these trenches are approximate. The waste in the two deepest original trenches may exist to a total depth of approximately 18 feet below grade.
4. Waste was identified throughout the upland area beyond the reported trenched locations (except the northwestern corner) which indicates a larger area of waste than previously indicated.
5. The main body of concentrated waste mass comprises an average thickness of approximately 6 to 7 feet with an average soil cover thickness of about 1 to 2 feet (calculated where waste was encountered). Lower percentages of soil are present where bagged waste was found which supports the trench method of landfilling where less daily cover was likely used. The material underlying the main body of waste typically consisted of a reworked green-gray clayey silt.
6. On the north and northeastern slopes of the upland landfill area, the waste grades into the adjacent wetlands. The test pits in this area contained greater amounts of waste and higher percentages of bagged waste which again supports the trench method of landfilling in this area.
7. The limits of test pits were in some cases defined by a compact dark green gray clayey silt, however, boulders were encountered in many of the test pits (typically at 8 feet below ground surface and below).

3.2 Spread and Cover Waste Fill Area

The material in the spread and cover waste area was reported by FP&M to be solid waste deposited to a depth of two to three feet below grade and comprises the oldest landfilled material. Four test pits were constructed outside of the upland landfill area most of which coincide with the spread and cover area outlined on the site plan. Inspection of material excavated from these four test pits revealed the following:

1. The lower lying land to the north of the upland landfill area was almost devoid of waste (only a few plastic bags were encountered in one of the two test pits constructed in this area).
2. The lower lying land to the north-northeast of the upland landfill area contained higher percentages of metal scraps compared to bagged waste, and the percentages of observable, potentially recyclable materials, including glass and paper, were typically very low.

The limits of waste as depicted on Figure 1 are primarily based on sketches provided by Mr. Grebe and supported by observations resulting from the test pits. Only in one instance were the limits of waste defined solely by a test pit (TP-7). Mr. Grebe indicated that the limits of waste generally follow close with the tree line in the wetlands to the east and northeast of the upland landfill area, and where the land slopes up to the road on the north side of the upland area (as shown on Figure 1). Mr. Grebe also indicated, that as a general rule, waste was not deposited down onto the slopes on the south and west side of the upland area (Figure 1). Mr. Grebe also indicated that an area to the east of test pits TP-20 and TP-21 was used to dispose of wrecked cars.

4.0 CONCLUSIONS

The following conclusions are based upon the results of the test pit program:

1. The waste is concentrated in trenches and most likely exists throughout the upland area, and typically consists of household waste contained in plastic bags. The waste mass comprises approximately 5.5 acres in the upland landfill area.

2. Low percentages of soil (approximately 10-50%) are found in the thick layers of waste mass in the upland landfill area which most likely is a result of the trenching type of landfilling practice where little daily cover soil was probably used.

3. Based on the test pits constructed, the general thickness of waste mass in the upland area is approximately 6 to 7 feet with a cover thickness of about 1 to 2 feet. The average depth of waste is approximately 8 feet below grade. In the area of the trenches, the thickness of waste, in general, approaches 11 feet, with a maximum thickness of 17 feet identified at one test pit location.

4. The thickness of waste in the spread and cover area north of the upland landfill area is greater (up to 8 feet) than previously reported (2 to 3 feet) and it appears that this area extends further north than reported. However, consolidation of waste in the spread and cover area onto the main, upland landfill area may still be feasible.

5. Based on the observations made as a result of the test pit program, the volume of waste mixed with soil (based on a general thickness of 6-7 feet) is approximately 60,000 cubic yards. Based on an average percentage of soil of 50% mixed with the waste, the volume of waste material is about 30,000 cubic yards. The amount of waste could be greater if, in general, waste is buried to a depth of 18 feet in the reported deep trenches.

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TEST PIT LOG

TEST PIT NO. 1

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C Track mounted excavator - Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/5/97 $1^{00} - 2^{00}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth of pit 9' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					Organic mat'l roots, grass, etc
1								
2								iron-stain soil
3	0-1	0	75	5	5	15	Trace	
4								
5								* Boulder
6	0	0	100*					
7								
8	0-1	0	100					
9			END	OF TEST	PIT			
10								
11								
12								
13								
14								
15								

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TEST PIT PROFILE

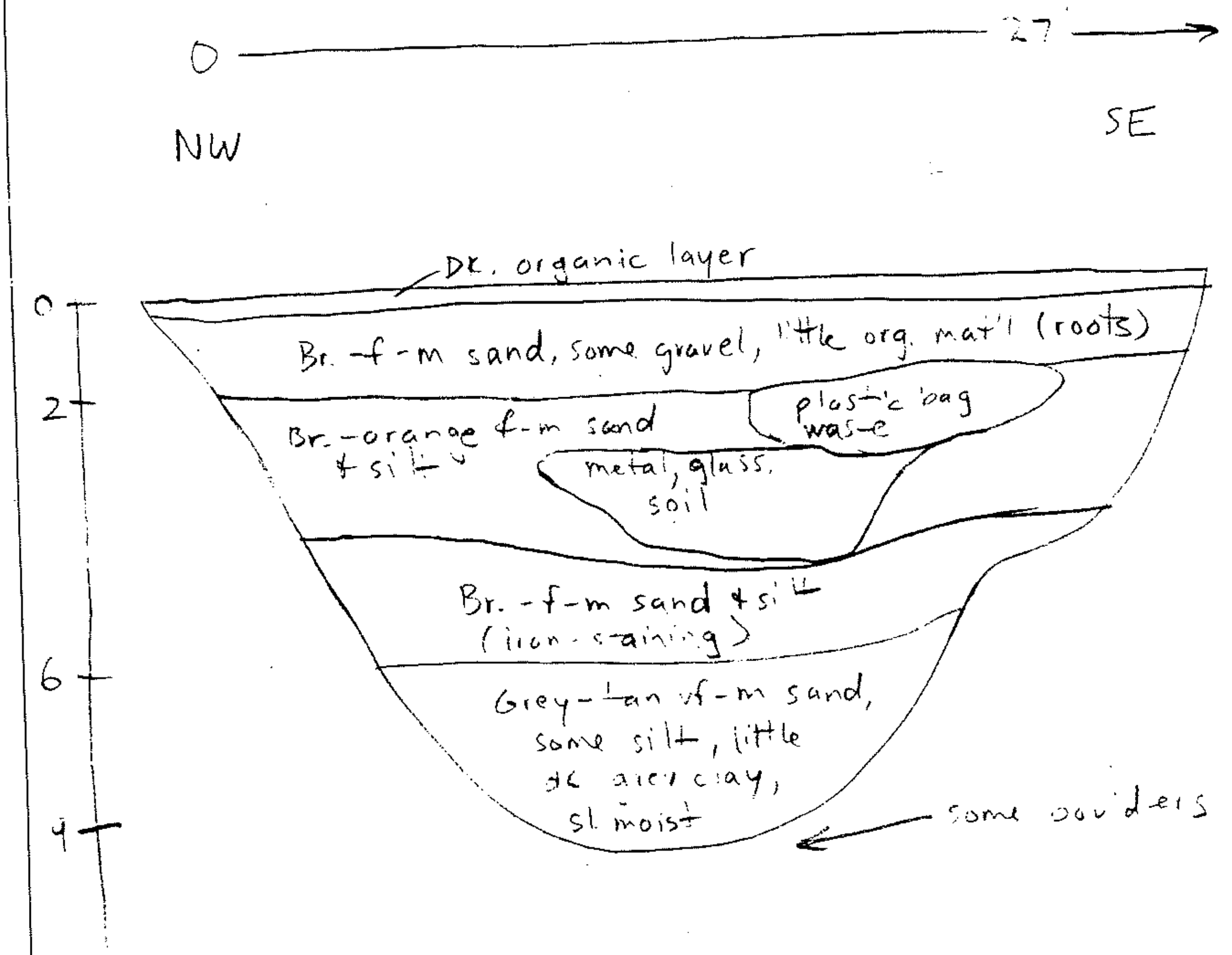
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-1

Adjacent to C-3 stake



Remarks

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TEST PIT LOG

TEST PIT NO. 2

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island. New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/5/97 2^{00}-2^{45}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth - 10' bg

CONDITION OF PIT
sides slumped from 2-10' bg

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1 2	0	0	100					
3 4 5	2.8	4	30	10	45	10	5	* plastic bag filled w/ waste
6 7 8 9	1-2	0	100					
10 11 12 13 14 15			END OF TEST PIT					

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TEST PIT PROFILE

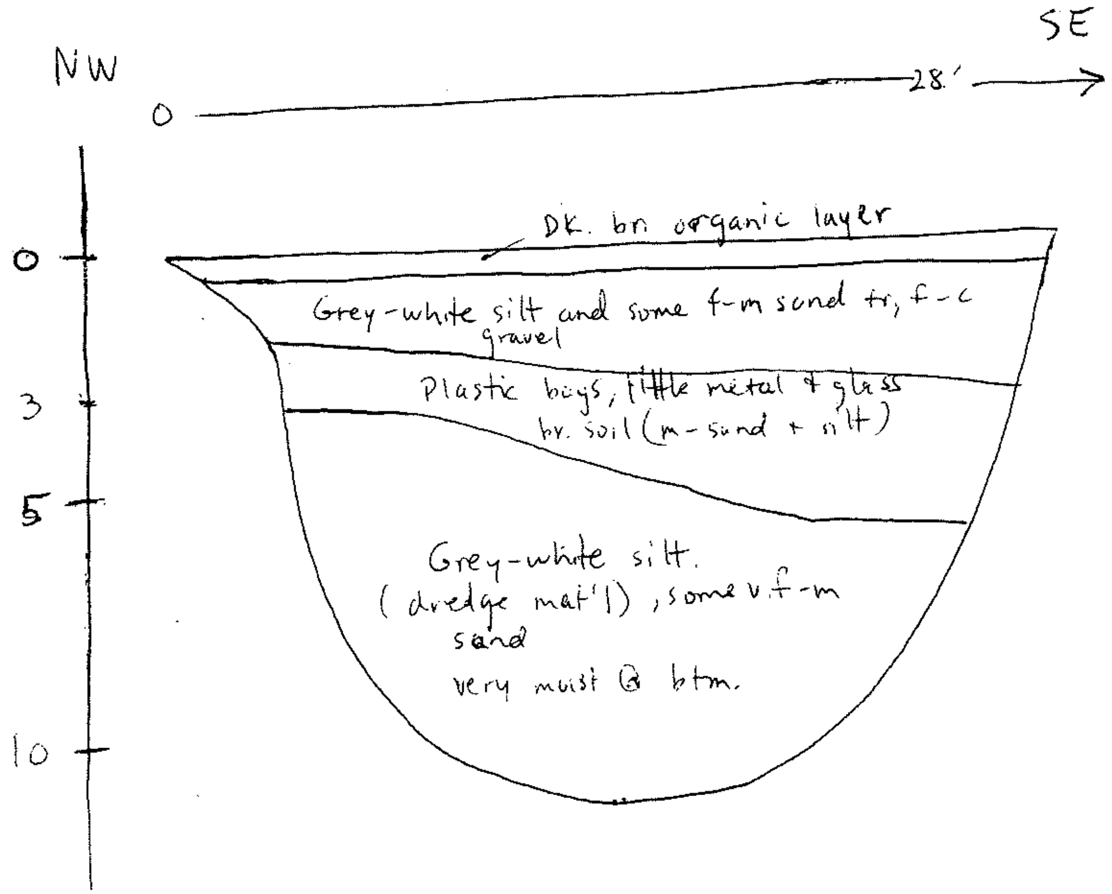
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-2

Adjacent to D-3 stake



Remarks

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TEST PIT LOG

TEST PIT NO. 3

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/5/97 2^{45} - 3^{30}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth of pit 14' bg

CONDITION OF PIT
Good - stayed open to 14' bg

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0-1	0	100					
1								
2								
3								
4								
5	1-4.8	0	30	10	50*	5	5	* plastic bags filled w/ waste
6								
7								
8								
9								
10								
11	1-2	0	100					
12								
13								
14			END OF TEST PIT					
15								

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TEST PIT PROFILE

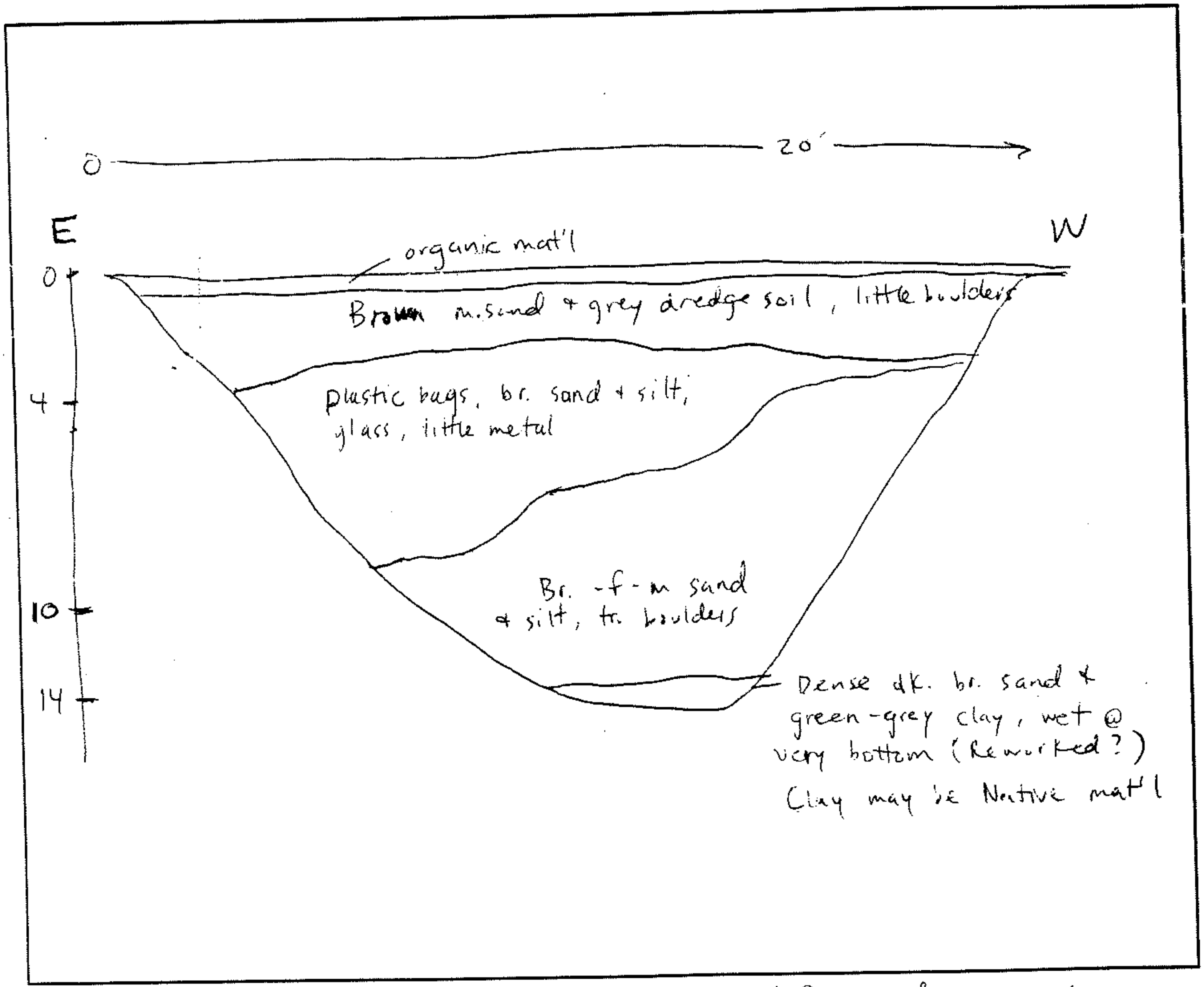
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number 3

Adjacent to E-3 stake



Remarks Close to gw. @ 14' bg - mat'l removed @ btm of excavation was wet

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TEST PIT LOG

TEST PIT NO. TP-4

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/6/97 8^{30} – 9^{45}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 13' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected. Raining

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0 1	0	0	95	Trace	5*	Trace	Trace	* bags containing waste
2 3 4	0	0	100					
5	0	0	10	Trace	90*	Trace	Trace	* bags w/waste
6 7 8 9 10 11 12	0	0	100		Trace			
13 14 15			END OF TEST PIT					

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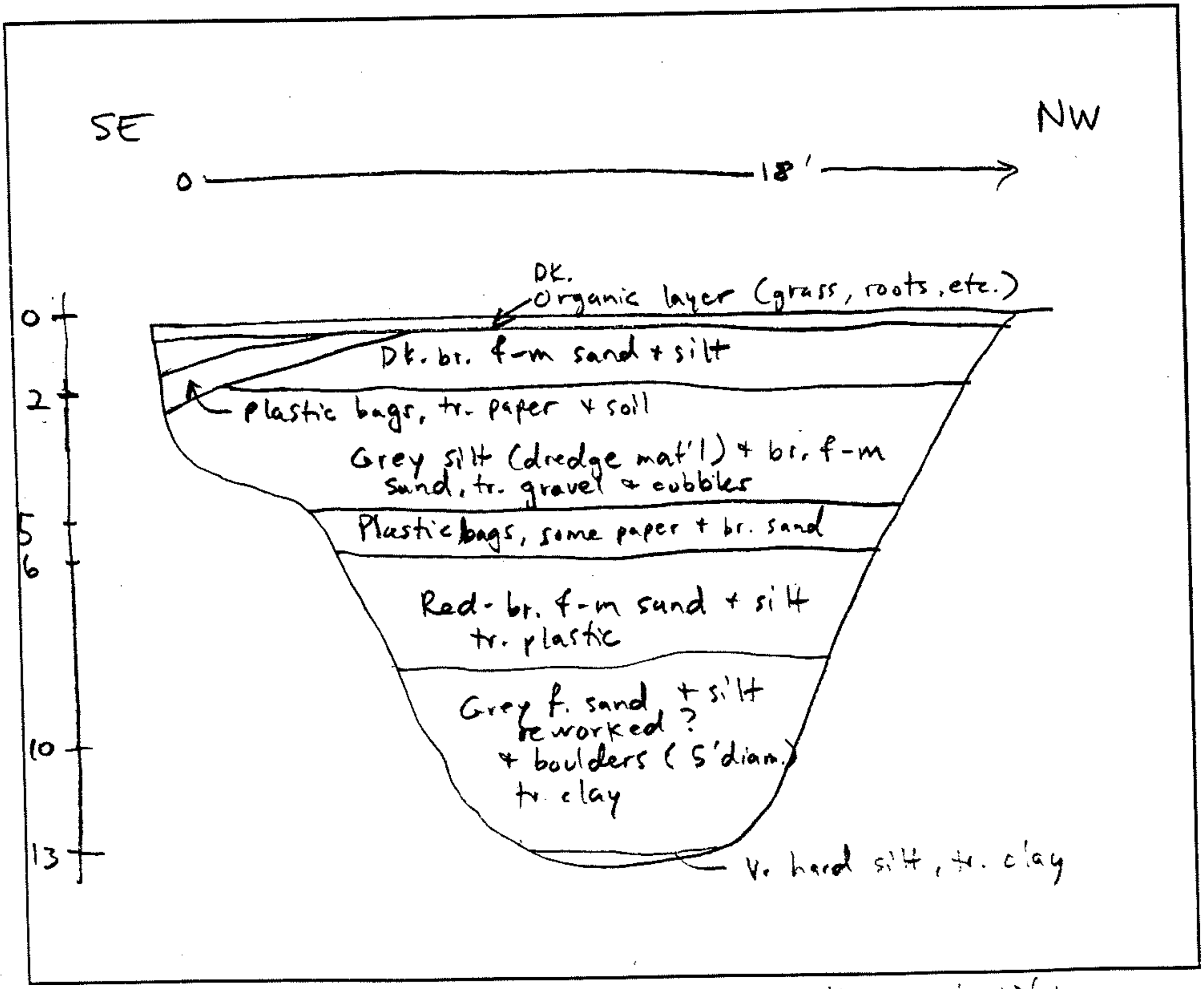
TEST PIT PROFILE

Project Fishers Island Landfill   Project Number 1468-B

Sample(s) Interval(s) N/A   Test Pit Number TP-4

Adjacent to stake F-3



Remarks still dry @ btm - v. difficult getting past 13' bg due to boulders

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TEST PIT LOG

TEST PIT NO. TP-5

Page 1 of 2

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/6/97 945 – 10^{30}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total depth is 18' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected. Heavy rain may have interfeared w/ readings

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100		Tr.			
1 2	0	0	60	Tr.	40*	Tr.	Tr.	*waste contain in bags
3 4	0	0	95	Tr.	5	Tr.	Tr.	*waste in bags
5 6 7 8 9 10 11 12 13 14 15	0	0	10	5	80	<5	<5	

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TEST PIT LOG

TEST PIT NO. TP-5

page 2 of 2

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/6/97 945-10^{30}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) TD 18' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected. Heavy Rain

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
16	0	0	10	5	80*	<5	<5	* waste contained in bags
17								
18			END	OF TEST	PIT			
19								
20								
21								
22								
23								
24								
25								

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TEST PIT PROFILE

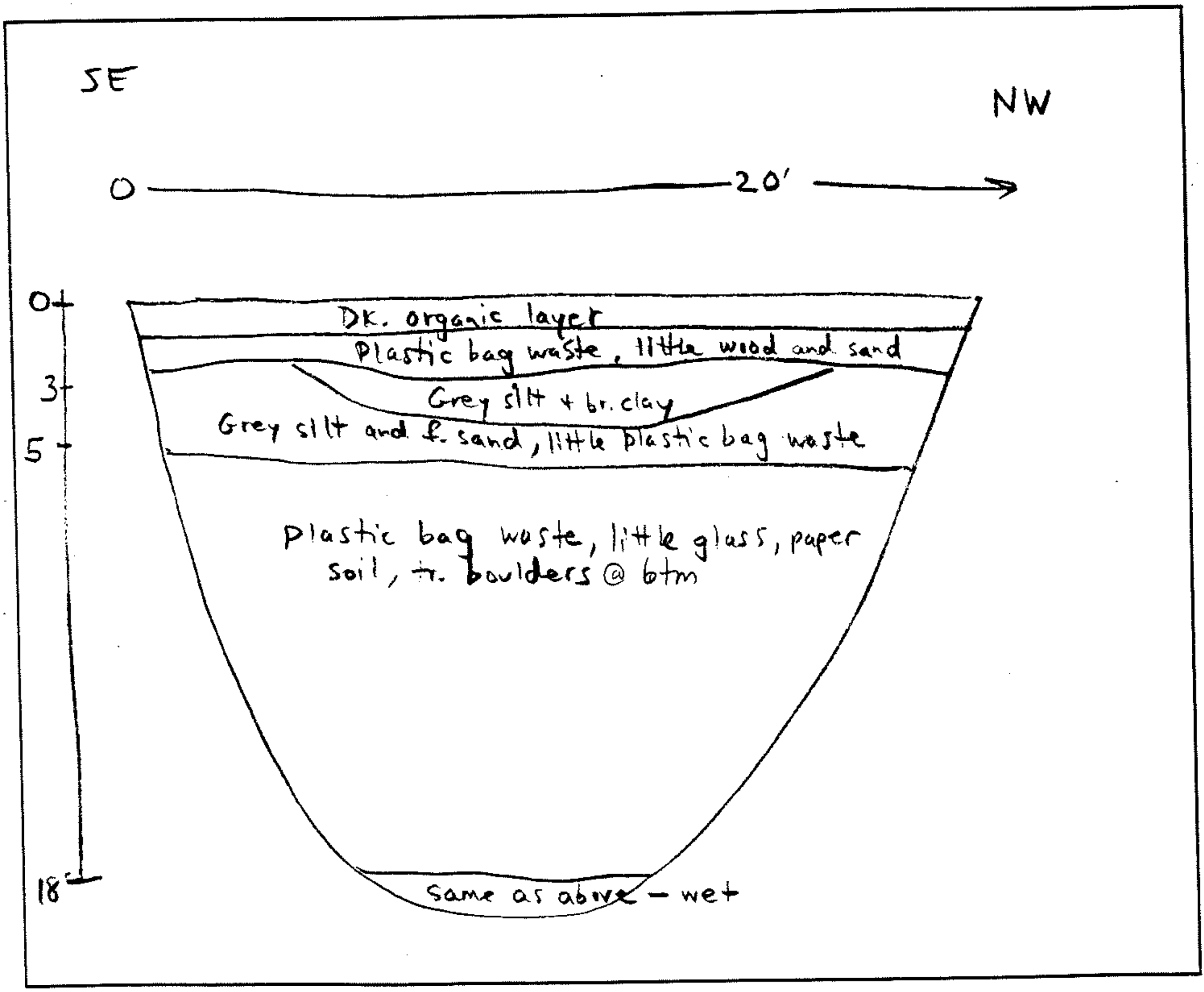
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s)

Test Pit Number TP-5

Adjacent to E-2 stake



Remarks

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TEST PIT LOG

TEST PIT NO. TP-6

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/6/97 $10^{40} - 11^{20}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth is 12' bg

CONDITION OF PIT
Top-exc. Btm- Fair-good

REMARKS
No analytical samples collected. Heavy rain

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1	0	0	70	Trace	30*	Trace	Trace	*waste in bags
2 3 4 5 6 7 8 9 10 11	0	0	100					
12 13 14 15			END OF TEST PIT					

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TEST PIT PROFILE

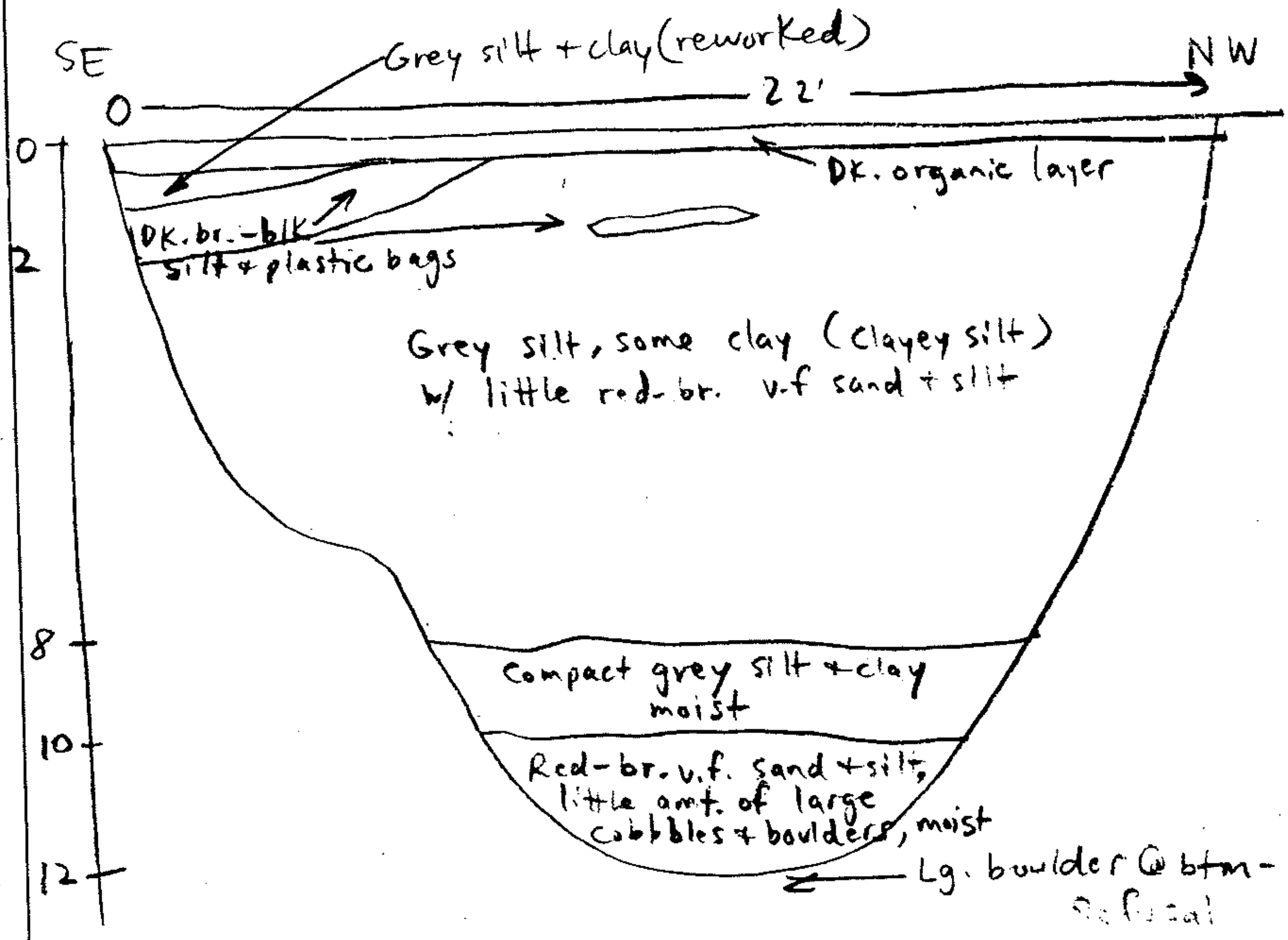
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-6

Adjacent to D-2 stake



Remarks Not sure if btm mat'l is native

TPP-0495.PM4

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TEST PIT LOG

TEST PIT NO. TP-7

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B

LOCATION Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE D. Obradovich/D&B

START/FINISH DATE 5/6/97 $11^{30}-12^{30}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 11'bg

CONDITION OF PIT Very Good

REMARKS No analytical samples collected. Raining heavy

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1	0	0	20	5	75*	Trace	Trace	*waste in bags
2								
3								
4	0	0	70	Trace	Trace	Trace	Trace	30 Tree-trunks, roots, branches, boulders
5								
6								
7								
8	0	0	80					20 boulders
9								
10								
11			END OF TEST PIT					
12								
13								
14								
15								

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TEST PIT PROFILE

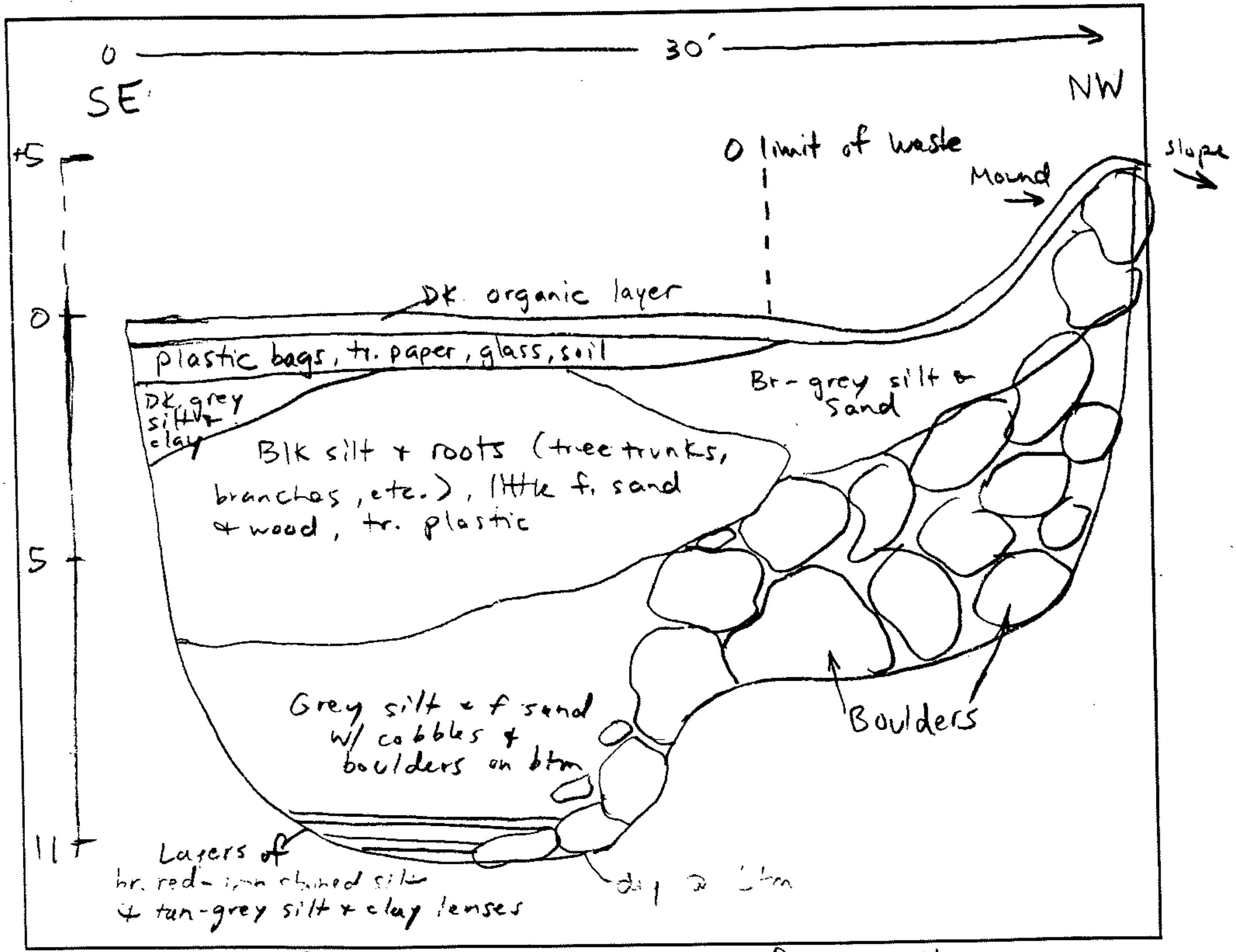
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-7

Adj. to C-2 stake



Remarks Refusal @ 5' bg @ NE end of test pit

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TEST PIT LOG

TEST PIT NO. TP-8

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/6/97 1^{00}-2^{15}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 15' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1								
2								
3								
4								
5	0	0	50	10	30	5	5	
6								
7								
8								
9								
10								
11								
12								
13	0	0	100					
14								
15			END	OF TEST	PIT			

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

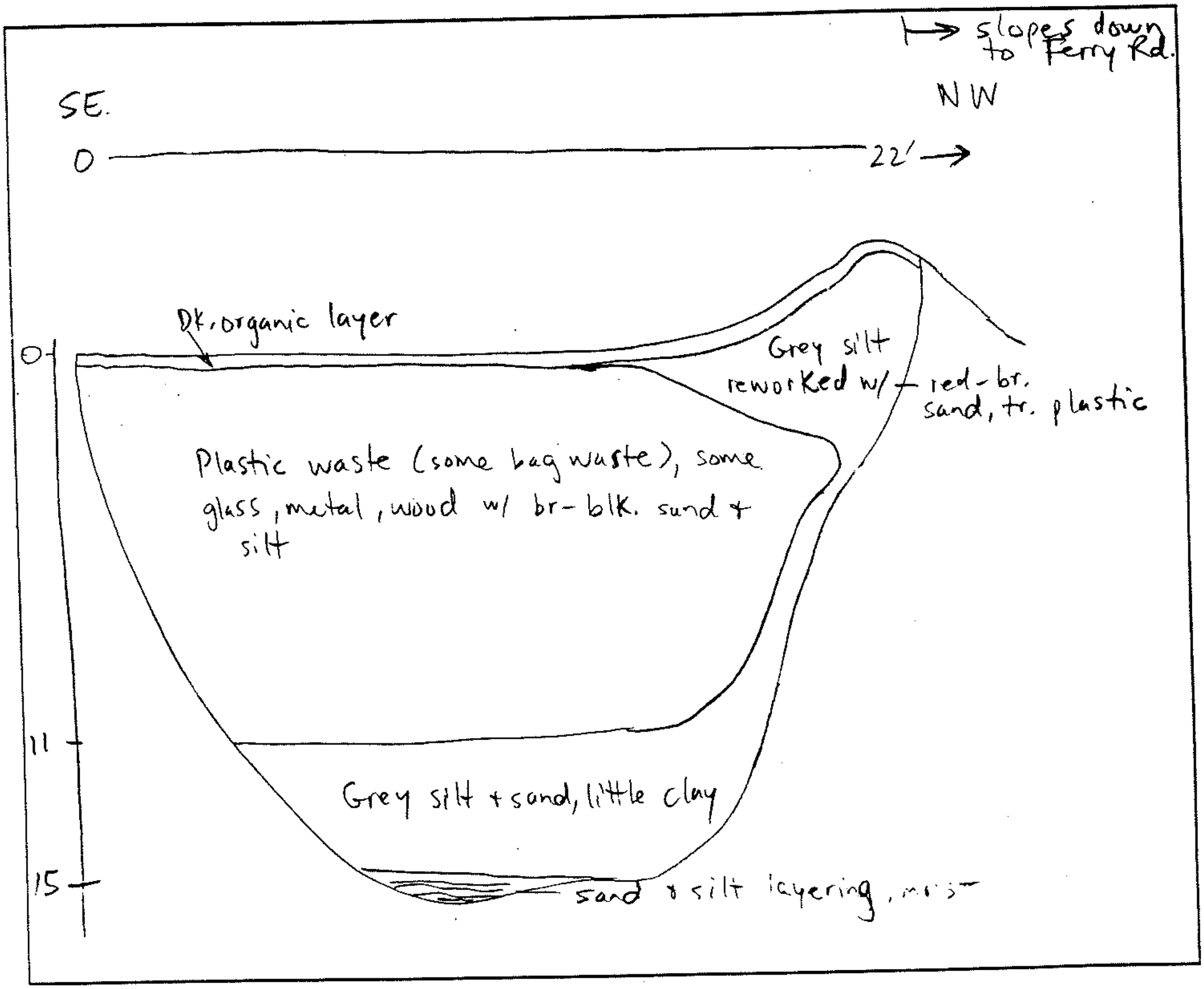
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-8

Adjacent to E-1 stake



Remarks

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-9

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/6/97 2^{30}-3^{15}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth >10 ' bg

CONDITION OF PIT
Poor - unstable

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1 2 3	0	0	70	Trace	30*	Trace	Trace	*waste in bags
4 5 6 7 8 9	0	0	100					
10 11 12 13 14 15			END OF	TEST	PIT			

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

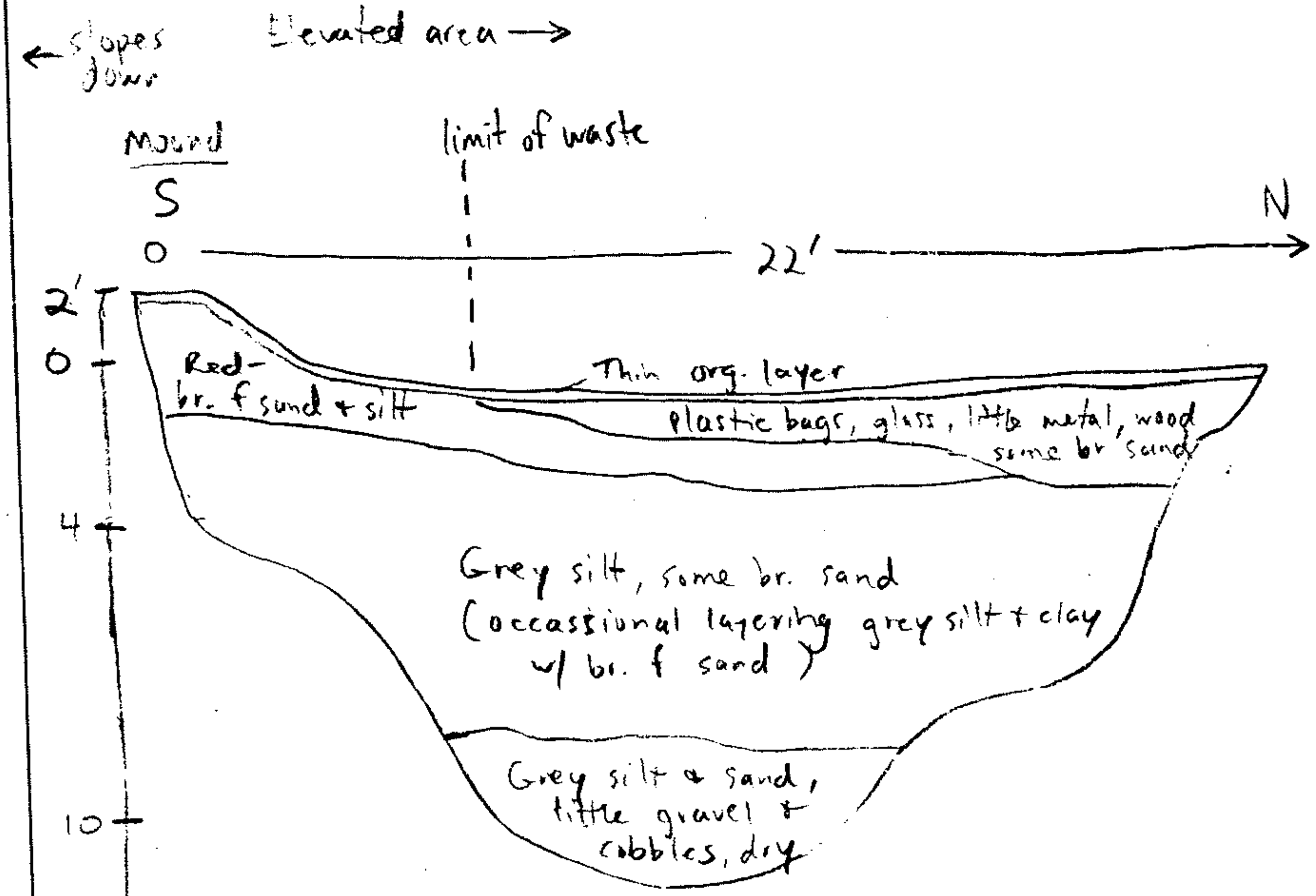
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-9

Adjacent to F-1 stake



Remarks Defined limit of waste at approx. 10' N. of mound

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-10

page 1 of 1

PROJECT NAME/NO.: Fishers Island Landfill/D&B No. 1468-B

LOCATION: Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR: Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE: D. Obradovich/D&B

START/FINISH DATE: 5/7/97 9

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL): Total Depth 17' bg

CONDITION OF PIT: Very Good

REMARKS: No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1								
2								
3								
4								
5	0	0	10	5	80*	<5	5	* waste in bags
6								
7								
8								
9								
10								
11								
12								
13	0	0	100					
14								
15								

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-10

page 2 of 2

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B	**LOCATION** Fishers Island, New York
EXCAVATOR/EQUIPMENT/OPERATOR H-1000-C Insley / Carl Hewitt	
INSPECTOR/OFFICE D. Obradovich/D&B	**START/FINISH DATE** 5/7/97 900–1000
ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) TD 17' bg	**CONDITION OF PIT** V. Good
REMARKS No analytical samples collected.	

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
16	0	0	100					
17								
18			END OF TEST PIT					
19								
20								
21								
22								
23								
24								
25								

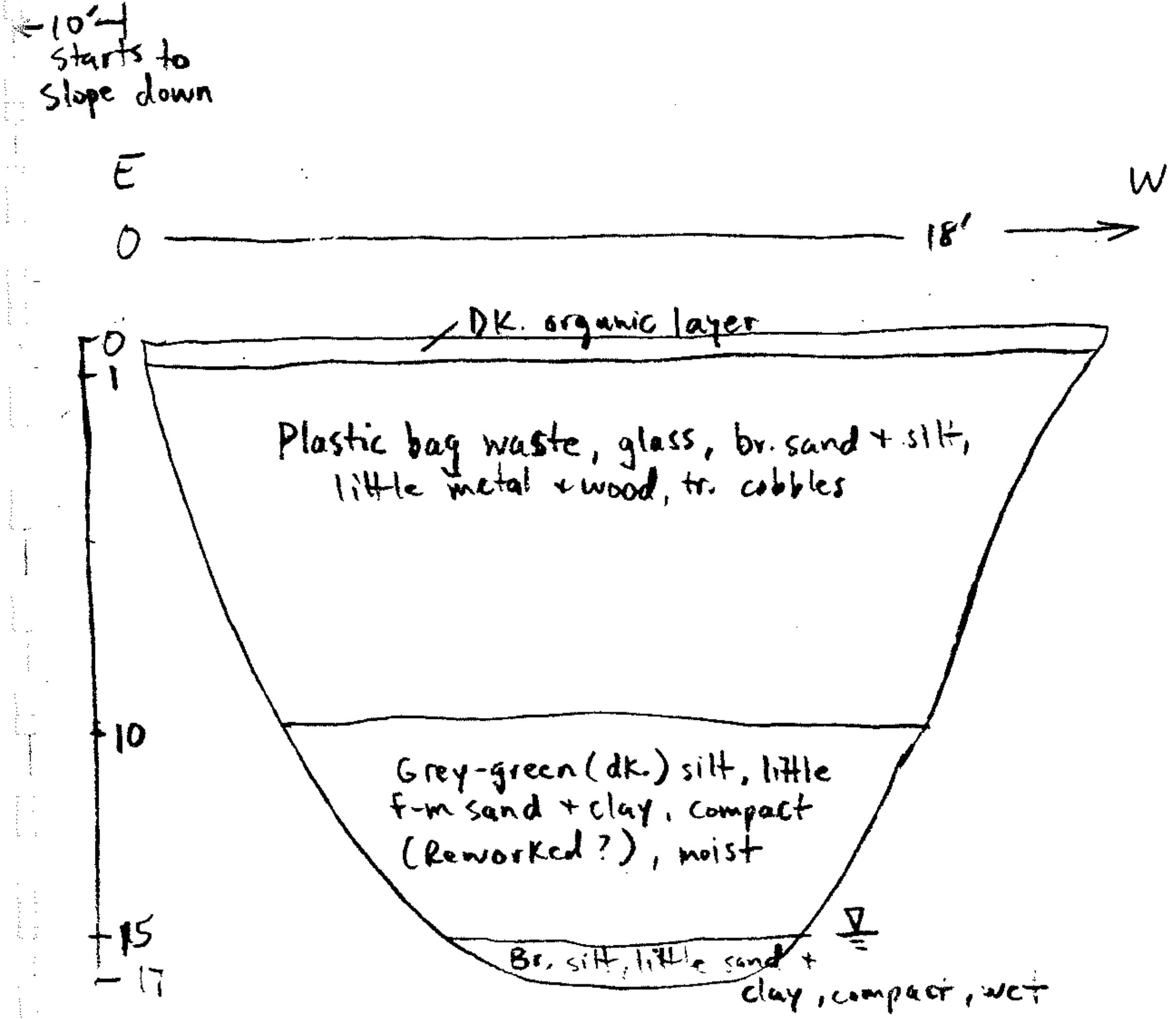
DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

roject Fishers Island Landfill Project Number 1468-B

ample(s) Interval(s) NA Test Pit Number TP-10

Adjacent to F-2 stake



Remarks Groundwater @ approx. 15-16' bg

P-0495.PM4

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-11

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B

LOCATION Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE D. Obradovich/D&B

START/FINISH DATE 5/7/97

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 10' bg

CONDITION OF PIT Poor @ top, Good @ btm

REMARKS No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0								
1								
2								
3	0	0	100					
4								
5								
6								
7								
8								
9								
10			END OF TEST PIT					
11								
12								
13								
14								
15								

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

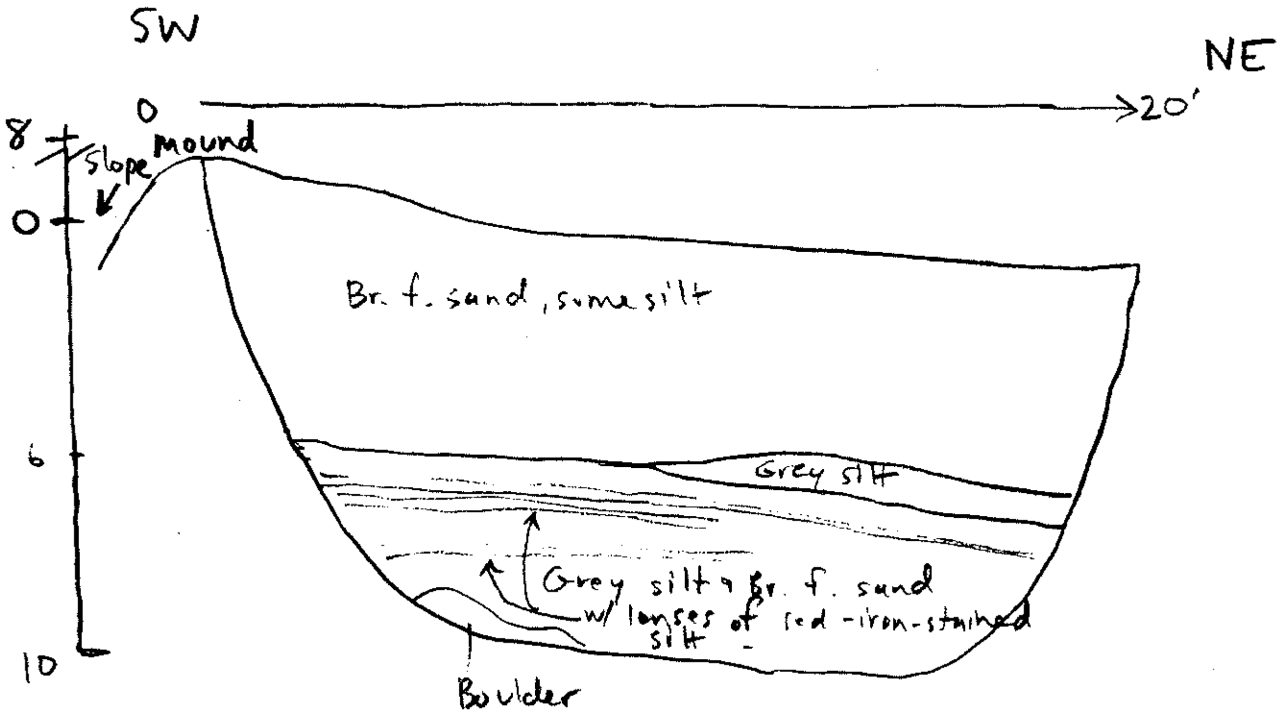
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-11

Adjacent to B-3 stake



Remarks Reworked soil over native soil

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-12

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B

LOCATION Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE D. Obradovich/D&B

START/FINISH DATE 5/7/97 $11^{00}-11^{40}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 9' bg

CONDITION OF PIT Good

REMARKS No analytical samples collected.

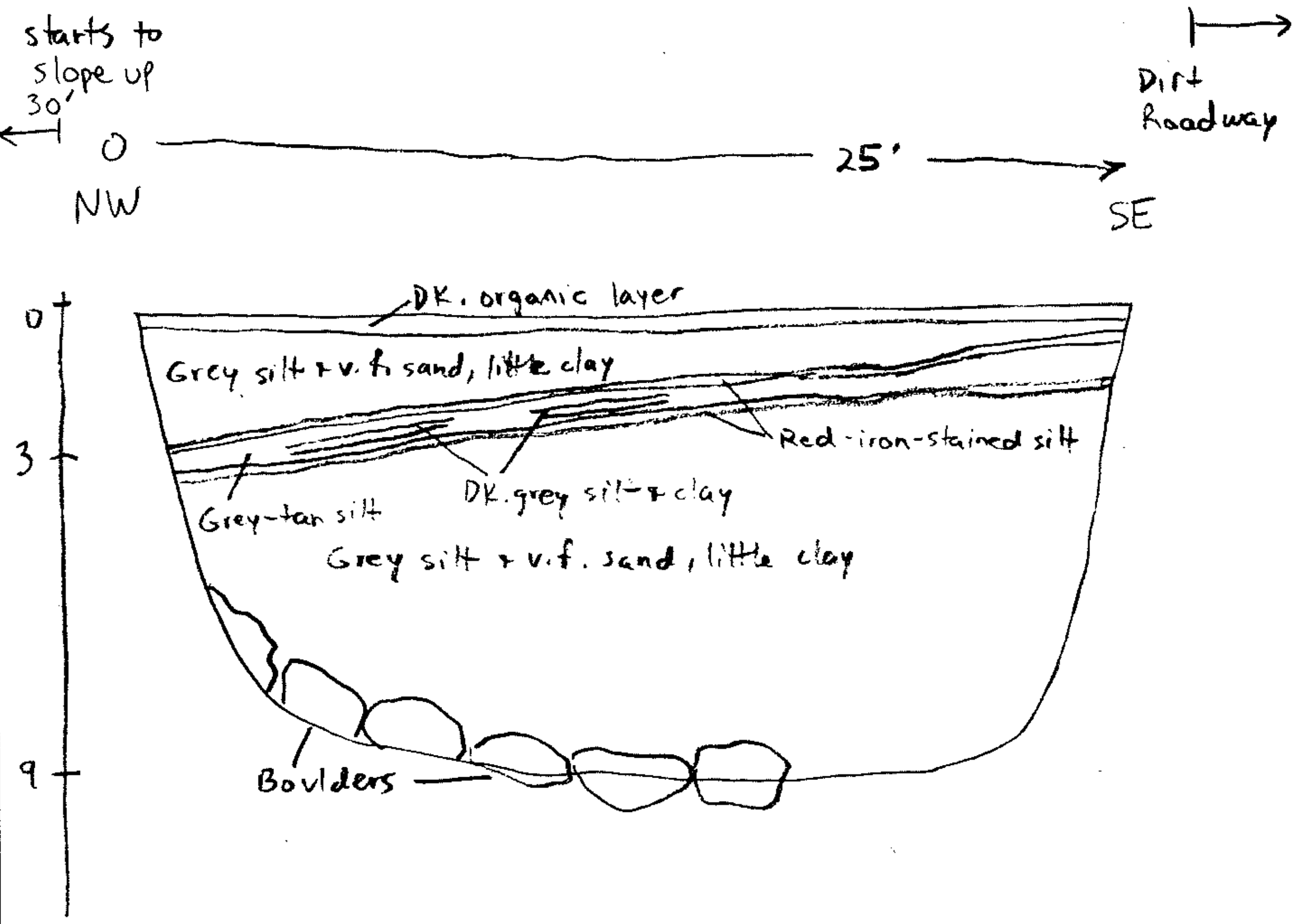
DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0								
1								
2								
3								
4	0	0	100					
5								
6								
7								
8								
9			END OF	TEST	PIT			
10								
11								
12								
13								
14								
15								

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

Project Fishers Island Landfill
Project Number 1468-B
Sample(s) Interval(s) NA
Test Pit Number TP-12

Adjacent to B-4 stake (15' to the north of B-4 heading north to 40' north of B-4)



Remarks Refusal @ 9' bg

TPP-0495.PM4

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-13

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/7/97 12^{30} – 1^{15}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth - 9' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0								
1	0	0	100		Trace			
2								
3								
4								
5	0	0	100					
6								
7								
8								
9			END OF	TEST	PIT			
10								
11								
12								
13								
14								
15								

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

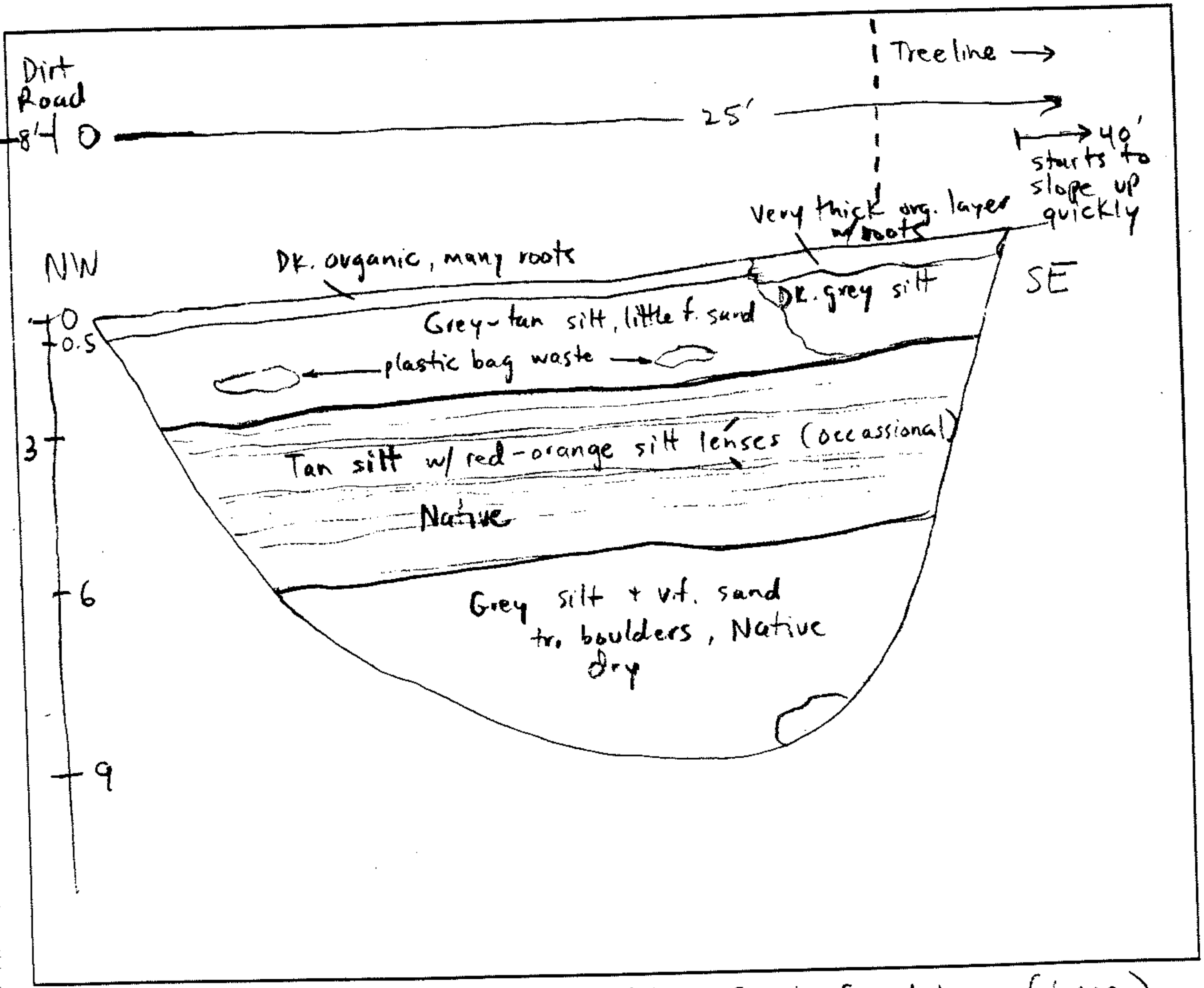
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-13

100' East of TP-12



Remarks Into Native mat'l @ 3' bg. Waste found here (trace) may be isolated and does not appear to define the limit

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-14

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/7/97 1^{45}-3^{00}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 15' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0 1	0	0	90					10 - C&D mat'l (asphalt)
2 3 4 5 6 7 8 9	0	0	50	<5	45*	<5	Trace	*waste in bags
10 11 12 13 14	0	0	100					
15			END OF TEST PIT					

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

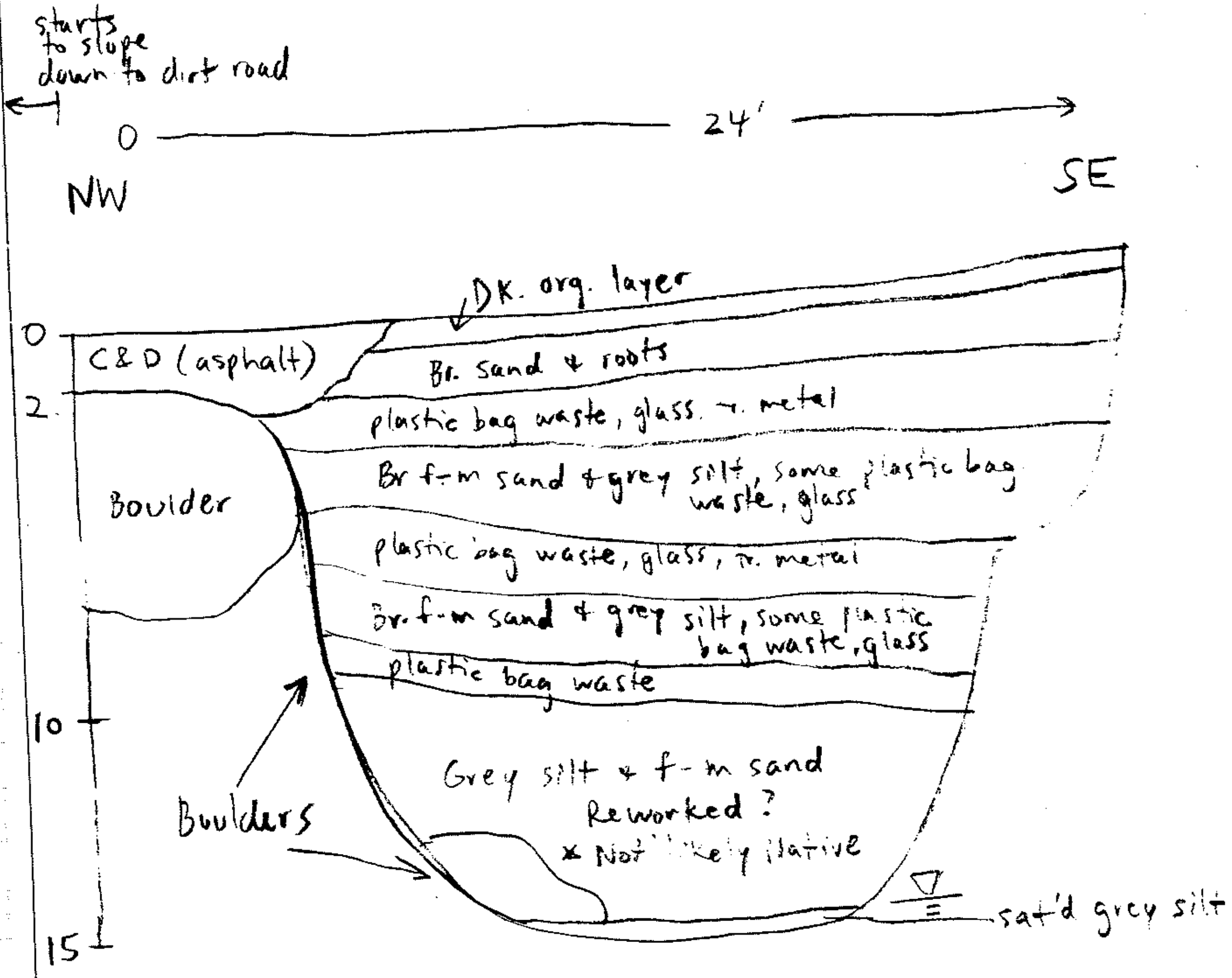
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-14

Adjacent to C-4 stake



Remarks * S. side of test pit w/ less visible waste

* Waste deposited close to g.w. C&D - construction & demolition waste - mostly asphalt

TPP-0495.PM4

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-15

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/7/97 300-415

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 15' bg

CONDITION OF PIT
Good - V. Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1 2	0	0	80	<5	15	<5	<5	
3 4 5 6	0	0	20	Trace	80 *	Trace	Trace	* waste in bags
7 8 9 10 11 12 13 14	0	0	100					
15			END OF TEST PIT					

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

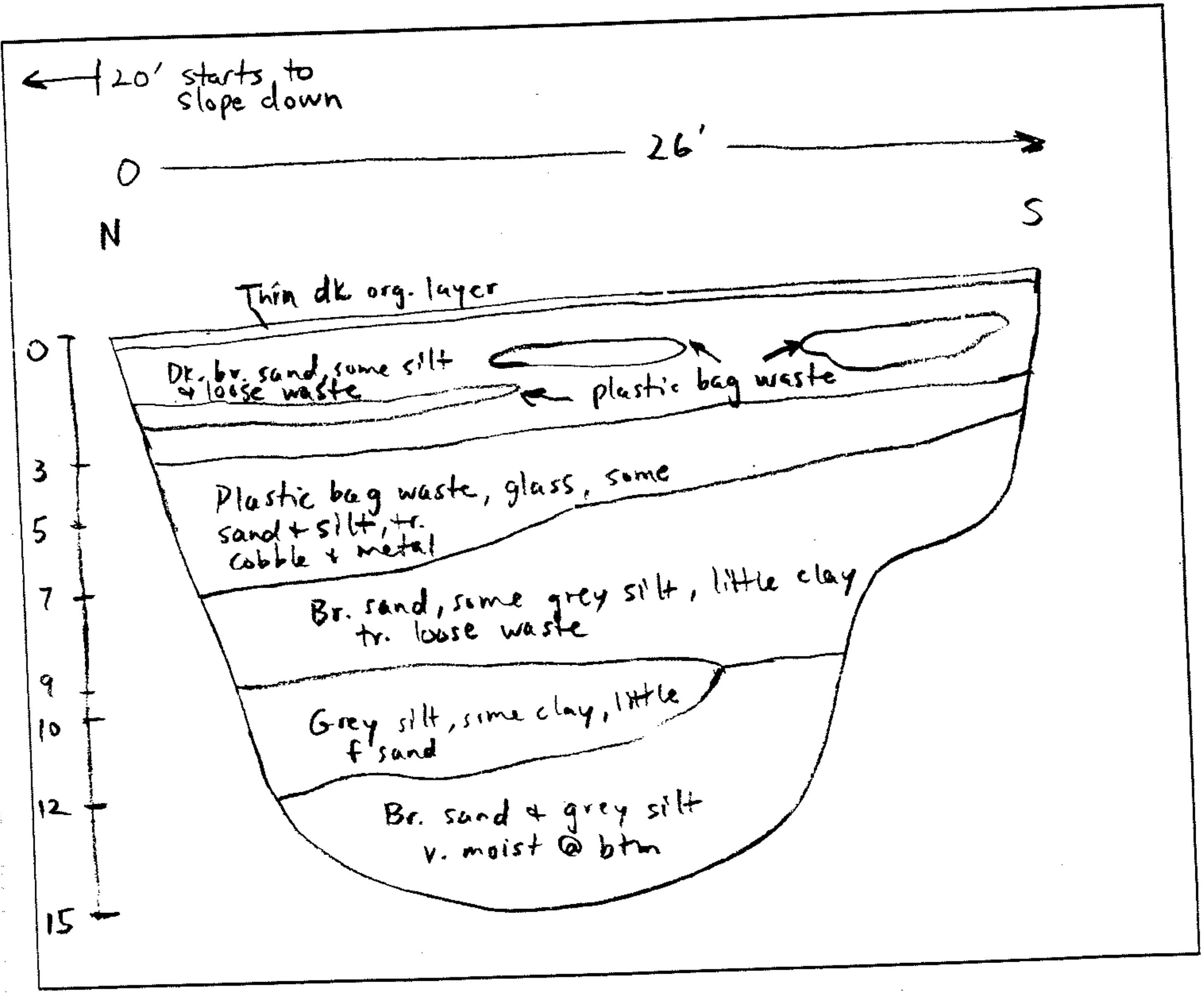
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-15

Adjacent to D-4 stake



Remarks

TPP-0495.PM4

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-16

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B

LOCATION Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR Insley H-1000-C /Carl Hewitt

INSPECTOR/OFFICE D. Obradovich/D&B

START/FINISH DATE 5/8/97 815-930

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 15' bg

CONDITION OF PIT V. Good

REMARKS No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1								
2								
3								
4								
5	0	0	15	5	>75*	<5	Trace	* waste in bags
6								
7								
8								
9								
10								
11								
12	0	0	100					
13								
14								
15			END OF TEST PIT					

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

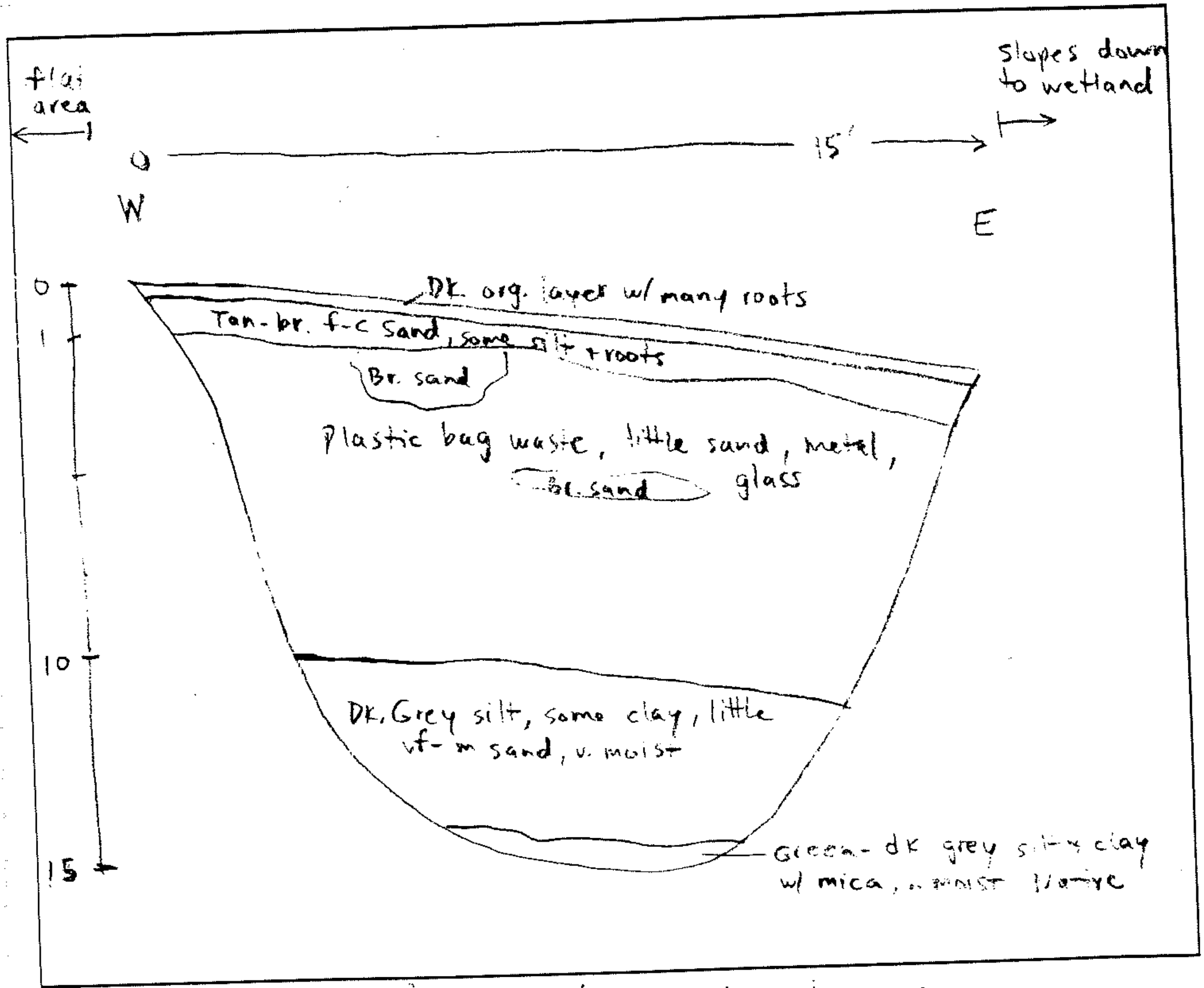
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-16

Adjacent to E-4 stake



Remarks * Waste from 1-10' bg - not much cover

TPP-0495.PM4

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-17

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/8/97 $9^{30}-10^{05}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 7' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0								
1								
2								
3	0	0	100					
4								
5								
6								
7			END OF	TEST	PIT			
8								
9								
10								
11								
12								
13								
14								
15								

TEST PIT PROFILE

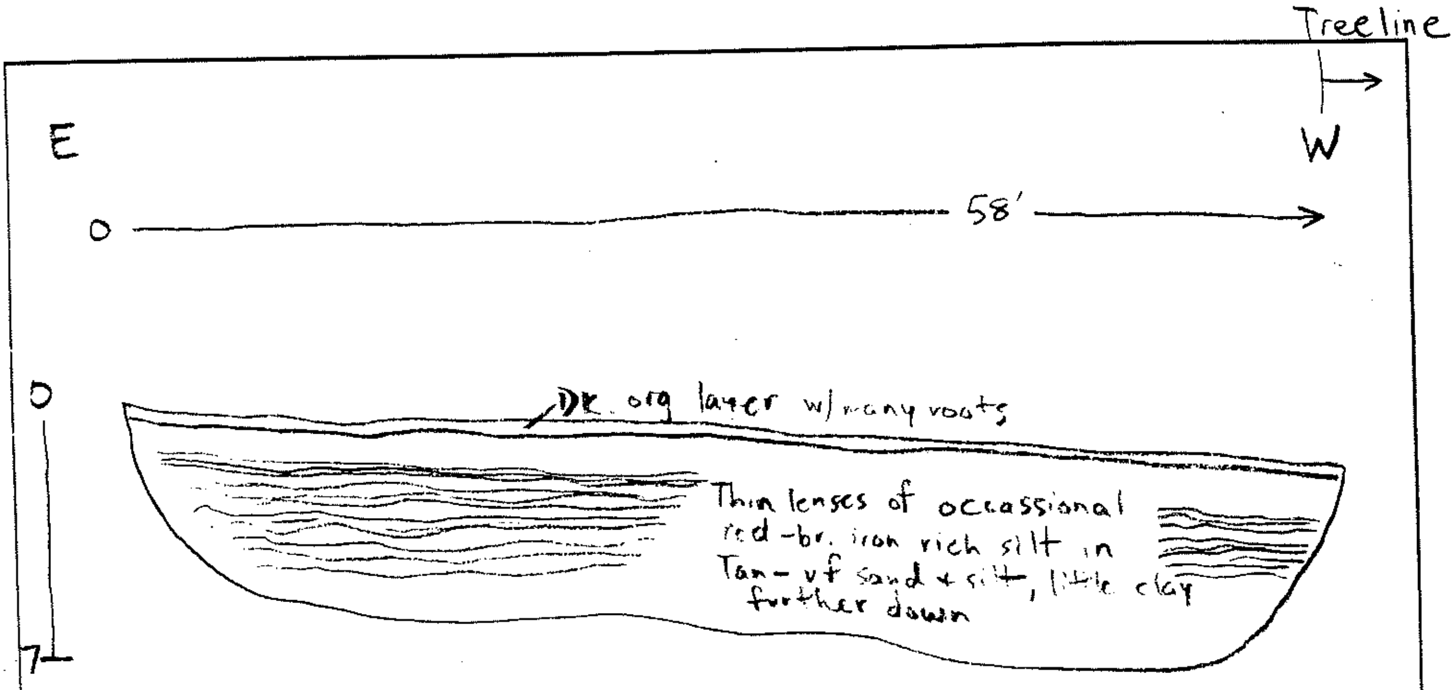
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-17

put stake in @ west end of TP-17



Remarks All Native

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-18

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/8/97 $10^{15} - 11^{00}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 13' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1								
2								
3	0	0	60	<5	30	<5	<5	
4								
5								
6								
7								
8								
9	0	0	100					
10								
11								
12								
13			END OF	TEST	PIT			
14								
15								

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

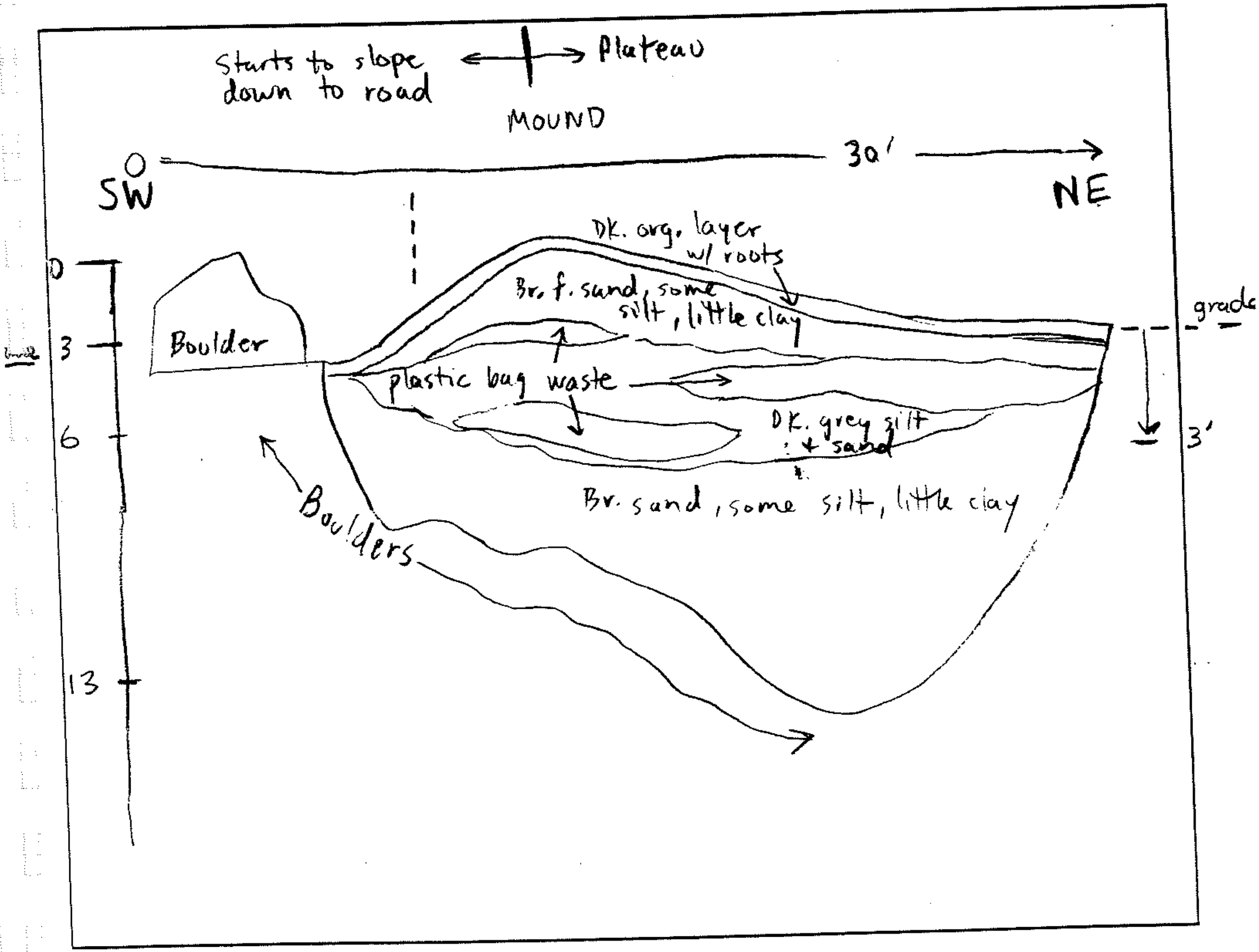
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-18

Put stake on east end of TP-18



Remarks + Waste from grade to 3' bg

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-19

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B

LOCATION Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE D. Obradovich/D&B

START/FINISH DATE 5/8/97 11^{00}-12^{00}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 15' bg

CONDITION OF PIT Good

REMARKS No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0								
1	0	0	100					
2								
3	0	0	100					
4	0	0	85	<5	10*	<5	Trace	* waste in bags
5								
6								
7								
8								
9								
10	0	0						
11								
12								
13								
14								
15			END	OF TEST	PIT			

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

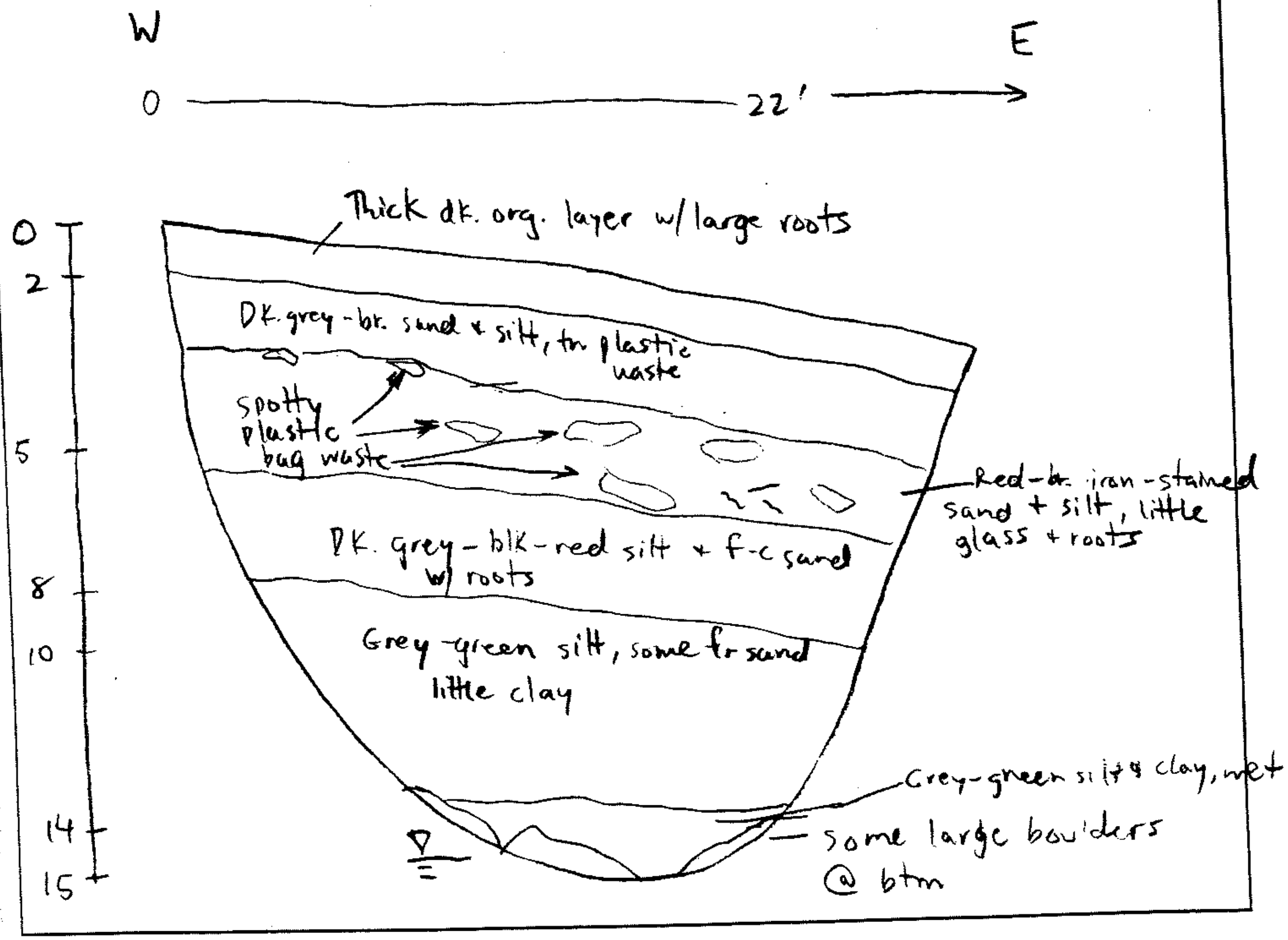
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-19

60' east of F-2 stake



Remarks G.W. @ approx. 14'

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-20

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/8/97 1^{00} - 2^{00}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 11' bg

CONDITION OF PIT
Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1 2	0	0	70	<5	25*	<5	<5	* waste in bags
3 4 5 6	0	0	80	5	10	5	Trace	
7 8 9 10	0	0	100					
11 12 13 14 15			END	OF	TEST	PIT		

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

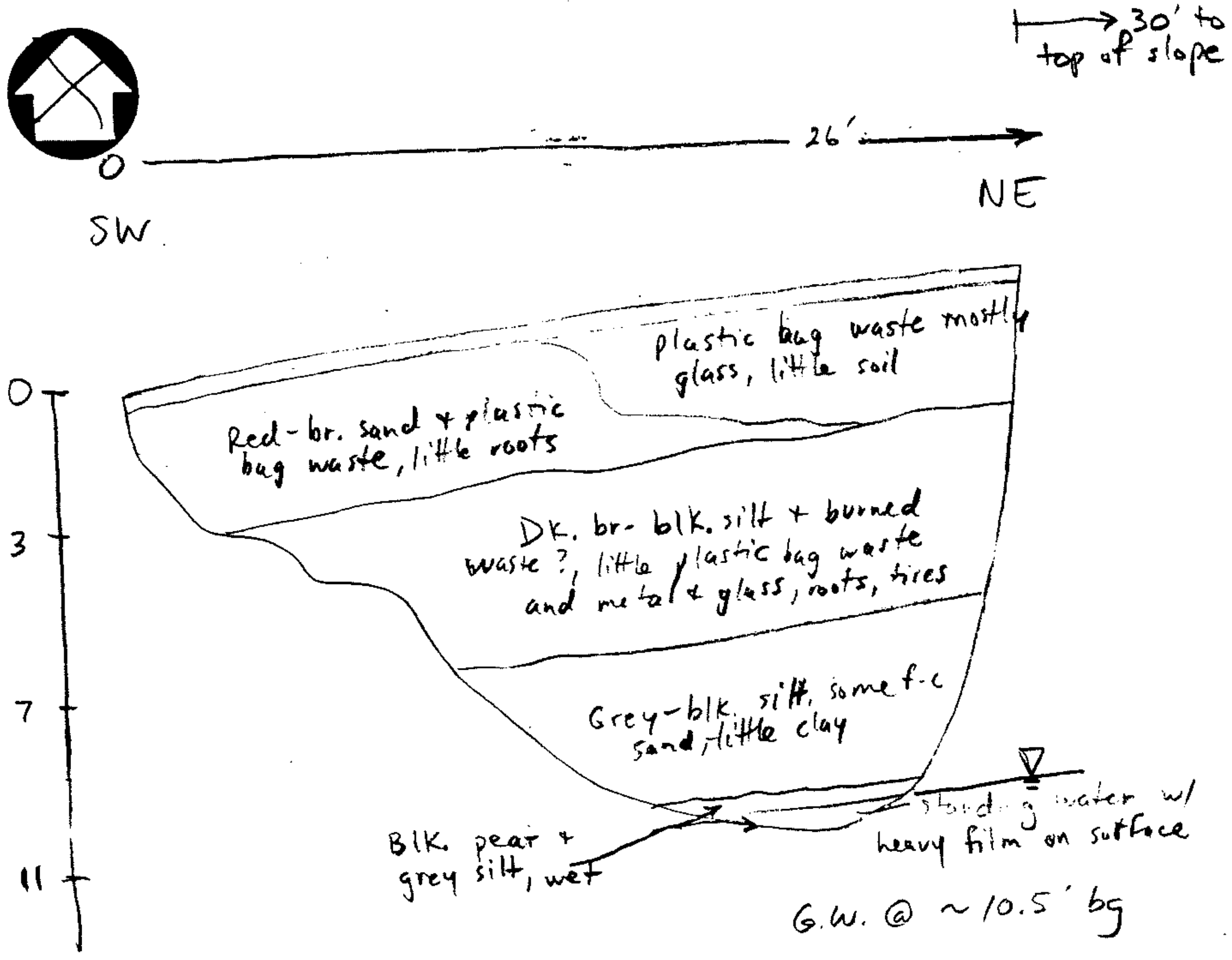
Project Fishers Is. Landfill Sample Crew D. Obradovich

Sample(s) Location(s) TP-20

Sample(s) and/or Well Number(s)

80' North of TP-15

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



LS

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-21

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/8/97 200-300

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 7' bg

CONDITION OF PIT
Fair - Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0 1	0	0	90	Trace	Trace	10	Trace	
2 3 4 5 6	0	0	75	5	Trace	20	Trace	
7			END OF	TEST	PIT			
8 9 10 11 12 13 14 15								

DVIRKA
AND
BARTILUCCI

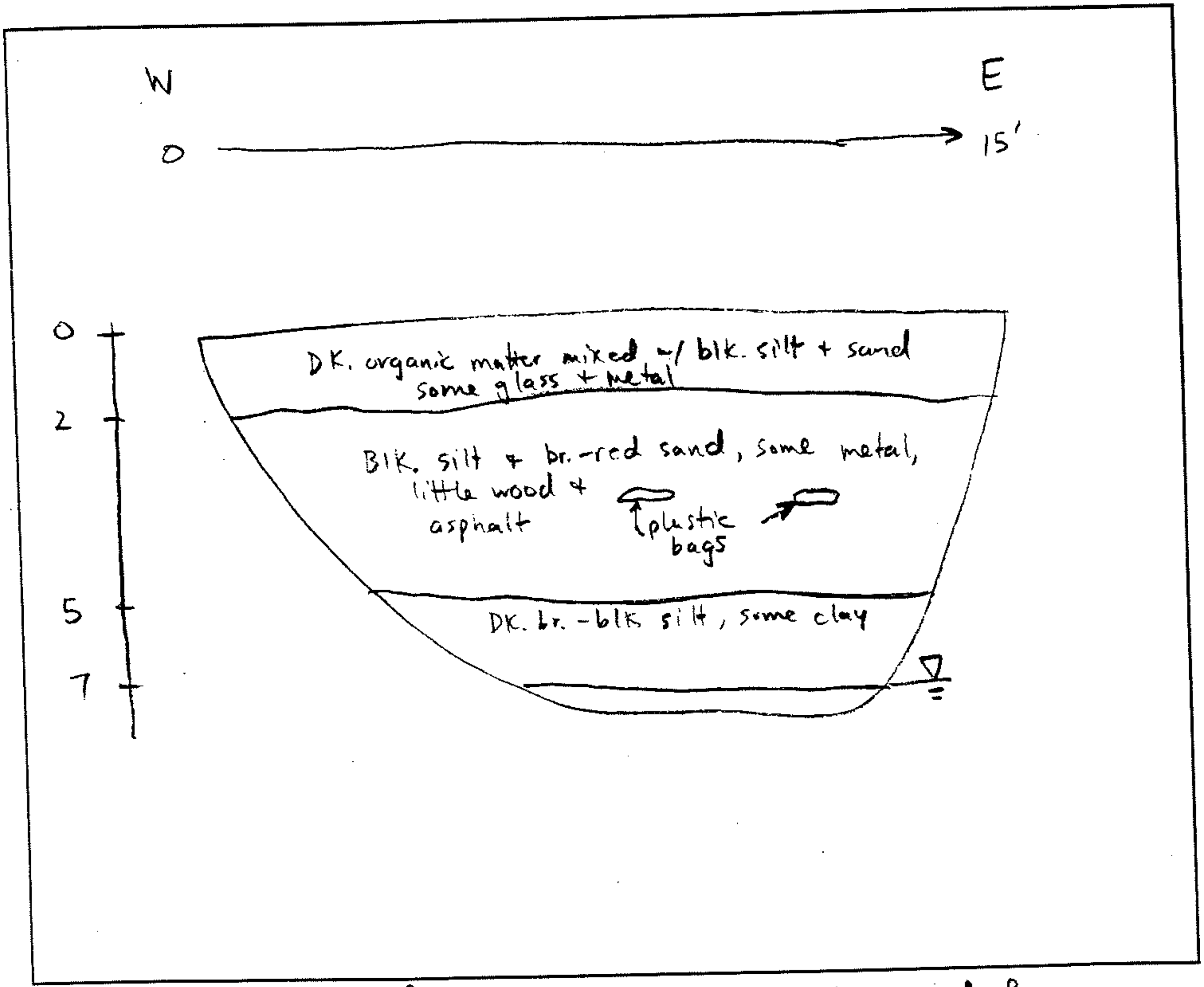
TEST PIT PROFILE

Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-21



Remarks * A lot of metal waste mixed w/ silt & sand from 2' bg to GW. @ ~7' bg

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-22

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / Carl Hewitt

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/8/97 $3^{15}-4^{15}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 13' bg

CONDITION OF PIT
V. Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0	0	0	100					
1 2 3 4 5	0	0	70	Trace	Trace	Trace	Trace	30 - C&D waste
6 7 8 9 10 11 12	0	0	100					
13 14 15			END OF TEST PIT					

DVIRKA AND BARTILUCCI

TEST PIT PROFILE

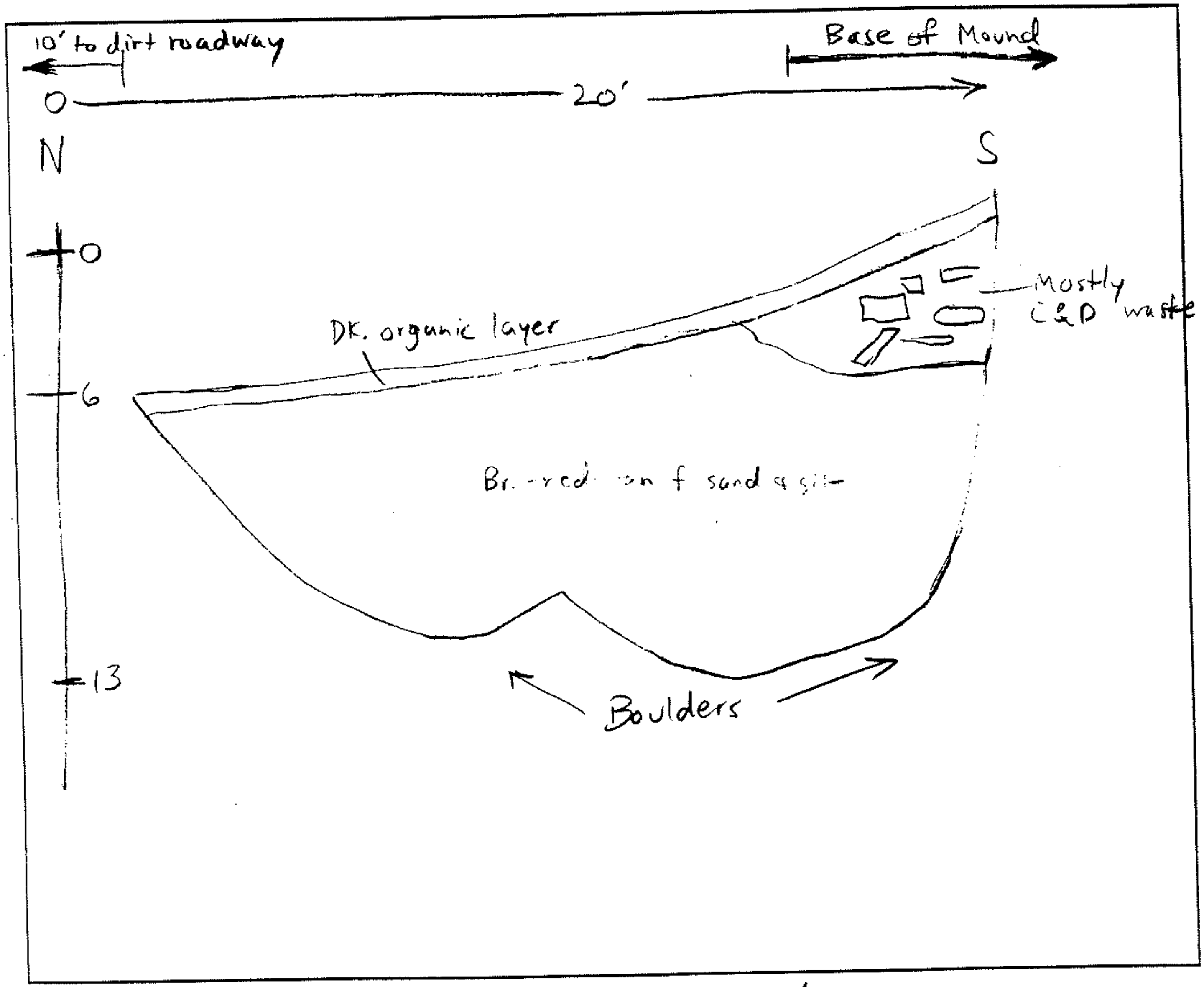
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-22

45' West of TP-14 stake



Remarks * Refusal due to boulders @ ~10' bg

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-23

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B

LOCATION Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR Insley H-1000-C / Carl Hewitt (payloader driver by Bill Hewitt)

INSPECTOR/OFFICE D. Obradovich/D&B

START/FINISH DATE 5/9/97 $8^{30}-9^{45}$

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 12' bg

CONDITION OF PIT Good

REMARKS No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0								
1								
2								
3								
4								
5	0	0	100					
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

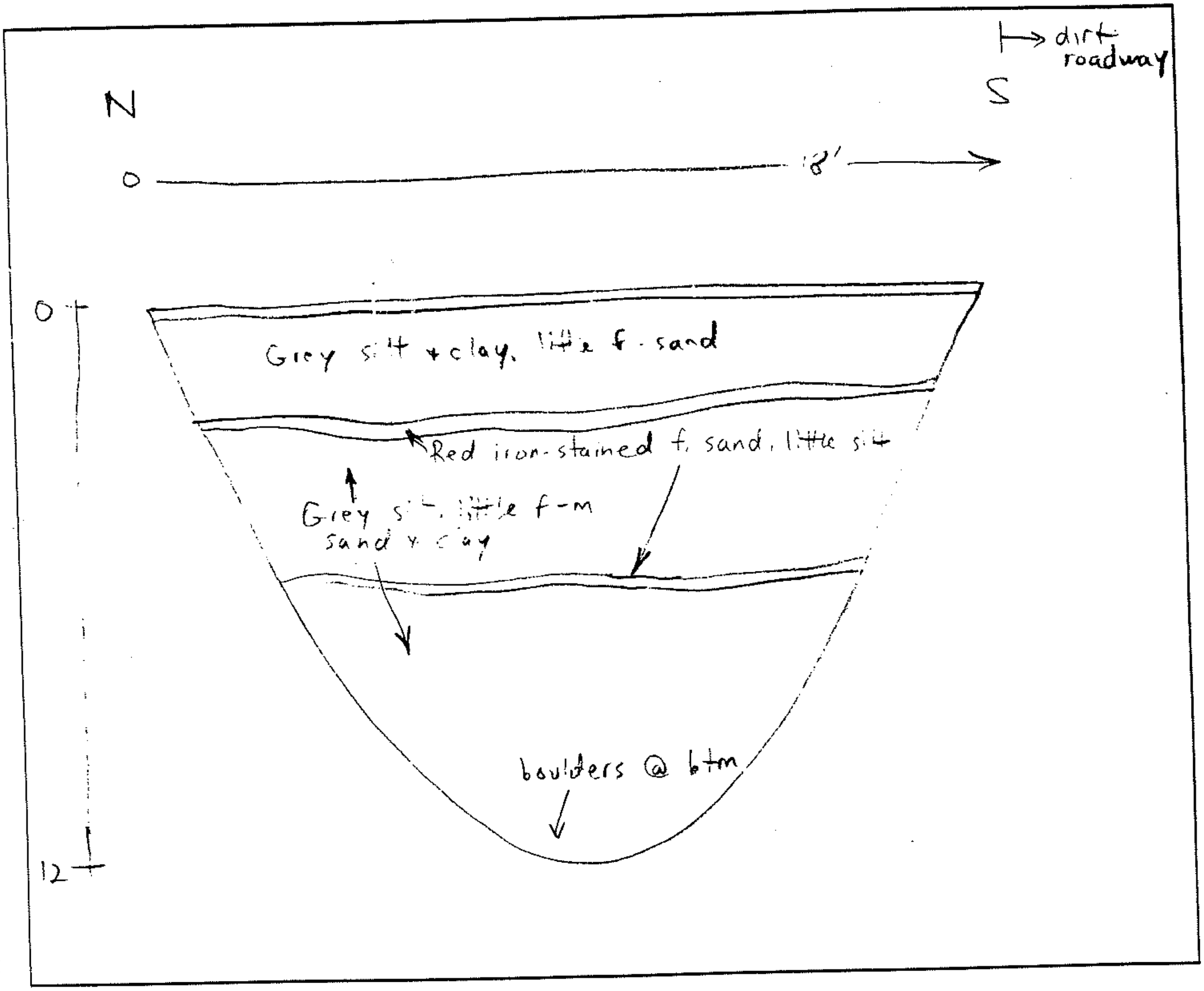
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-23

west side of large mound in btwn TP-1 + TP-11 on east side of dirt roadway



Remarks

Dvirka
and
Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-24

PROJECT NAME/NO.
Fishers Island Landfill/D&B No. 1468-B

LOCATION
Fishers Island, New York

EXCAVATOR/EQUIPMENT/OPERATOR
Insley H-1000-C / carl Hewitt (Payloader driven by Bill Hewitt)

INSPECTOR/OFFICE
D. Obradovich/D&B

START/FINISH DATE
5/9/97 9^{45}–10^{30}

ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 9' bg

CONDITION OF PIT
Fair – Good

REMARKS
No analytical samples collected.

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0 1	0	0	100					
2 3 4 5	0	0	70	10	15	5	Trace	
6 7 8	0	0	100					
9 10 11 12 13 14 15			END OF TEST PIT					

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

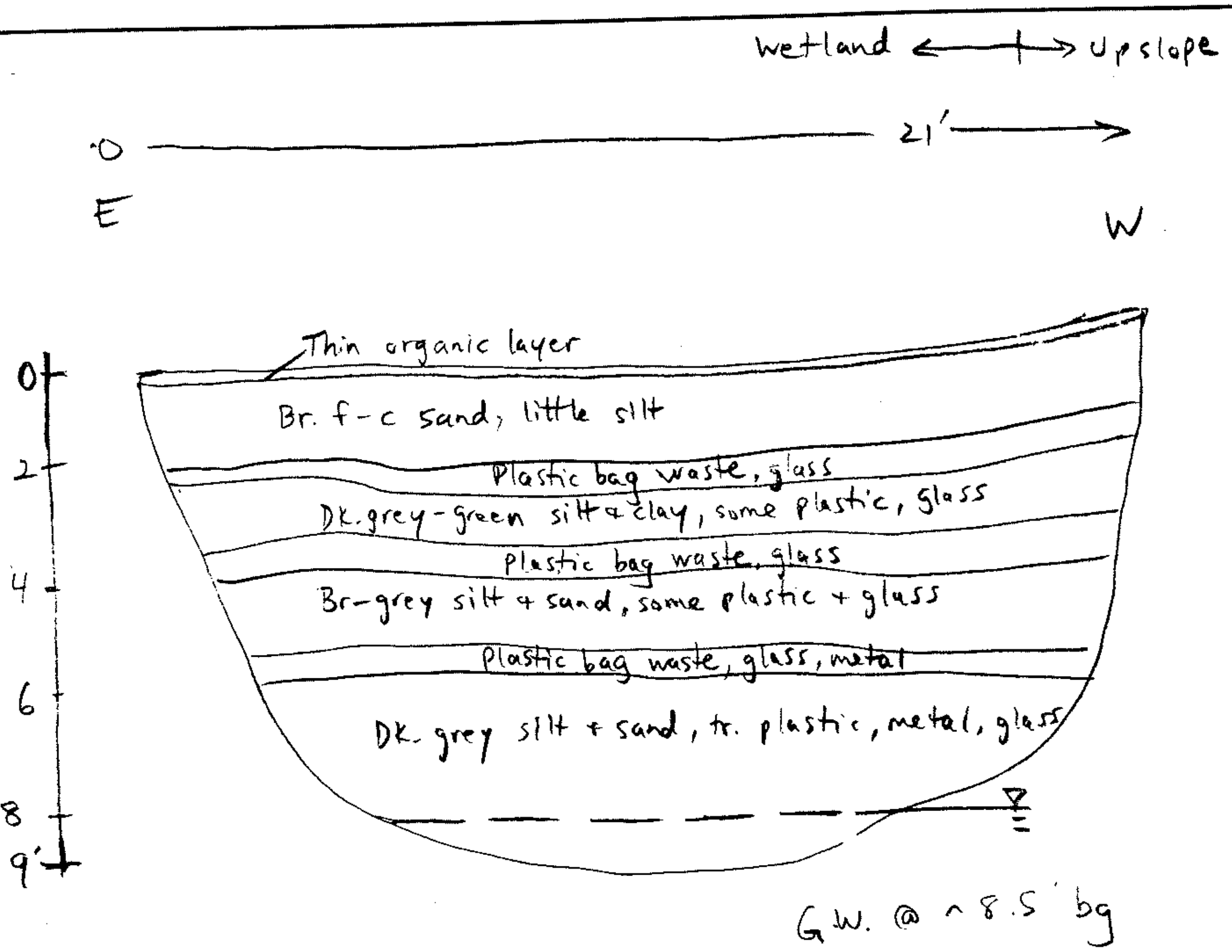
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-24

65' East of TP-15



Remarks

Dvirka and Bartilucci
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT NO. TP-25

PROJECT NAME/NO. Fishers Island Landfill/D&B No. 1468-B	**LOCATION** Fishers Island, New York
EXCAVATOR/EQUIPMENT/OPERATOR Insley H-1000-C / Carl Hewitt	
INSPECTOR/OFFICE D. Obradovich/D&B	**START/FINISH DATE** 5/9/97 10^{40} – 11^{15}
ELEVATION OF GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL) Total Depth 7' bg	**CONDITION OF PIT** Fair
REMARKS No analytical samples collected.	

DEPTH (feet)	PID READINGS (ppm)	EXPLOSIVE GAS READINGS (% LEL)	DESCRIPTION OF MATERIALS (Approximate Percentages)					
			SOIL	GLASS	PLASTIC	METAL	PAPER	OTHER
0 1 2 3	0	0	99		Trace			
4 5 6	0	0	80 *	5	5	Trace	Trace	* 10 cobbles
7 8 9 10 11 12 13 14 15			END OF	TEST PIT				

DVIRKA
AND
BARTILUCCI

TEST PIT PROFILE

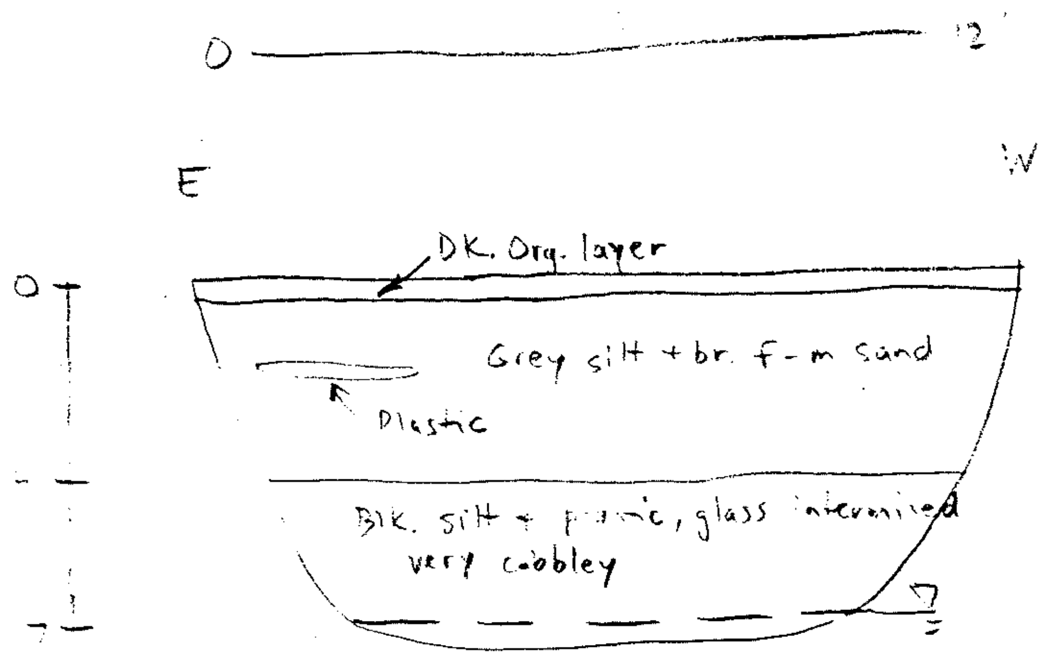
Project Fishers Island Landfill

Project Number 1468-B

Sample(s) Interval(s) NA

Test Pit Number TP-25

50' East of TP-21



Remarks

APPENDIX B

DAILY ACTIVITY REPORTS

DVIRKA
AND
BARTILUCCI

DAILY FIELD ACTIVITY REPORT

Report Number: 01 Project Number: 1468-B Date: 5/5/97

Field Log Book Page Number: p. 1-3

Project: Fishers Island Landfill

Address: Fishers Is. N.Y.

Weather: (AM) Sunny (PM): ↓

Rainfall: (AM) 0 Inches (PM) ↓ Inches

Temperature: (AM) 50 °F (PM) 60 °F

Wind Speed: (AM) 5-8 MPH (PM) ↓ MPH

Wind Direction: (AM) WNW (PM) ↓

Site Condition: Dry, Bar. Pressure 30.08↑

Personnel On Site:

Name	Affiliation	Arrival Time	Departure Time
D. Obradovich	D&B	12^{45}	3^{30}
T. Maher	↓	↓	↓
G. Thibodeau	Refuse District	↓	1^{30}
C. Hewitt	↓ Subcon.	↓	3^{30}

Subcontractor Work Commencement: (AM) ______ (PM) ______ NA

Subcontractor Work Completion: (AM) ______ (PM) ______

DVIRKA
AND
BARTILUCCI

DATE: 5/5/97

DAILY FIELD ACTIVITY REPORT

Work performed today by subcontractor(s) (includes equipment and labor breakdown):

No subcontractors today

DVIRKA
AND
BARTILUCCI

DATE: 5/5/97

DAILY FIELD ACTIVITY REPORT

General work performed today by D&B: Oversee test pit installation, field forms, walk-through of site, checked survey results (map) and met w/ Refuse district representatives.

List specific inspection(s) performed and results (include problems and corrective actions):

N/A

List type and location of tests performed and results (include equipment used and monitoring results):

Air monitoring for methane (% LEL) w/ combustible gas meter + total organic vapors w/ PID meter

Verbal comments received from subcontractor (include construction and testing problems, and ecommendations/resulting action):

NA

repared by: AWD.   Reviewed by:

B-DFAR

DVIRKA AND BARTILUCCI

DAILY FIELD ACTIVITY REPORT

Report Number: 02 Project Number: 1468-B Date: 5/6/97

Field Log Book Page Number: p. 4-10

Project: Fishers Island Landfill

Address: Fishers Is. N.Y.

Weather: (AM) Overcast - drizzle then rain (PM): Raining

Rainfall: (AM) 0 Inches (PM) <1 Inches

Temperature: (AM) 50 °F (PM) °F

Wind Speed: (AM) 0-2 MPH (PM) ↓ MPH

Wind Direction: (AM) - (PM) -

Site Condition: Dry in am,

Personnel On Site:

Name	Affiliation	Arrival Time	Departure Time
D. Obradovich	D&B	7^{45}	4^{10}
C. Hewitt	Refuse District	↓	↓
G. Thibodeau	↓	3^{30}	3^{45}

NA

Subcontractor Work Commencement: (AM) ~~(PM)~~

Subcontractor Work Completion: (AM) (PM)

DB-DFAR

DATE: 5/6/97

DAILY FIELD ACTIVITY REPORT

Work performed today by subcontractor(s) (includes equipment and labor breakdown):

No subcontractors today

**DVIRKA
AND
BARTILUCCI**

DATE: 5/6/97

DAILY FIELD ACTIVITY REPORT

General work performed today by D&B: Oversee test pit installation, field forms, air monitoring, and travel via ferry to and from site

List specific inspection(s) performed and results (include problems and corrective actions):

NA

List type and location of tests performed and results (include equipment used and monitoring results):

Air monitoring for methane (% LEL) w/ combustible gas meter and total organic vapors w/ PID meter

Verbal comments received from subcontractor (include construction and testing problems, and recommendations/resulting action):

NA

Prepared by: DWO. Reviewed by: ____________

DVIRKA
AND
BARTILUCCI

DAILY FIELD ACTIVITY REPORT

Report Number: 03 Project Number: 1468-B Date: 5/7/97

Field Log Book Page Number: p. 11-16

Project: Fishers Island Landfill

Address: Fishers Is. N.Y.

Weather: (AM) M. Cloudy / ~~Overcast / Raining~~ Rainfall: (AM) 0 Inches
(PM): M. Sunny (PM) ↓ Inches

Temperature: (AM) 40+ °F Wind Speed: (AM) 5-15 MPH Wind Direction: (AM) WNW
(PM) 50+ °F (PM) ↓ MPH (PM) ↓

Site Condition: Moist in am / dry in pm.

Personnel On Site:

Name	Affiliation	Arrival Time	Departure Time
D. Obradovich	D&B	8^{00}	4^{15}
C. Hewitt	Refuse District	↓	↓

NA

Subcontractor Work Commencement: (AM) ______ (PM) ______

Subcontractor Work Completion: (AM) ______ (PM) ______

B-DFAR

DVIRKA
AND
BARTILUCCI

DATE: 5/7/97

DAILY FIELD ACTIVITY REPORT

Work performed today by subcontractor(s) (includes equipment and labor breakdown):

No subcontractors today

DVIRKA AND BARTILUCCI

DATE: 5/7/97

DAILY FIELD ACTIVITY REPORT

General work performed today by D&B: Oversee test pit installation, field forms, measure out locations, install add'l stakes, interview Dick Grebe for history + fill out field forms

List specific inspection(s) performed and results (include problems and corrective actions):

NA

List type and location of tests performed and results (include equipment used and monitoring results):

Airmonitoring w/ PID for total organic vapors + % LEL (methane) w/ combustible gas meter

Verbal comments received from subcontractor (include construction and testing problems, and recommendations/resulting action):

NA

Prepared by: Dwa

Reviewed by:

DB-DFAR

**DVIRKA
AND
BARTILUCCI**

DAILY FIELD ACTIVITY REPORT

Report Number: 04 Project Number: 1468-B Date: 5/8/97

Field Log Book Page Number: p. 17-22

Project: Fishers Island Landfill

Address: Fishers Is. N.Y.

Weather: (AM) Sunny (PM): ↓

Rainfall: (AM) 0 Inches (PM) ↓ Inches

Temperature: (AM) 45 °F (PM) 55-60 °F

Wind Speed: (AM) 5-12 MPH (PM) ↓ MPH

Wind Direction: (AM) W (PM) ↓

Site Condition: Dry

Personnel On Site:

Name	Affiliation	Arrival Time	Departure Time
D. Obradovich	D&B	8^{00}	4^{00}
C. Hewitt	Refuse District Subcon.	↓	↓
B. Hewitt	↓	10^{30}	↓

NA

Subcontractor Work Commencement: (AM) (PM)

Subcontractor Work Completion: (AM) (PM)

B-DFAR

DVIRKA
AND
BARTILUCCI

DATE: 5/8/97

DAILY FIELD ACTIVITY REPORT

Work performed today by subcontractor(s) (includes equipment and labor breakdown):

No subcontractors today

**DVIRKA
AND
BARTILUCCI**

DATE: 5/8/97

DAILY FIELD ACTIVITY REPORT

General work performed today by D&B: Oversee test pit installation, field forms, instruct pay loader for completion of final grade over test pits; field forms.

List specific inspection(s) performed and results (include problems and corrective actions):

NA

List type and location of tests performed and results (include equipment used and monitoring results):

Air monitoring for total organic vapors w/ PID meter &
% LEL methane w/ combustible gas meter

Verbal comments received from subcontractor (include construction and testing problems, and recommendations/resulting action):

NA

Prepared by: DWO

Reviewed by:

DVIRKA AND BARTILUCCI

DAILY FIELD ACTIVITY REPORT

Report Number: 05 Project Number: 1468-B Date: 5/9/97

Field Log Book Page Number: p. 23-24

Project: Fishers Island Landfill

Address: Fishers Is. N.Y.

Weather: (AM) Overcast - raining (PM): Clearing

Rainfall: (AM) 0 Inches (PM) ↓ Inches

Temperature: (AM) 45 °F (PM) 60 °F

Wind Speed: (AM) 5-12 MPH (PM) ↓ MPH

Wind Direction: (AM) SSW (PM) ↓

ite Condition: Wet

ersonnel On Site:

Name	Affiliation	Arrival Time	Departure Time
D. Obradovich	D&B	8^{00}	11^{45}
C. Hewitt	Refuse Dist. Subcon.	↓	↓
B. Hewitt	↓	~~10^{30}~~ 8^{00}	
G. Thibodeau	Refuse Distr. Commiss.	10^{20}	10^{40}

NA

ubcontractor Work Commencement: (AM) ______ (PM) ______

ubcontractor Work Completion: (AM) ______ (PM) ______

DVIRKA
AND
BARTILUCCI

DATE: 5/9/97

DAILY FIELD ACTIVITY REPORT

Work performed today by subcontractor(s) (includes equipment and labor breakdown):

No Subcontractors today

DVIRKA
AND
BARTILUCCI

DATE: 5/9/97

DAILY FIELD ACTIVITY REPORT

General work performed today by D&B: Oversee test pit installation, field forms, demob. off site, check over site to ensure the site had no garbage on surface

List specific inspection(s) performed and results (include problems and corrective actions):

NA

List type and location of tests performed and results (include equipment used and monitoring results):

Air monitoring for total organic vapors w/ PID meter, % LEL of explosive gas w combustible gas meter

Verbal comments received from subcontractor (include construction and testing problems, and recommendations/resulting action):

NA

Prepared by: DWB. Reviewed by:

DB-DFAR

APPENDIX C

LOCATION SKETCHES

DVIRKA AND BARTILUCCI

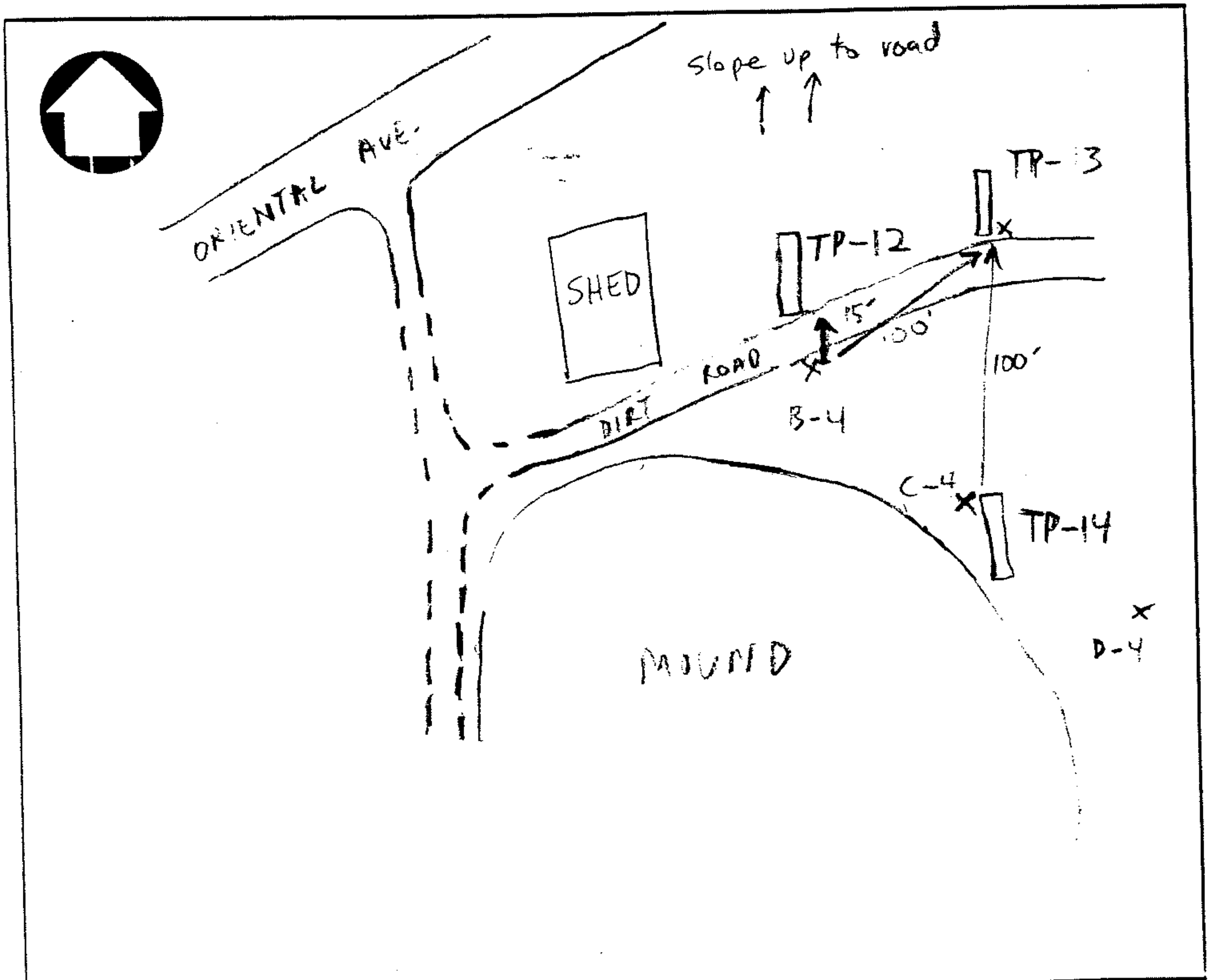
LOCATION SKETCH

Project Fishers Is. Landfill Sample Crew D. Obradovich

Sample(s) Location(s) TP-12, TP-13, TP-14

Sample(s) and/or Well Number(s)

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



LS

DVIRKA
AND
BARTILUCCI

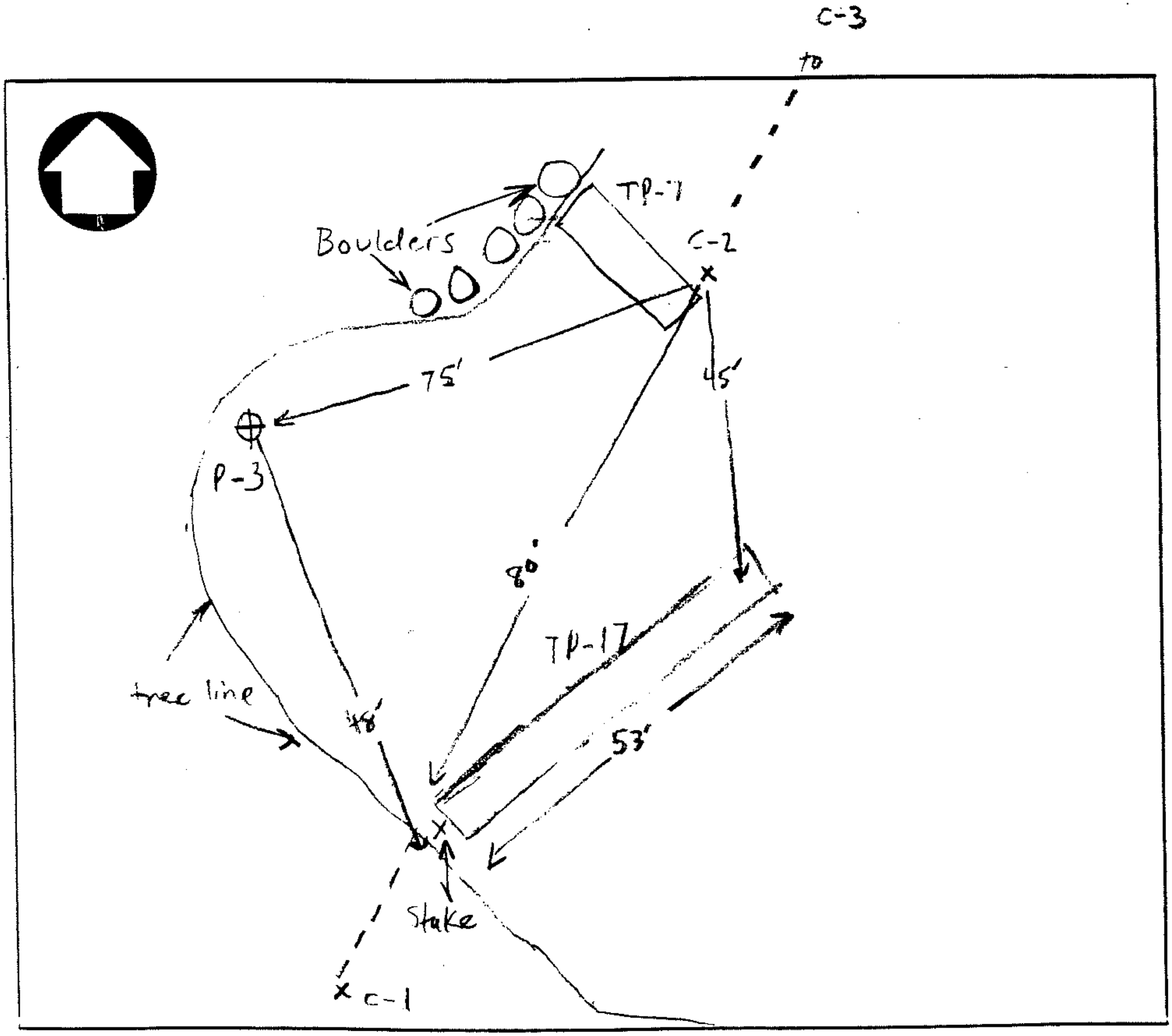
LOCATION SKETCH

Project Fishers Is. Landfill Sample Crew D. Obradovich

Sample(s) Location(s) TP-17

Sample(s) and/or Well Number(s)

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



LS

DVIRKA
AND
BARTILUCCI

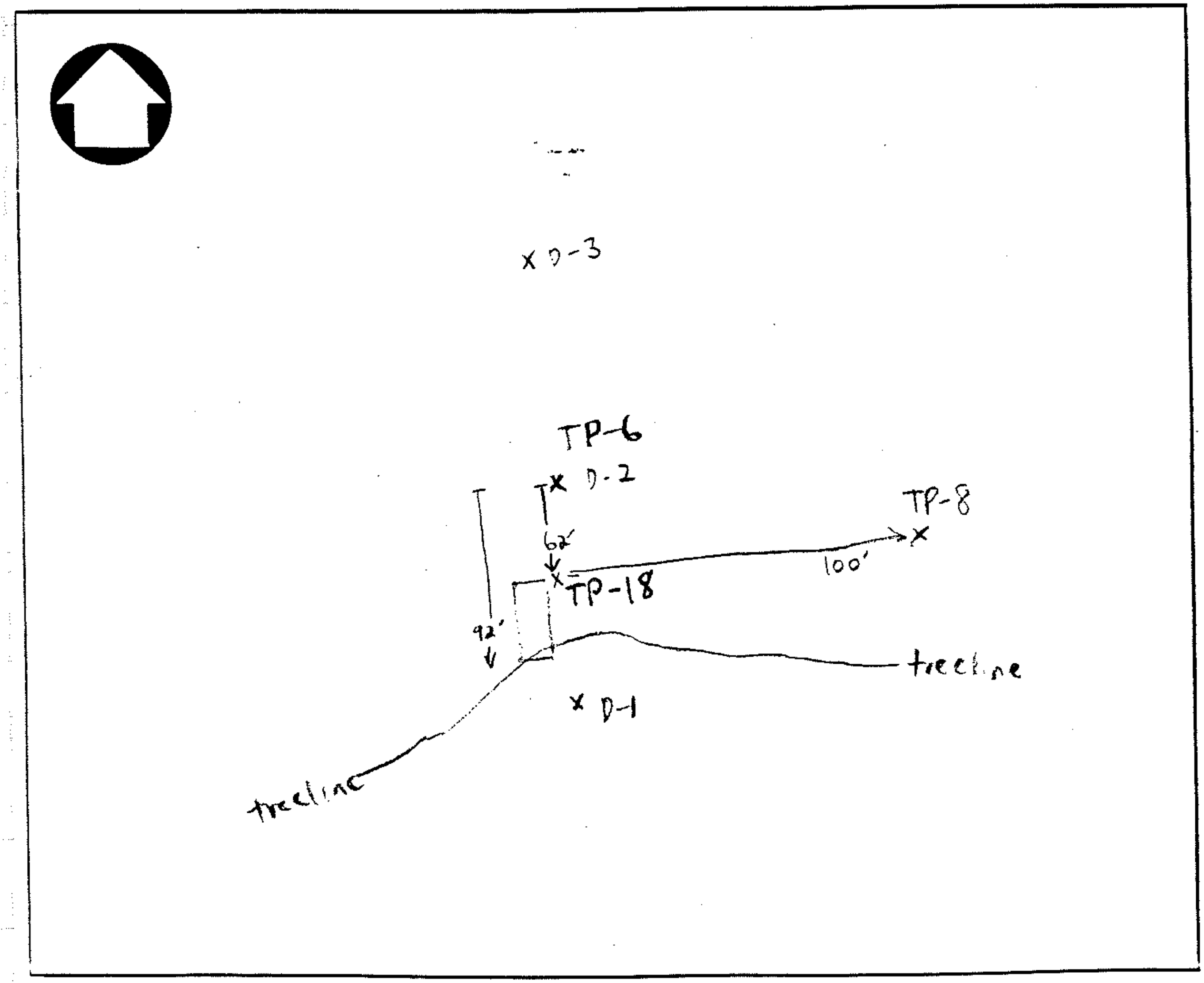
LOCATION SKETCH

Project Fishers Is. Landfill Sample Crew D. Obradovich

Sample(s) Location(s) TP-18

Sample(s) and/or Well Number(s)

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



DVIRKA
AND
BARTILUCCI

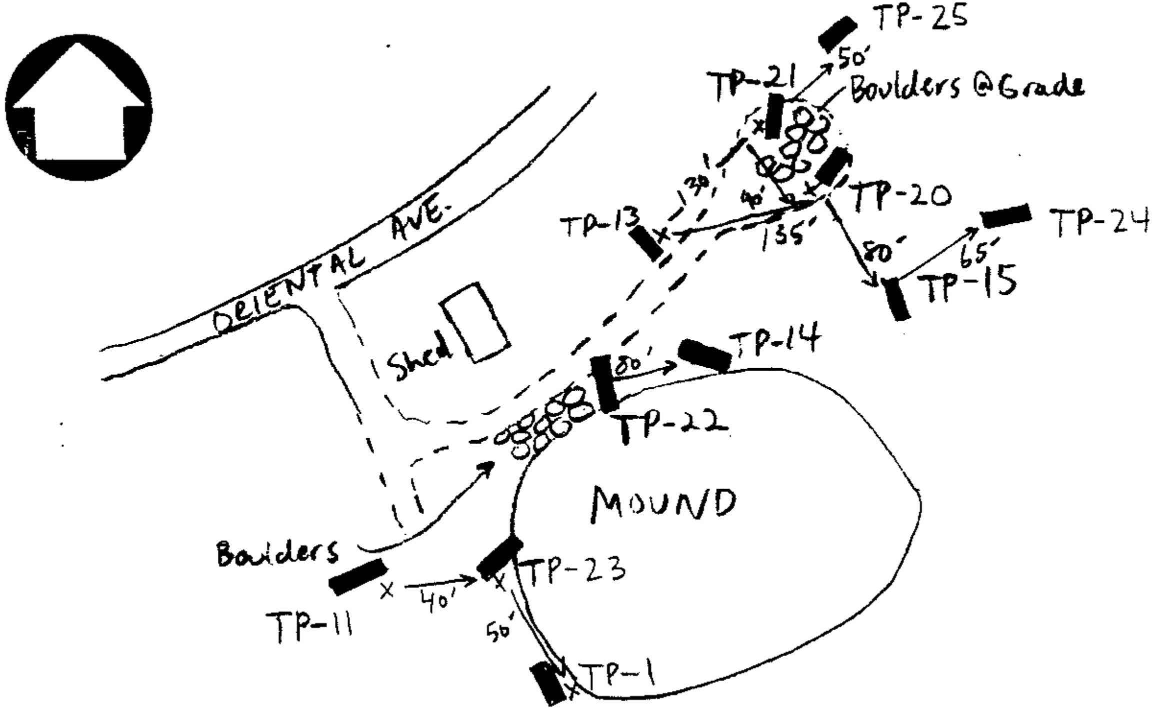
LOCATION SKETCH

Project Fishers Is. Landfill Sample Crew D. Obradovich

Sample(s) Location(s) TP-13, TP-20, TP-21, TP-22, TP-23, TP-24 + TP-25

Sample(s) and/or Well Number(s)

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



APPENDIX D

AIR MONITORING FORM

DVIRKA
AND
BARTILUCCI

AIR MONITORING FORM

PROJECT NAME: Fishers Island Landfill

DATE(S) 5/5/97 – 5/9/97

PROJECT NUMBER: 1468-B

INSTRUMENT: PID & combustible gas meter

RECORDED BY: D. Obradovich

CALIBRATION DATE: 5/5 – 5/9/97

WEATHER CONDITIONS: See daily forms

Date ~~TIME~~	LOCATION	WIND SPEED AND DIRECTION	PID ppm READING	% LEL	OBSERVATIONS
5/5	TP-1	–	0-1.5	0	Over waste pile
	↓	–	0	0	In bz (ambient)
	TP-2	–	0-2.8	0	Over waste pile
	↓	–	0	0	In bz (ambient)
	TP-3	–	0-4.8	0	Over waste pile
↓	↓	–	0	0	In bz (ambient)
5/6	All locations	–			
5/7		–			
5/8		–			
5/9	↓	–	↓	↓	↓ ↓ ↓

RECORDING PROCEDURES/REMARKS: bz = breathing zone

APPENDIX E

DAILY EQUIPMENT CALIBRATION LOG

DVIRKA AND BARTILUCCI

DAILY EQUIPMENT CALIBRATION LOG

Project Name: Fishers Is. Landfill

Project Number: 1468-B

Date: 5/6/97 - 5/9/97

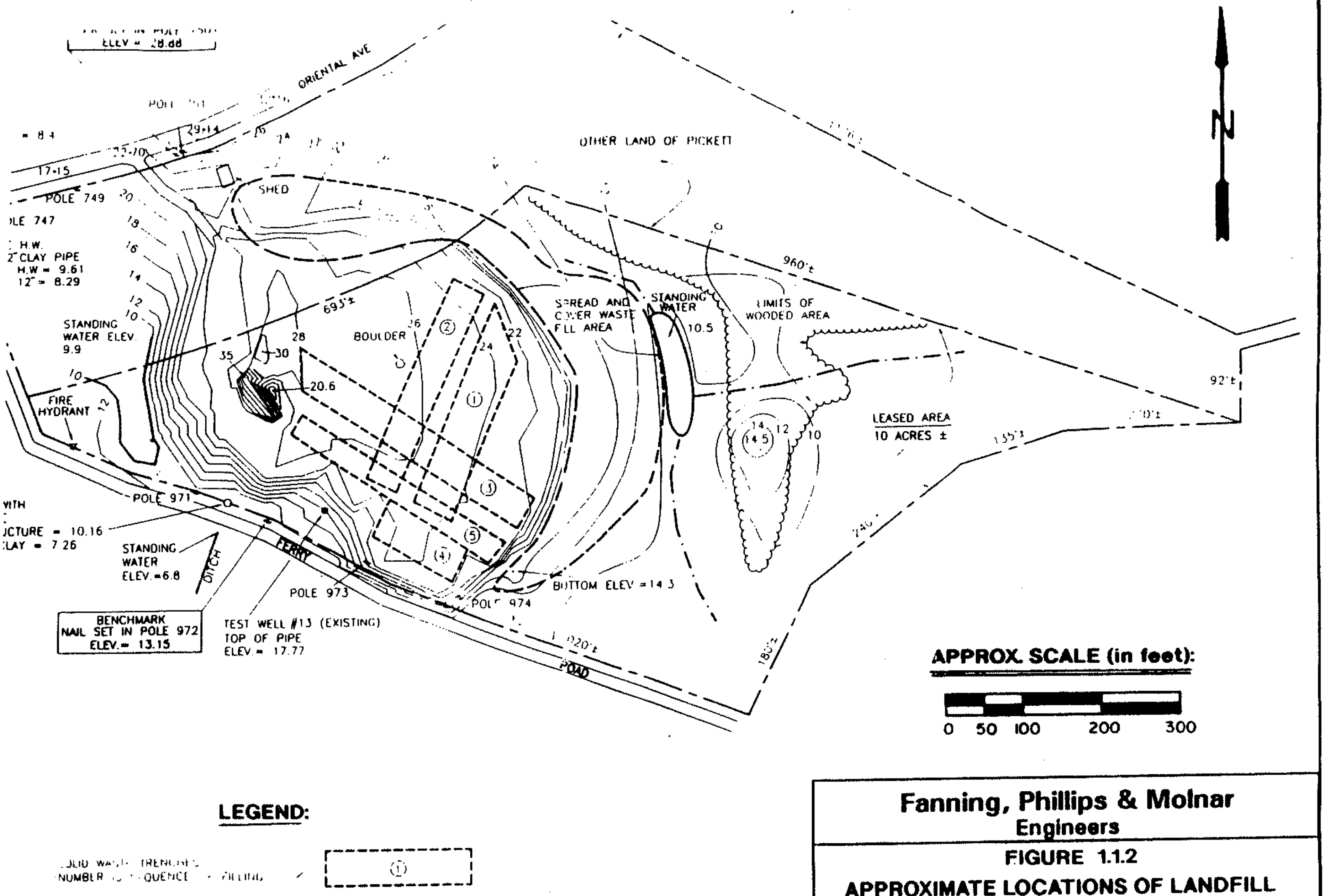
Calibrated By: D. Obradovich

Instrument Name and Model Number	Calibration Method	Time	Readings and Observations
Gastech GT-402 % LEL	20% LEL (Methane)	9^{00}	22% Response
Meter S/N 9415298			
Photovac Microtip HL-2000	100PPM Isobutylene	9^{15}	100 ppm response
S/N PA 920080			
Gastech GT-402	20% LEL Methane	8^{30}	21% Response
Photovac MTIP	100 ppm Isobutylene	8^{40}	100 ppm "
18 Gastech GT-402	20% LEL	8^{20}	23% response
Photovac MTIP	100 ppm Iso.	8^{30}	100 ppm / 0 background (bg)
9 Gastech GT-402	20% LEL	9^{00}	21% Response
Photovac MTIP	100 ppm Iso.	↓	100 ppm / 0 bg

DECL

APPENDIX F

FP & M SITE PLAN (FIGURE 1.1.2)



SOURCE: A.R. LOMBARDI ASSOCIATES, INC.

Fanning, Phillips & Molnar
Engineers

FIGURE 1.1.2

APPROXIMATE LOCATIONS OF LANDFILL CELLS AT THE PICKETT LANDFILL FISHERS ISLAND, NEW YORK

Drawn By: JDS	**Checked By:** PD	**Date:** 10-5-92

Appendix B

APPENDIX B

SLOPE STABILITY ANALYSIS

SLOPE STABILITY ANALYSIS
FISHERS ISLAND LANDFILL CLOSURE
FISHERS ISLAND, NEW YORK

PREPARED FOR:

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
330 CROSSWAYS PARK DRIVE
WOODBURY, NEW YORK 11797-2015

PREPARED BY:

TECTONIC ENGINEERING CONSULTANTS, P.C.
615 ROUTE 32, P.O. BOX 447
HIGHLAND MILLS, N.Y. 10930

AUGUST 1998

THOMAS JOHN CRITELLI
071384

THOMAS J. CRITELLI, P.E. No. 071384

W.O. 2114.01

FILE 6\211401.COV

1.0 INTRODUCTION

In accordance with your request, a slope stability analysis was performed for the proposed landfill closure at Fishers Island, New York. The purpose of our study was to evaluate the stability of the final proposed closure slopes for the Fishers Island Landfill (also known as the Pickett Landfill) project. This report presents our findings and recommendations for the design of the landfill closure slopes.

As part of our analyses, we have reviewed the "Draft Closure Investigation Report for the Pickett Landfill, Fishers Island, New York", dated March, 1997 prepared for the Fishers Island Garbage and Refuse District by Fanning, Phillips and Molnar. We also reviewed a report titled "Fishers Island Landfill Test Pit Program, Fishers Island, New York", dated June,1997 prepared for Fishers Island Garbage and Refuse District by Dvirka and Bartilucci Consulting Engineers.

2.0 SCOPE OF SERVICES

The specific scope of our services for the proposed Fishers Island landfill closure includes:

- Review of the proposed landfill closure design drawings and previous reports that were provided by the client.
- Compilation and geotechnical engineering analysis of the subsurface conditions as they relate to the slope stability analysis of the proposed landfill closure slopes.
- Performing slope stability analysis for two geometric cross-sections using the computer program PCSTABL 5M. Cross-sections were analyzed for overall slope stability considering both static and seismic loading conditions. The veneer stability of the landfill side slope was also analyzed.

- Preparation of this report presenting the results of our slope stability analysis, as well as the conclusions and geotechnical recommendations for design and construction of the landfill closure slopes.

3.0 PROJECT AND SITE DESCRIPTION

The landfill is located on Fishers Island, New York. Fishers Island is about seventeen miles east of the north fork of Long Island and four miles south of the Connecticut shoreline. The landfill site is an approximately 10 acre property bounded by Oriental Avenue on the north and Ferry Road on the south. The eastern and western sides of the landfill are adjoined by marsh/wetlands. The site is located approximately 0.6 mile east of the intersection of Ferry Road and Oriental Avenue. The proposed landfill layout is shown in Figure 1.

Based on our background review, the Fishers Island landfill was in operation from the early 1950s until its closure in 1991. The present landfill setting consists of a spread and cover waste fill area to the north and east of the main landfill area. The main landfill area is designated the upland area and is approximately 5.5 acres. The upland area was reportedly trenched and filled with landfill material. The spread and cover area was reported to be the original portion of the landfill and no materials have been deposited in this area since the late 1960s. The elevation of the landfill averages about 30 feet above mean sea level and is approximately 15 to 20 feet above the surrounding grade. The existing surface of the landfill is predominantly covered with vegetation. No landfilled refuse is exposed at the surface.

The borings were drilled to depths ranging between 21 and 38 feet using 4-1/4 inch internal diameter hollow-stem augers through soil. An NX diamond bit core barrel was used at one location to penetrate through a boulder. Split-spoon sampling and Standard Penetration Testing (SPT) were performed continuously to depths of at least 12 feet and intervals not exceeding 5 feet thereafter. Groundwater observations were made during the course of drilling. The groundwater level data is presented on the boring logs.

The locations of the borings used for this evaluation are shown on attached Figure 1. The logs of the borings performed for this phase of work are included in Appendix I.

6.0 SUBSURFACE CONDITIONS

Based on information provided in the Draft Closure Investigation Report, the Fishers Island Landfill Test Pit Log Program Report, and the recent boring data, the relevant subsurface data is summarized below.

6.1 Waste and Refuse Materials

The present landfill setting consists of an upland trenched area and a spread and cover waste fill area to the north and east of the upland area. The waste materials are primarily concentrated in trenches throughout the upland area, and typically consists of household waste contained in plastic bags. Based on the test pits data, the general thickness of waste mass in the main (upland) area is approximately 6 to 7 feet with a cover thickness of about 1 to 2 feet. The average depth of waste is approximately 8 feet below grade. In the area of the waste-filled trenches, the thickness of landfill material approaches 11 feet, with a maximum thickness of 17 feet identified at one test pit location. The thickness of waste in the spread and cover area north of the upland landfill area is estimated to be up

8.0 SLOPE STABILITY ANALYSIS

Based on the Final Closure Plans two geometric cross-sections designated as profile A-A' and profile C-C' were analyzed for overall slope stability. Profile B-B' was also provided by the client; however, this profile has a flatter slope than profiles A-A' and C-C', and therefore, was not considered to be a critical cross-section. The locations of the cross sections are indicated on Figure 1. The geometry of profiles A-A' and C-C' are shown on Figures 2 and 3, respectively.

Slope stability analyses were performed by the Simplified Bishop Method utilizing the PCSTABL 5M computer program. Failure surfaces along the cross sections were generated using the "CIRCLE" searching algorithm and "SURFAC" for both static and pseudo-static (seismic) conditions. Iterations using these subroutines yielded the critical failure surfaces for the subject slopes.

8.1 Shear Strength Parameters

Shear strength parameters used in our analyses were based on the subsurface exploration, laboratory test results on similar materials, and professional judgment. A summary of the shear strength data is presented in the following table:

SHEAR STRENGTH PARAMETERS

SLOPE MATERIAL	MOIST UNIT WEIGHT (pcf)	SATURATED UNIT WEIGHT (pcf)	FRICTION ANGLE (degrees)	COHESION (psf)
Landfill Cap Soils	105	115	32	0
Landfill Solid Waste Materials	65	75	20	200
Wetland Materials	65	75	20	200

8.2 Slope Stability Design Considerations

The slopes were analyzed to evaluate the static slope stability, the effect of the design seismic effect on the gross stability of the subject slopes, and the surficial stability of the landfill cap material and underlying waste. The pseudo-static subroutine of the PCSTBL 5M program and a coefficient of horizontal acceleration of 0.10g were used in our analyses. The 0.10g horizontal ground acceleration was obtained from the BOCA National Building Code.

The design is based on a static factor of safety of 1.5 and a pseudo-static factor of safety of 1.1 and the assumption that the slope configuration will be as indicated on Figure 1 and Cross Sections A-A' and C-C'.

The following table summarizes the results of the static and pseudo-static slope stability analyses. In addition, plots of our slope stability analyses are provided in Appendix II.

SUMMARY OF SLOPE STABILITY ANALYSES			
CROSS SECTION	DESIGN CONDITION	CALCULATED MINIMUM STATIC FACTOR OF SAFETY	CALCULATED MINIMUM PSEUDO-STATIC FACTOR OF SAFETY
A-A'	Eastern landfill slope	2.4	1.4
C-C'	Northern landfill slope	2.2	1.6

8.3 Veneer Slope Stability Analysis

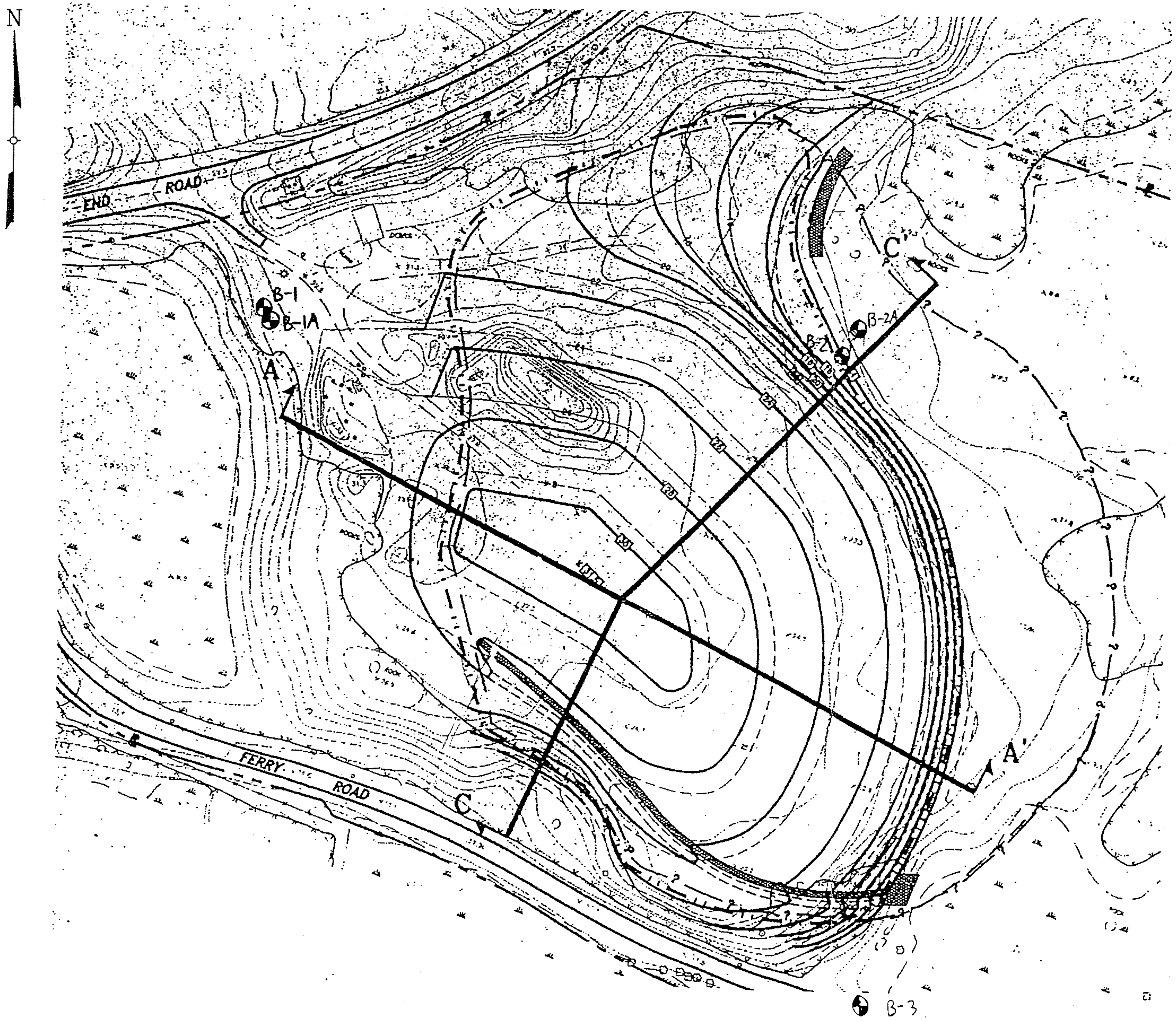
To facilitate the veneer slope stability analysis for the surficial stability of the landfill cap, a typical profile as shown in Figure 4 was utilized. This profile is based on the Final Closure Plans.

and geologists practicing in this or similar situations. The interpretation of the field data is based on good judgment and experience. However, no matter how qualified the geotechnical engineer or detailed the investigation, subsurface conditions cannot always be predicted between the points of actual sampling and testing. No other warranty, expressed or implied, is made as to the professional advice included in this report.

This report has been prepared for the exclusive use of Dvirka and Bartilucci Consulting Engineers for the specific application to the proposed landfill closure located on Fishers Island, New York. In the event that any changes in the design of the proposed landfill closure are planned or additional subsurface or laboratory test data inconsistent with that presented in this report becoming available, the conclusions and recommendations contained in this report shall not be considered valid unless reviewed and verified in writing by Tectonic Engineering Consultants P.C.

File FX\2114_01report.doc

FIGURE 1



LEGEND

C C'

APPROXIMATE LOCATION OF CROSS SECTIONS

B-3

APPROXIMATE LOCATION OF BORING BY DVIRKA & BARTILUCCI CONSULTING ENGINEERS

NOTE:

THIS PLAN WAS CREATED BASED ON A "KEY PLAN" BY DVIRKA & BARTILUCCI CONSULTING ENGINEERS DATED APRIL, 1998.

TECTONIC *ENGINEERING CONSULTANTS P.C.*

P.O. Box 447, 615 Route 32
Highland Mills, N.Y. 10930

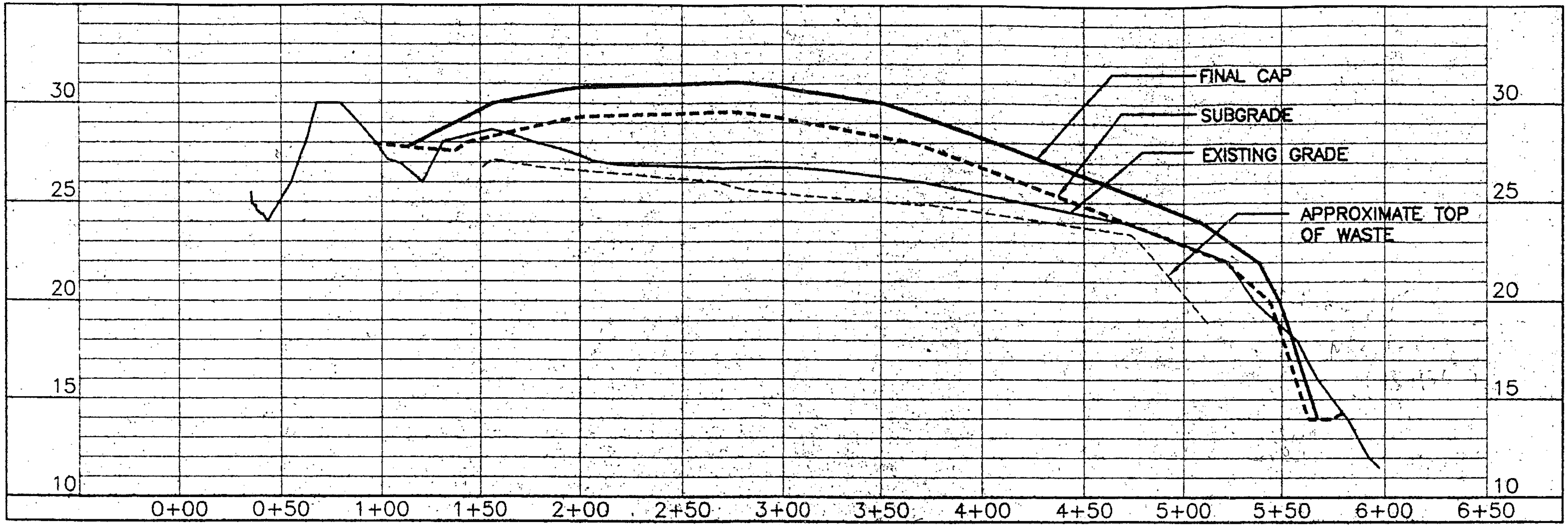
(914) 928-6531

PLAN

FISHERS ISLAND LANDFILL
FISHERS ISLAND
LONG ISLAND, NY

Date	Work Order	Drawing No.	Rev
7/10/98	2114.01	FIGURE 1	0
Scale 1"= 80'			

FIGURE 2



PROFILE A–A'

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=5'

NOTE:
THIS PLAN WAS CREATED BASED ON A PLAN & PROFILES BY DVIRKA & BARTILUCCI CONSULTING ENGINEERS DATED APRIL, 1998.

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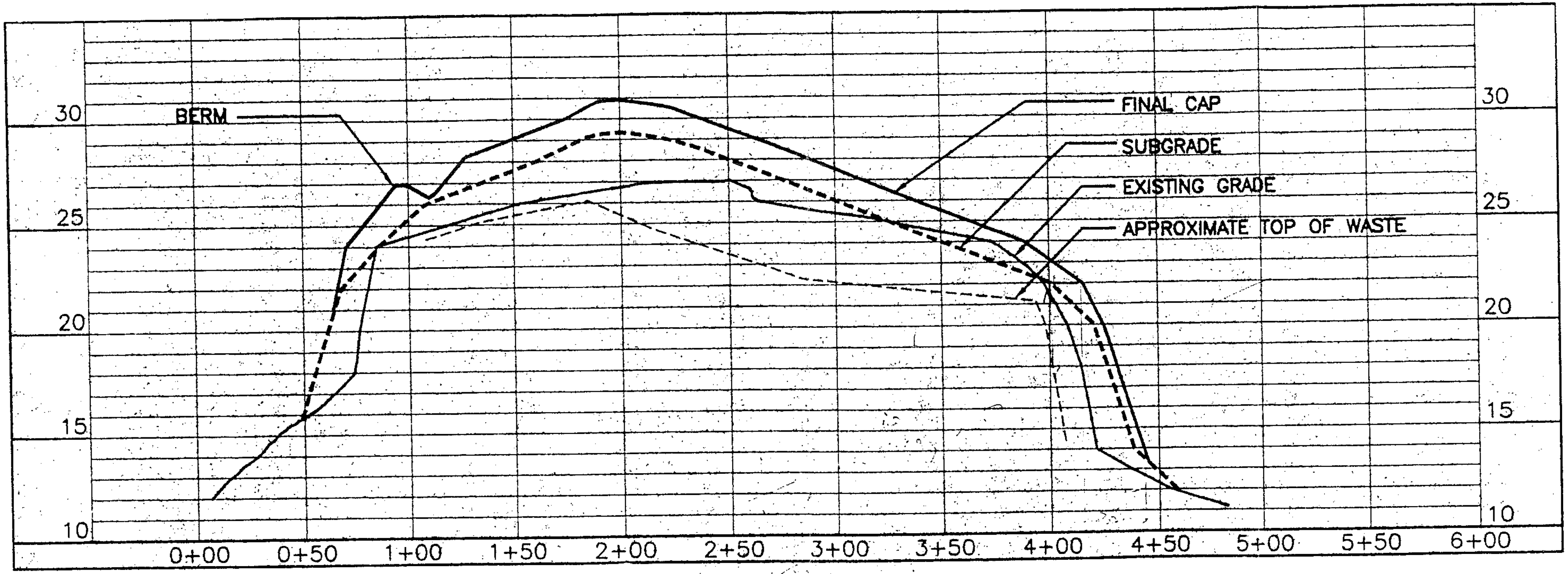
Highland Mills, N.Y. 10930
(914) 928-6531

PROFILE A–A'

FISHERS ISLAND LANDFILL
FISHERS ISLAND
LONG ISLAND, NY

Date	Work Order	Drawing No.	Rev
7/10/98	2114.01	FIGURE 2	0
Scale AS NOTED			

FIGURE 3



PROFILE C–C'

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=5'

NOTE:
THIS PLAN WAS CREATED BASED ON A PLAN & PROFILES BY DVIRKA & BARTILUCCI CONSULTING ENGINEERS DATED APRIL, 1998.

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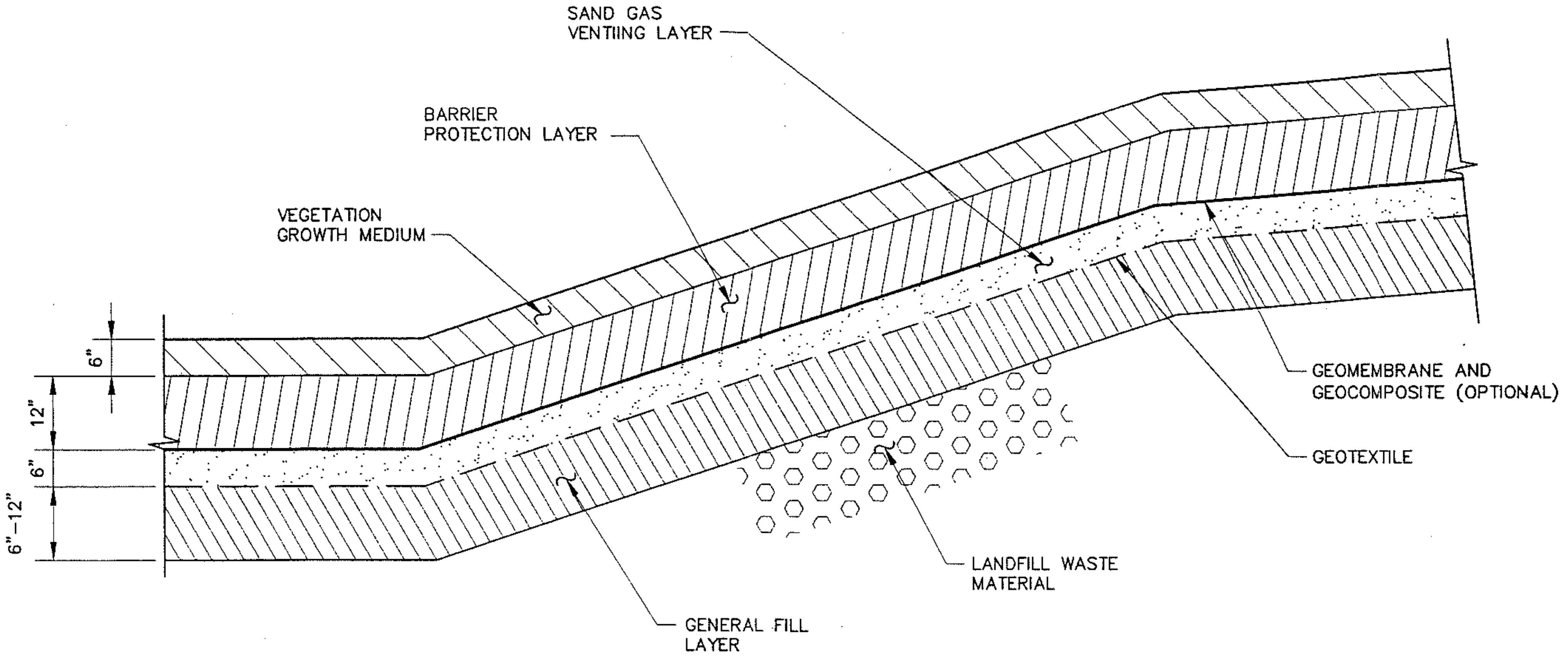
PROFILE C–C'

FISHERS ISLAND LANDFILL
FISHERS ISLAND
LONG ISLAND, NY

Date	Work Order	Drawing No.	Rev
7/10/98	2114.01	FIGURE 3	0
Scale AS NOTED			

FIGURE 4



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TYPICAL CAP CROSS SECTION

FISHERS ISLAND LANDFILL
FISHERS ISLAND
LONG ISLAND, NY

Date	Work Order	Drawing No.	Rev
7/10/98	2114.01	FIGURE 4	0
Scale NTS			

APPENDIX I

Driller: NEBC, S.Graves/M.Weed
Inspector: D. Stahl
Rig Type: Mobile B47 ATV
Drilling Method: 4¼" id HSAs, NX Core

Dvirka and Bartilucci Boring Log

Project Name: Fishers Island L.F.
Project #: 1468
Boring Depth: 26.5'

Boring ID : B-1
Sheet 1 of 1
Location: west of entrance road

Groundwater Observations			
Date			
Time			
DTW			
Casing Total Depth			

Start (Date & Time): 7-23-98, 09:15
Finish (Date & Time): 7-23-98, 12:10
Weather: M. Cloudy 85-90°F
Elevation of Ground Surface: ______

Location Sketch:

	Sample Interval	Sample No.	SPT	N	Field Description	Well Schematic	Comments
	0-2.0'	SS-1	2-4	8	Moist, brown f sand, trace silt.		
	Rec=	1.5'	4-5				
	2-4.0'	SS-2	7-6	12	Moist, brown f sand, trace silt.		
	Rec=	1.5'	6-6				▼ = 10'±
	4-6.0'	SS-3	5-6	13	Moist, brown f sand, little silt w/		
	Rcc=	1.5'	7-7		faint layering.		
	6-8.0'	SS-4	8-7	13	Moist, brown f sand, trace silt		
	Rec:	2.0'	6-6		w/ layering.		
	8-10.0'	SS-5	3-4	11	Moist, brown f sand, trace silt	Backfill Boring w/ cuttings	
	Rec=	2.0'	7-7		w/ layering.		
10	10-12.0'	SS-6	7-7	13	Wet, brown f sand, trace silt		
	Rec=	1.4'	6-6		w/ layering.		
							18' drilling becomes gravelly
	15-17.0'	SS-7	8-10	22	Wet, brown f sand, little silt.		
	Rec=	1.5'	12-10				
					18.0'		23.5' auger refusal on boulder.
20	20-22.0'	SS-8	4-4	8	Wet, brown m-f sand, little c sand,		
	Rec=	2.0'	4-5		trace f gravel, trace (-) silt.		
					23.5'		
	23.5-26.5	C-1	—	—	Grey granite gneiss.		
	Rec=	2.3'					
	RQD=	83%					
					B.O.B. = 26.5'		
30							

Soil Stratigraphy Summary ______

Driller: NEBC, S. Graves / M. Weed
Inspector: D. Stahl
Rig Type: Mobile B47 ATV
Drilling Method: 4¼" id HSAs

Dvirka and Bartilucci Boring Log

Project Name: Fishers Island L.F.
Project #: 1468
Boring Depth: 20.5'

Boring ID : B-1A
Sheet 1 of 1
Location: 15' SE of B-1

	Groundwater Observations		
Date			
Time			
DTW			
Casing Total Depth			

Start (Date & Time): 7-24-98/13:00
Finish (Date & Time): 7-24-98/14:05
Weather: Sun 90°F, W 1-5
Elevation of Ground Surface:

Location Sketch:

Depth	Sample Interval	Sample No.	SPT	N	Field Description	Well Schematic	Comments
					No spoon sampling 0-20.5'	Backfill Boring w/ Cuttings	
							▼ = 10'±
10							drilling becomes bouldery at 17.0'
					17.0' Some cobbles or small boulders, 17.0-20.5'		auger refusal on boulder, 20.5'
20					B.O.B. = 20.5'		
30							

Soil Stratigraphy Summary

Driller: NEBC, S. Graves / M. Weed
Inspector: D. Stahl
Rig Type: Mobile B47 ATV
Drilling Method: 4¼" i.d. HSAs

Dvirka and Bartilucci Boring Log

Project Name: Fishers Island L.F.
Project #: 1468
Boring Depth: 21.0'

Boring ID : B-2
Sheet 1 of 1
Location: NE edge of refuse

	Groundwater Observations		
Date			
Time			
DTW			
Casing Total Depth			

Start (Date & Time): 7-23-98 / 13:00
Finish (Date & Time): 7-23-98 / 14:20
Weather: O-cast 85-90°F
Elevation of Ground Surface:

Location Sketch:

	Sample Interval	Sample No.	SPT	N	Field Description	Well Schematic	Comments
	0-2.0'	SS-1	3-8	19	Dry, brown f sand, trace c-m sand,	Backfill Boring w/ cuttings and bentonite hole plug	
	Rec=	1.4'	11-13		trace f gravel, trace silt. 2.0'		
	2-4.0'	SS-2	14-7	11	Moist, dark grey f sand, trace c-m		SS-2, faint odor
	Rec=	0.2'	4-3		sand, trace blue plastic.		
	4-6.0'	SS-3	3-1	4	Moist, dark grey f sand, little silt w/		SS-3, odor
	Rec=	0.6'	3-4		plastic fragments. Wet in tip		▼ = 6'±
	6-8.0'	SS-4	4-7	23	Wet, dark grey f sand, trace c-m		SS-4, odor
	Rec=	0.1'	16-17		Sand w/ metal fragments.		
	8-10.0'	SS-5	4-2	6	Wet, grey f sand, little silt w/		SS-5, odor
10	Rec=	0.2'	4-5		plastic + brick fragments.		
	10-12.0'	SS-6	4-5	9	Wet, grey f sand, trace silt w/		SS-6, odor
	Rec=	0.5'	4-2		plastic. 12.0'		
	12-14.0'	SS-7	1-1	2	Wet, grey c-f sand, trace peat		SS-7, odor
	Rec=	0.4'	1-1		w/ brick + metal fragments		
	15-17.0'	SS-8	4-1	2	Wet, grey f sand, little m sand w/		SS-8, faint odor
	Rec=	0.5'	1-3		peat portions + plastic fragments 17.0'		
	17-19.0'	SS-9	2-2	4	Wet, brown peat.		SS-9, no odor
	Rec=	2.0'	2-2				
	19-21.0'	SS-10	11-11	22	Wet, brown peat (1.0') over wet, brown		
20	Rec=	2.0'	11-9		silt w/ peat (0.8'). A grey c-f sand seam (0.1') at 20.7'.		
					B.O.B = 21.0'		
30							

Soil Stratigraphy Summary:

Driller: NEBC, S. Graves / M. Wead
Inspector: D. Stahl
Rig Type: Mobile B47 ATV
Drilling Method: 4¼" i.d. HSAs

Dvirka and Bartilucci Boring Log

Project Name: Fishers Island L.F.
Project #: 1468
Boring Depth: 38.0'

Boring ID: B-2A
Sheet 1 of 1
Location: 19' ENE of B-2

	Groundwater Observations		
Date			
Time			
DTW			
Casing Total Depth			

Start (Date & Time): 7-24-98 / 10:05
Finish (Date & Time): 7-24-98 / 12:15
Weather: M-Sunny 85°F
Elevation of Ground Surface:

Location Sketch:

	Sample Interval	Sample No	SPT	N	Field Description	Well Schematic	Comments
							▼ = 6' ±
							SS-1, odor
10	9-11.0'	SS-1	3-1	2	Wet, grey, f sand, little silt, trace c-m sand w/ plastic, metal + wood fragments.	Backfill Boring w/ Cuttings and bentonite hole plug	
	Rec:	0.3'	1-2				
							auger past gravel at 17.5'
20	20-22.0'	SS-2	1-0	1	Wet, brown peat		
	Rec:	1.6'	1-1				
	22-24.0'	SS-3	1-2	4	Wet, brown peat grades to Wet, brown peat, trace silt.		
	Rec:	1.5'	2-2				
	24-26.0'	SS-4	1-1	1	Wet, brown silt, trace peat.		
	Rec:	1.5'	0-1				
	26-28.0'	SS-5	1-1	2	Wet, brown silt, trace peat.		
	Rec:	1.0'	1-1				
					30.0'		
30	30-32.0'	SS-6	7-12	30	Wet, brown silt, trace peat (0.3') over wet, brown f sand, trace c-m sand, trace f gravel (1.3')		
	Rec:	1.6'	18-17				
	32-34.0'	SS-7	6-5	14	Wet, grey-brown m-f sand, trace c sand, trace f gravel, trace silt.		
	Rec:	1.4'	9-9				
	34-36.0'	SS-8	8-9	26	Wet, grey f sand, little silt, trace c-m sand, trace m-f gravel.		
	Rec:	0.8'	17-43				
	36-38.0'	SS-9	13-13	32	Wet, grey f sand and silt, trace c-m sand, trace f gravel.		
	Rec:	1.3'	19-25				
					B.O.B. = 38.0'		

Soil Stratigraphy Summary

Driller: NEBC, S. Graves / M. Weed
Inspector: D. Stahl
Rig Type: Mobile B47 ATV
Drilling Method: 4 1/4" id. HSAs

Dvirka and Bartilucci Boring Log

Project Name: Fishers Island L.F.
Project #: 1468
Boring Depth: 22.0'

Boring ID : B-3
Sheet 1 of 1
Location: South edge of refuse

Groundwater Observations			
Date			
Time			
DTW			
Casing Total Depth			

Start (Date & Time): 7-24-98/08:05
Finish (Date & Time): 7-24-98/09:25
Weather: M. Cloudy 80-85°F

Elevation of Ground Surface:

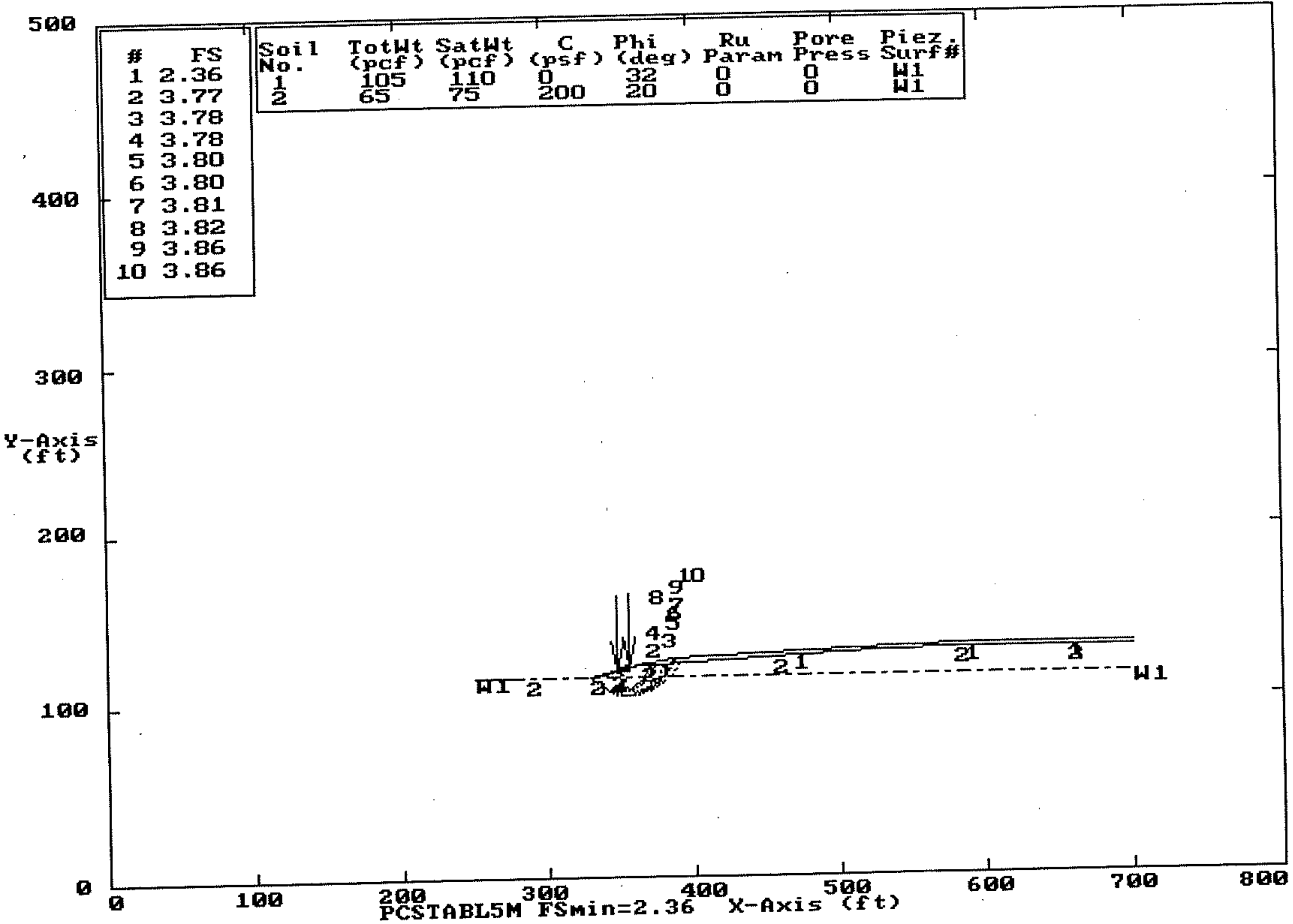
Location Sketch:

	Sample Interval	Sample No.	SPT	N	Field Description	Well Schematic	Comments
	0-2.0'	SS-1	2-4	12	Moist, brown silt and f sand (0.4') over	Backfill Boring w/ cuttings and bentonite hole plug	gravelly drilling
	Rec:	0.8'	8-11		Moist, brown f sand, some silt (0.4').		3.0 - 7.0'.
	2-4.0'	SS-2	5-7	23	Wet, brown f sand, some silt w/		
	Rec:	0.9'	16-19		og + rd staining. 4.0'		▼ = 4.5' ±
	4-6.0'	SS-3	8-14	30	Wet, brown c-f sand, trace f gravel		
	Rec:	0.8'	16-10		w/ wood fragments in tip.		
	6-8.0'	SS-4	10-7	13	Wet, brown m-f sand, little c sand,		
	Rec:	0.8'	6-5		trace m-f gravel, trace silt.		
	8-10.0'	SS-5	25-8	14	Wet, grey f sand, trace c-m sand,		SS-5, odor
10	Rec:	1.3'	6-43		trace m-f gravel, trace silt.		
	10-12.0'	SS-6	16-16	37	Wet, grey-brown m-f sand, little c sand,		
	Rec:	1.1'	21-15		trace m-f gravel, trace silt. 12.0'		
							occasional gravel
							12.0-15.0'.
	15-17.0'	SS-7	11-9	20	Wet, grey-brown c-f sand, little m-f		
	Rec:	1.0'	11-9		gravel, trace silt.		gravelly 17.0-20.0'.
20	20-22.0'	SS-8	10-11	23	Wet, brown-grey c-f sand and m-f		
	Rec:	0.7'	12-14		gravel, trace silt.		
					B.O.B = 22.0'		
30							

Soil Stratigraphy Summary

APPENDIX II

Fishers Island Landfill Cross Section A_A Stability Analysis
Ten Most Critical. C:FISH_AAX.PLT By: Tectonic Engineering 08-05-98 10:48am

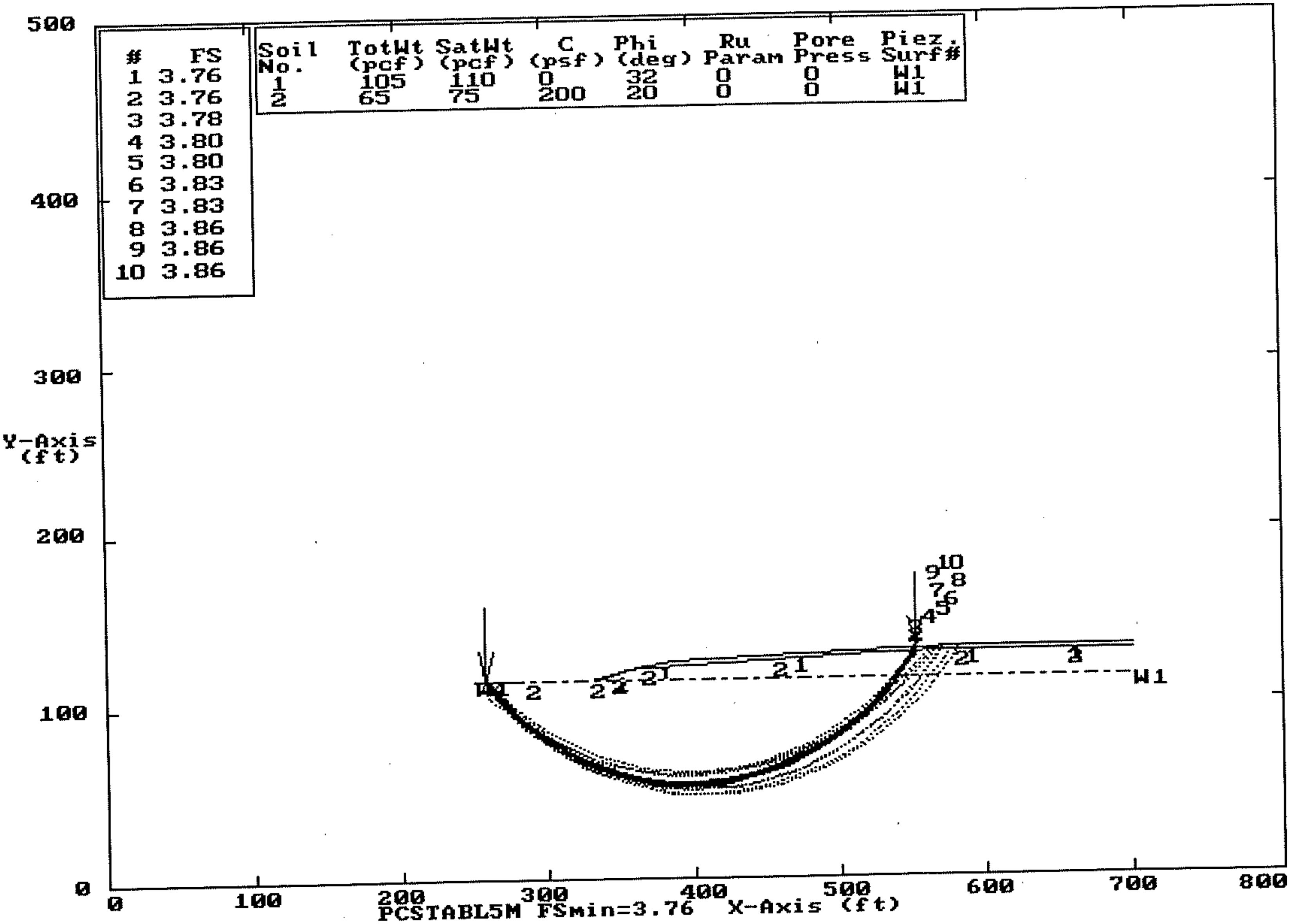


#	FS
1	2.36
2	3.77
3	3.78
4	3.78
5	3.80
6	3.80
7	3.81
8	3.82
9	3.86
10	3.86

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

PCSTABL5M FSmin=2.36

Fishers Island Landfills Cross Section A A Static, Deep Failure
Ten Most Critical. C:FISH_AAZ.PLT By: Tectonic Engineering 08-05-98 10:45am

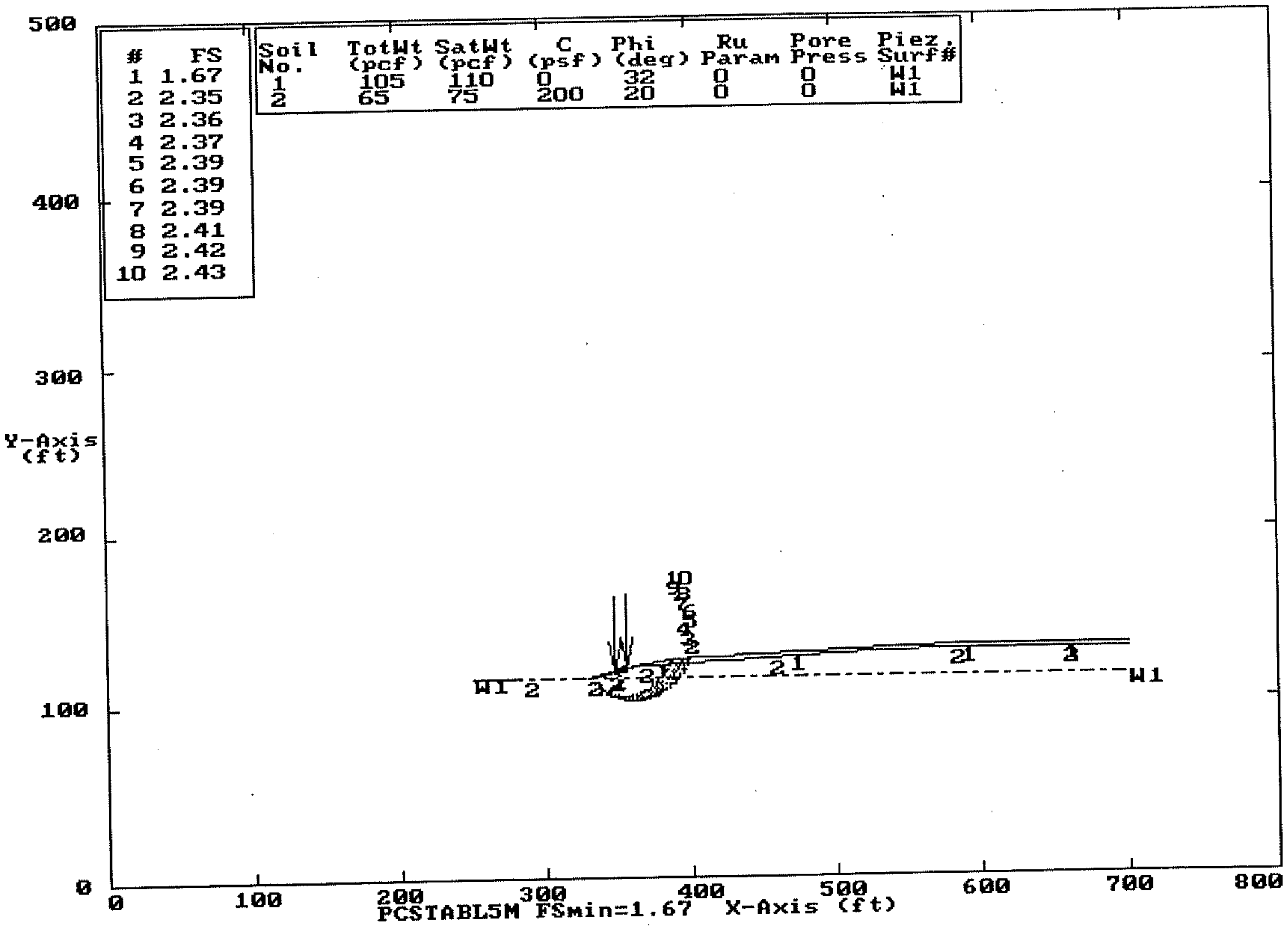


#	FS
1	3.76
2	3.76
3	3.78
4	3.80
5	3.80
6	3.83
7	3.83
8	3.86
9	3.86
10	3.86

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

PCSTABL5M FSmin=3.76

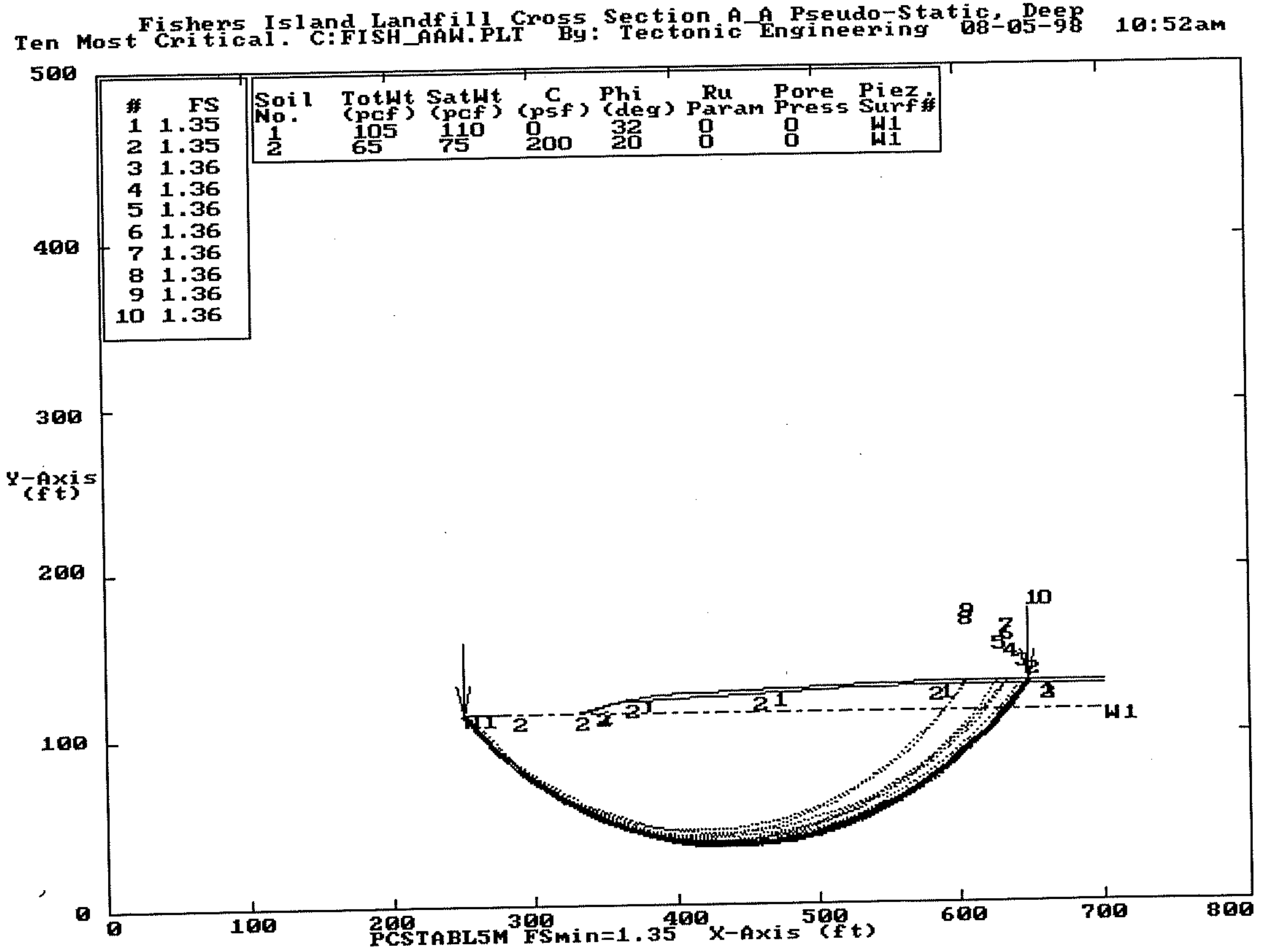
Fishers Island Landfill Cross Section A_A Pseudo-Static, Shallow
Ten Most Critical. C:FISH_AAV.PLT By: Tectonic Engineering 08-05-98 10:54am



#	FS
1	1.67
2	2.35
3	2.36
4	2.37
5	2.39
6	2.39
7	2.39
8	2.41
9	2.42
10	2.43

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

PCSTABL5M FSmin=1.67



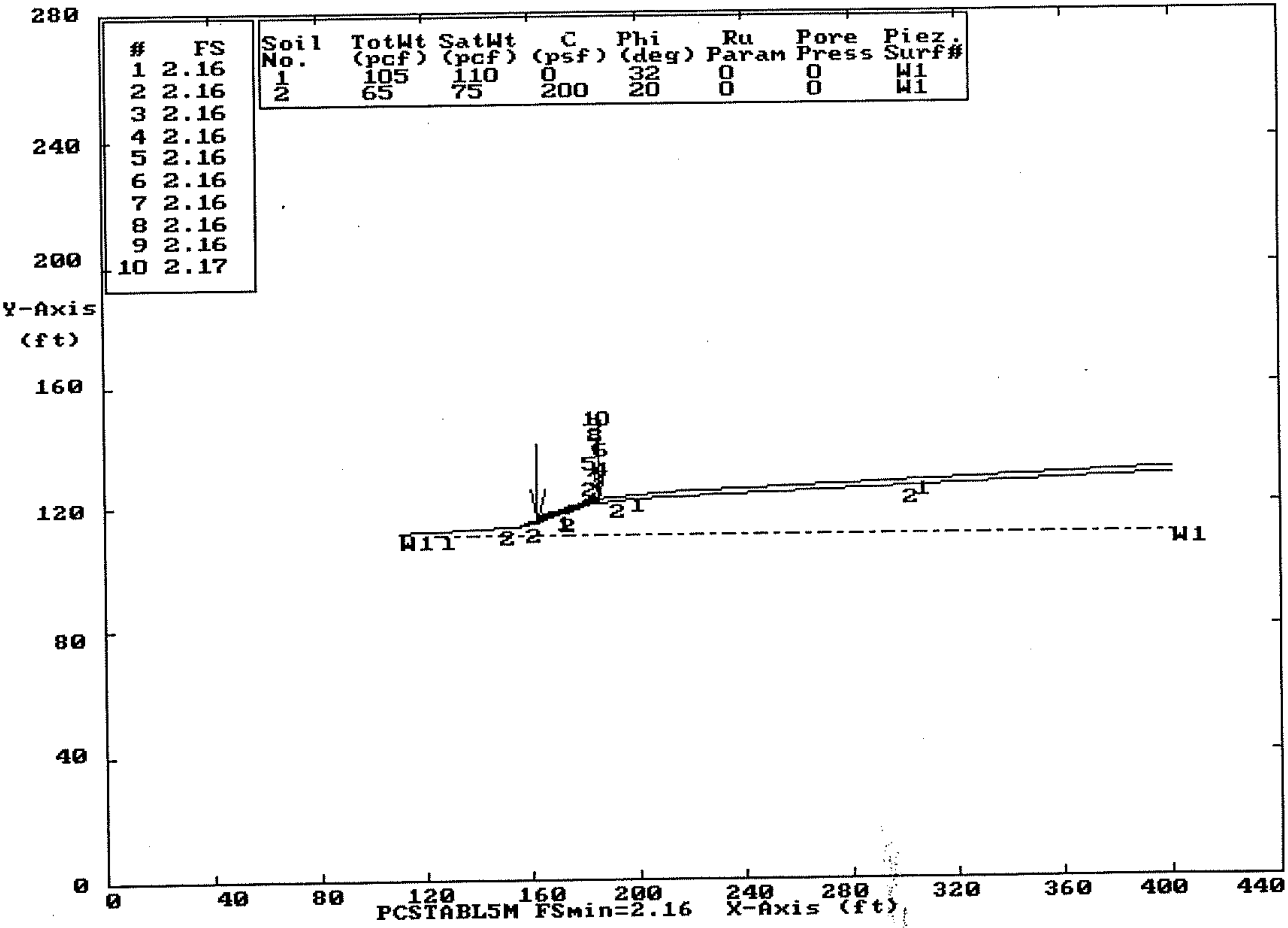
Fishers Island Landfill Cross Section A_A Pseudo-Static, Deep
Ten Most Critical. C:FISH_AAW.PLT By: Tectonic Engineering 08-05-98 10:52am

#	FS
1	1.35
2	1.35
3	1.36
4	1.36
5	1.36
6	1.36
7	1.36
8	1.36
9	1.36
10	1.36

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

PCSTABL5M FSmin=1.35

Fishers Island Landfill Cross Section C_C Shallow Failure
Ten Most Critical. C:FISH_CCZ.PLT By: Tectonic Engineering 08-05-98 10:39am

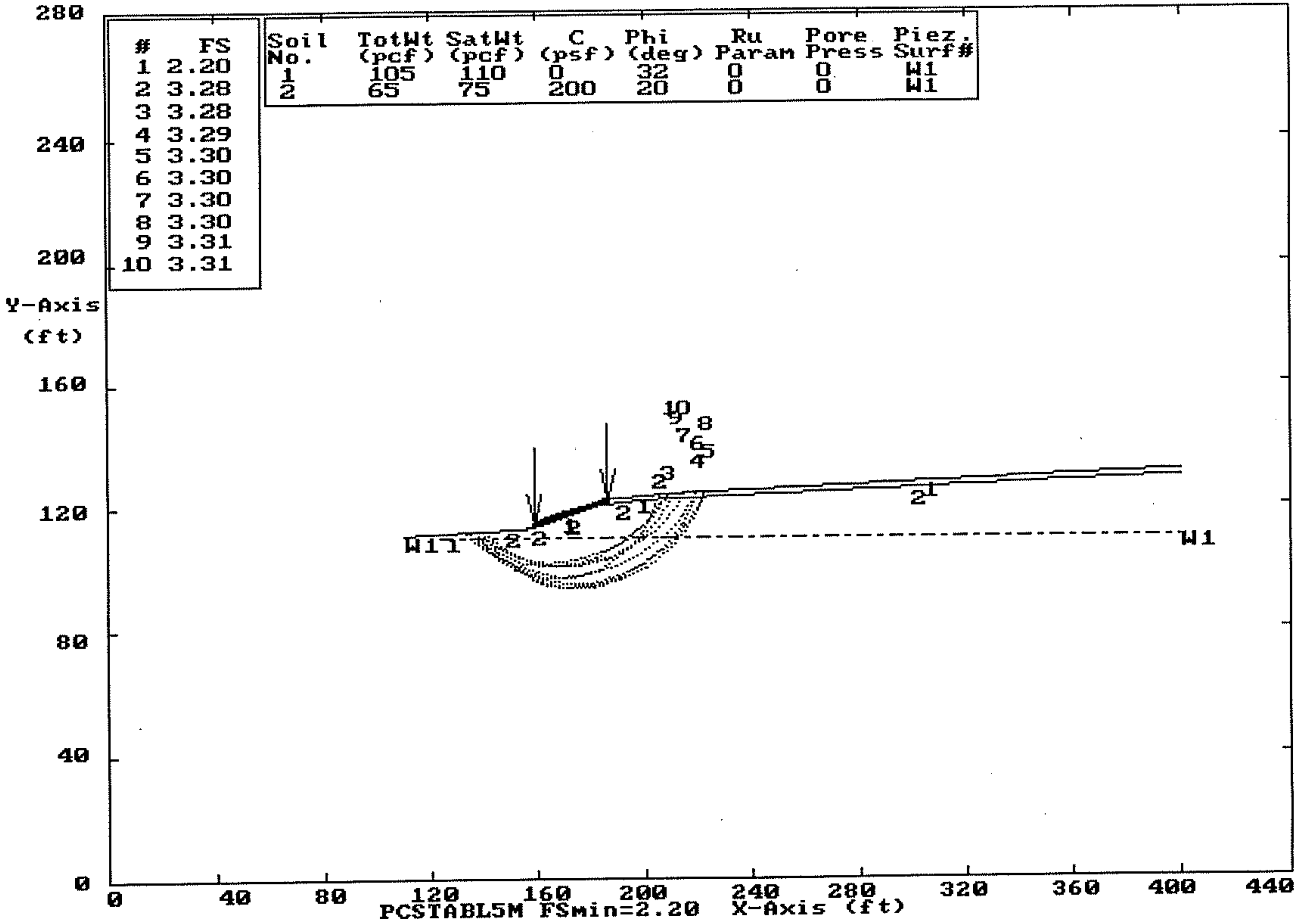


#	FS
1	2.16
2	2.16
3	2.16
4	2.16
5	2.16
6	2.16
7	2.16
8	2.16
9	2.16
10	2.17

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

PCSTABL5M FSmin=2.16

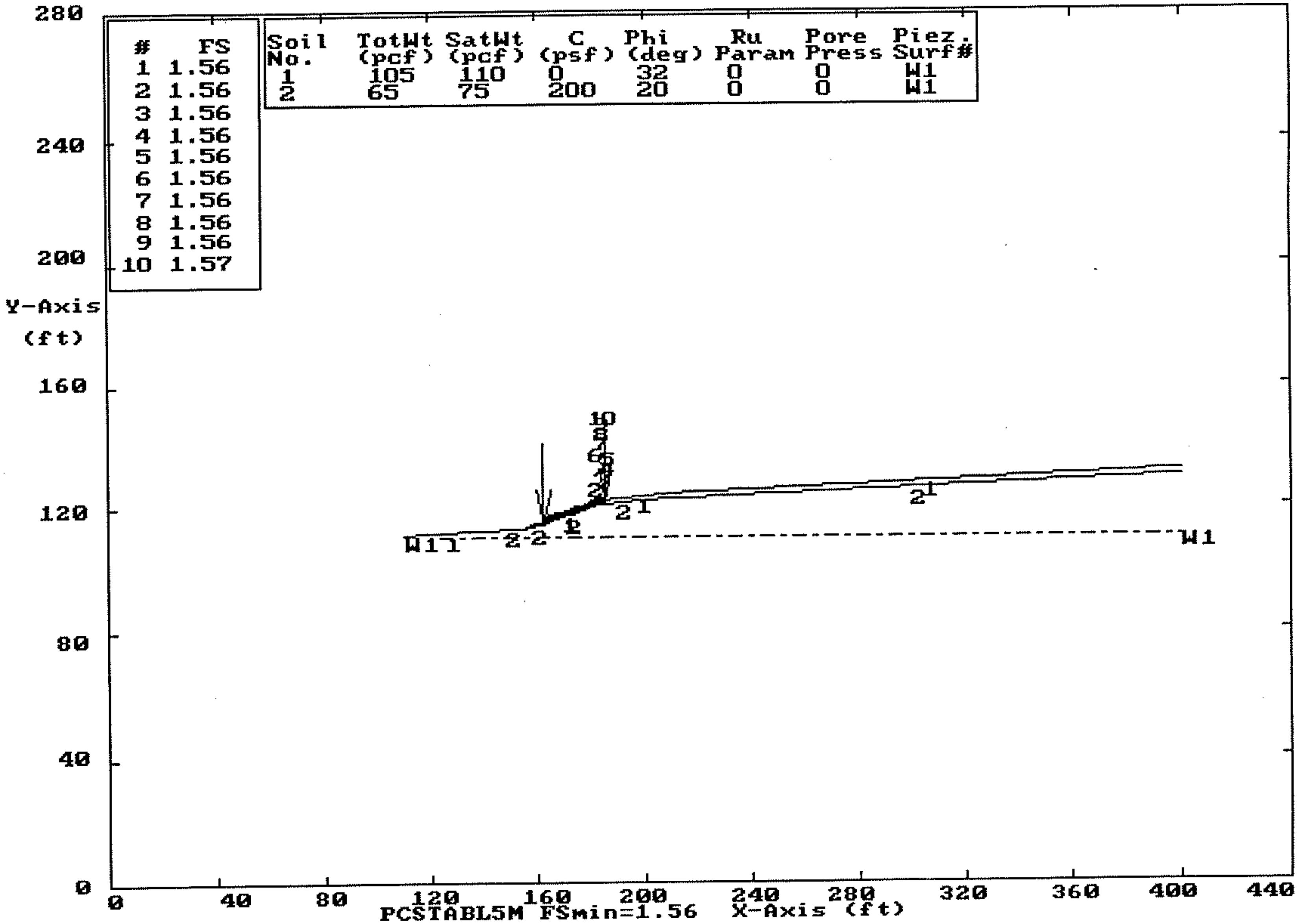
Fishers Island Landfill Cross Section C_C Intermediate Failure
Ten Most Critical. C:FISH_CC1.PLT By: Tectonic Engineering 08-05-98 10:36am



#	FS
1	2.20
2	3.28
3	3.28
4	3.29
5	3.30
6	3.30
7	3.30
8	3.30
9	3.31
10	3.31

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

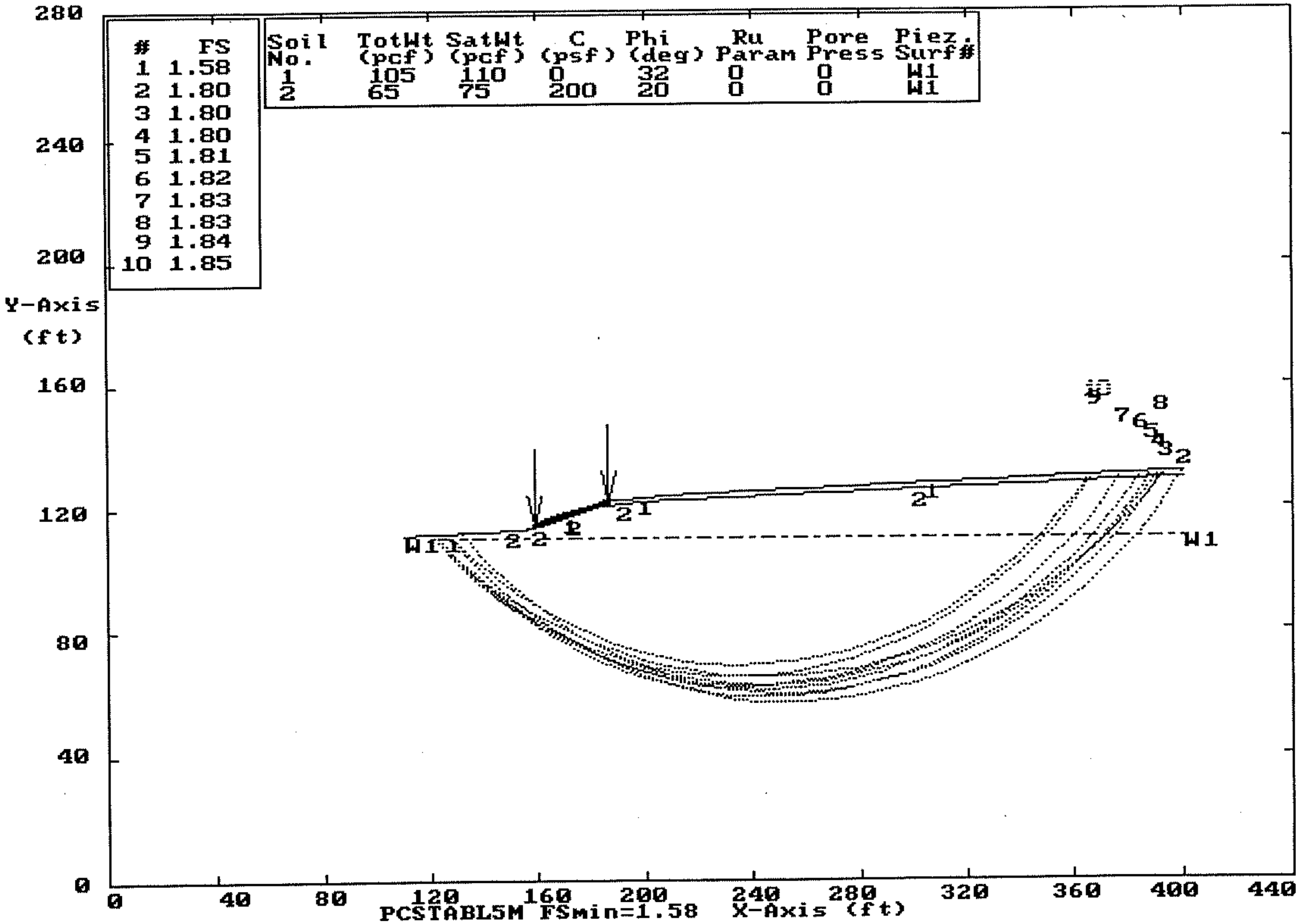
Fishers Island Landfill Cross Section C_C Pseudo-Static, Shallow
Ten Most Critical. C:FISH_CCX.PLT By: Tectonic Engineering 08-05-98 10:44am



#	FS
1	1.56
2	1.56
3	1.56
4	1.56
5	1.56
6	1.56
7	1.56
8	1.56
9	1.56
10	1.57

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

Fishers Island Landfill Cross Section C_C Pseudo-Static, Deep
Ten Most Critical. C:FISH_CCY.PLT By: Tectonic Engineering 08-05-98 10:42am

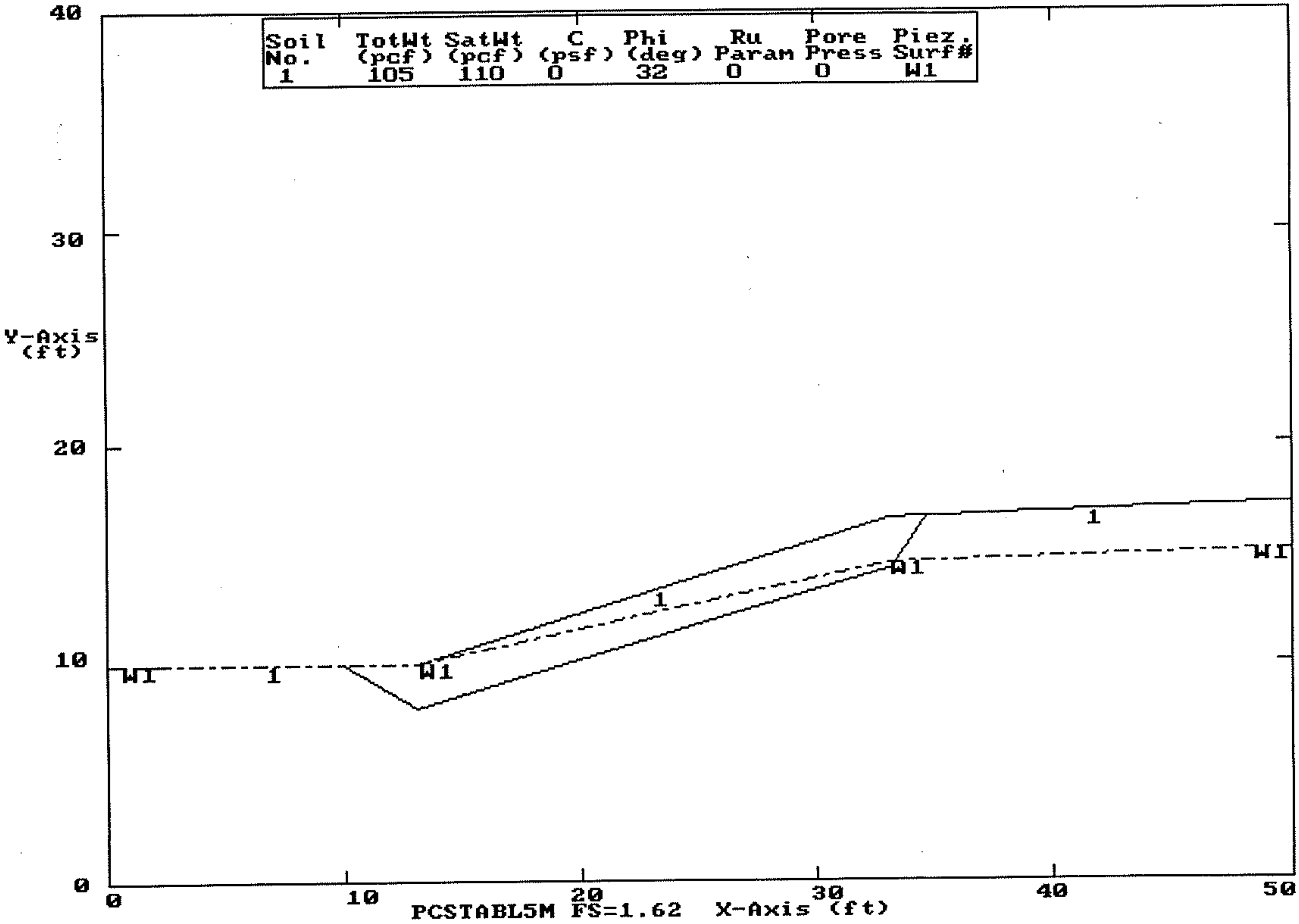


#	FS
1	1.58
2	1.80
3	1.80
4	1.80
5	1.81
6	1.82
7	1.83
8	1.83
9	1.84
10	1.85

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1
2	65	75	200	20	0	0	W1

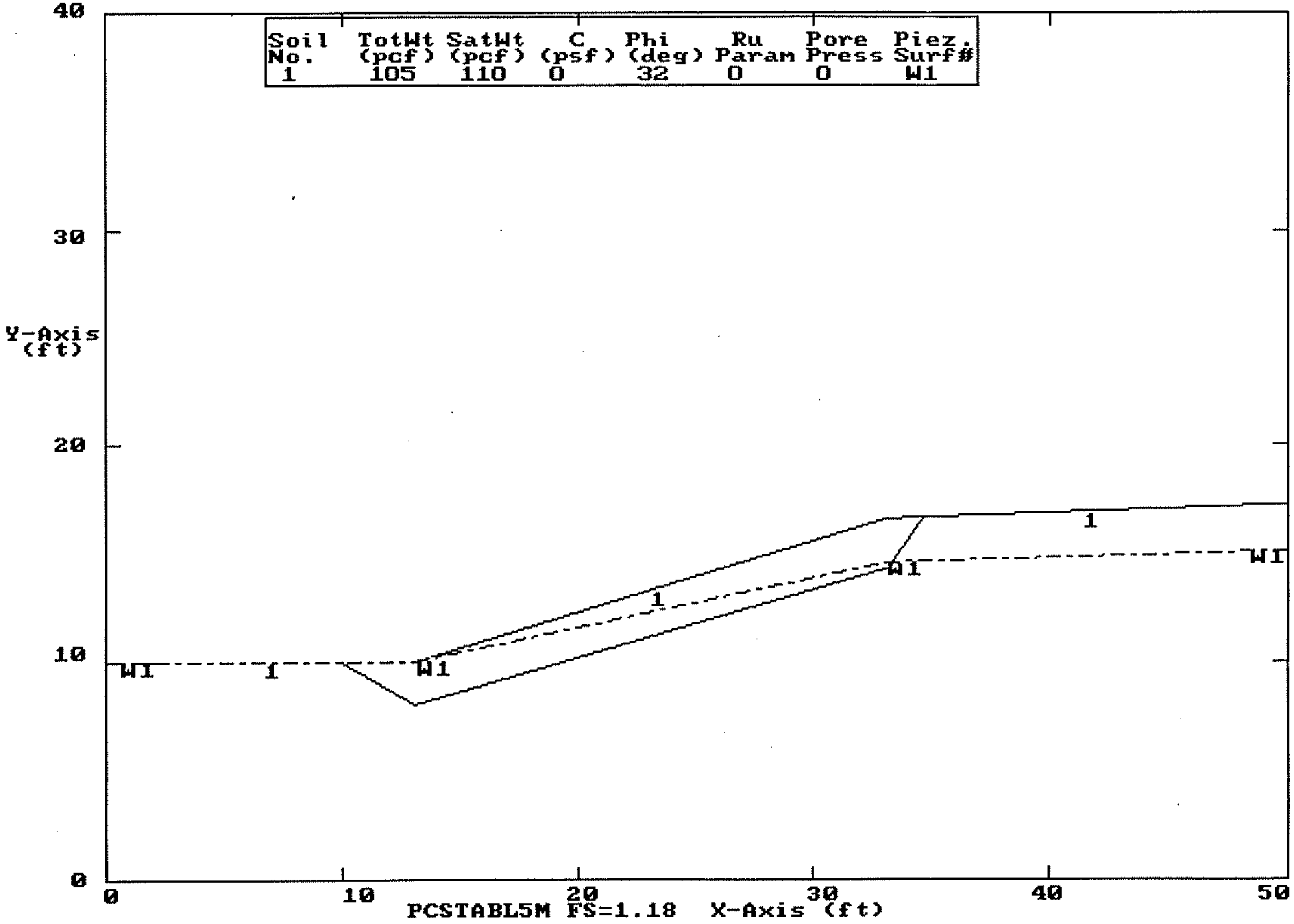
PCSTABL5M FSmin=1.58

Veneer Analysis - Static Loading
Specified Surface. C:FISHAAU.PLT By: Tectonic Engineering 08-05-98 10:57am



Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1

Veneer Analysis - Seismic Loading
Specified Surface. C:FISHAAT.PLT By: Tectonic Engineering 08-05-98 10:58am



Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez. Surf#
1	105	110	0	32	0	0	W1

Appendix C

APPENDIX C

HELP MODEL RESULTS

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******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**             HELP MODEL VERSION 3.01    (14 OCTOBER 1994)                 **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY                     **
**                  USAE WATERWAYS EXPERIMENT STATION                       **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                 **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP3\FISHER.D4
TEMPERATURE DATA FILE:        C:\HELP3\FISHER.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\FISHER.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\FISHER.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\FIL4NC12.D10
OUTPUT DATA FILE:             C:\HELP3\FIL4NC12.OUT


TIME:  17:45     DATE:  10/16/1998


******************************************************************************

     TITLE:  FISHER ISLAND LANDFILL,EVAP ZONE 12",4%SLOPE,NO GEOCOMPOSITE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   6
             THICKNESS                  =      6.00   INCHES
             POROSITY                   =      0.4530 VOL/VOL
```

```
          FIELD CAPACITY              =     0.1900 VOL/VOL
          WILTING POINT               =     0.0850 VOL/VOL
          INITIAL SOIL WATER CONTENT  =     0.3780 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.720000011000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
               FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                 LAYER  2
                                 --------

                         TYPE 2 - LATERAL DRAINAGE LAYER
                          MATERIAL TEXTURE NUMBER   5
          THICKNESS                   =    12.00   INCHES
          POROSITY                    =     0.4570 VOL/VOL
          FIELD CAPACITY              =     0.1310 VOL/VOL
          WILTING POINT               =     0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT  =     0.4570 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC
          SLOPE                       =     4.00   PERCENT
          DRAINAGE LENGTH             =   200.0    FEET


                                 LAYER  3
                                 --------

                         TYPE 4 - FLEXIBLE MEMBRANE LINER
                          MATERIAL TEXTURE NUMBER  35
          THICKNESS                   =     0.06   INCHES
          POROSITY                    =     0.0000 VOL/VOL
          FIELD CAPACITY              =     0.0000 VOL/VOL
          WILTING POINT               =     0.0000 VOL/VOL
          INITIAL SOIL WATER CONTENT  =     0.0000 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
          FML PINHOLE DENSITY         =     1.00   HOLES/ACRE
          FML INSTALLATION DEFECTS    =     3.00   HOLES/ACRE
          FML PLACEMENT QUALITY       =  3 - GOOD


                                 LAYER  4
                                 --------

                         TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER   5
          THICKNESS                   =     6.00   INCHES
```

```
            POROSITY                       =      0.4570 VOL/VOL
            FIELD CAPACITY                 =      0.1310 VOL/VOL
            WILTING POINT                  =      0.0580 VOL/VOL
            INITIAL SOIL WATER CONTENT     =      0.2120 VOL/VOL
            EFFECTIVE SAT. HYD. COND.      =  0.100000005000E-02 CM/SEC


                                 LAYER  5
                                 --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   9
            THICKNESS                      =      6.00   INCHES
            POROSITY                       =      0.5010 VOL/VOL
            FIELD CAPACITY                 =      0.2840 VOL/VOL
            WILTING POINT                  =      0.1350 VOL/VOL
            INITIAL SOIL WATER CONTENT     =      0.3051 VOL/VOL
            EFFECTIVE SAT. HYD. COND.      =  0.190000006000E-03 CM/SEC


                                 LAYER  6
                                 --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER  18
            THICKNESS                      =    180.00   INCHES
            POROSITY                       =      0.6710 VOL/VOL
            FIELD CAPACITY                 =      0.2920 VOL/VOL
            WILTING POINT                  =      0.0770 VOL/VOL
            INITIAL SOIL WATER CONTENT     =      0.2569 VOL/VOL
            EFFECTIVE SAT. HYD. COND.      =  0.100000005000E-02 CM/SEC


                   GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                   ----------------------------------------

            NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                      SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A
                      FAIR STAND OF GRASS, A SURFACE SLOPE OF  4.%
                      AND A SLOPE LENGTH OF  200. FEET.

            SCS RUNOFF CURVE NUMBER            =     70.50
            FRACTION OF AREA ALLOWING RUNOFF   =    100.0     PERCENT
            AREA PROJECTED ON HORIZONTAL PLANE =      1.000   ACRES
```

```
      EVAPORATIVE ZONE DEPTH                 =    12.0    INCHES
      INITIAL WATER IN EVAPORATIVE ZONE      =     5.010  INCHES
      UPPER LIMIT OF EVAPORATIVE STORAGE     =     5.460  INCHES
      LOWER LIMIT OF EVAPORATIVE STORAGE     =     0.858  INCHES
      INITIAL SNOW WATER                     =     0.000  INCHES
      INITIAL WATER IN LAYER MATERIALS       =    57.088  INCHES
      TOTAL INITIAL WATER                    =    57.088  INCHES
      TOTAL SUBSURFACE INFLOW                =     0.00   INCHES/YEAR


                 EVAPOTRANSPIRATION AND WEATHER DATA
                 -----------------------------------

        NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                 NEW HAVEN          CONNECTICUT

            MAXIMUM LEAF AREA INDEX                    =  2.00
            START OF GROWING SEASON (JULIAN DATE)      =    83
            END OF GROWING SEASON (JULIAN DATE)        =   296
            AVERAGE ANNUAL WIND SPEED                  = 12.00 MPH
            AVERAGE 1ST QUARTER RELATIVE HUMIDITY      = 65.00 %
            AVERAGE 2ND QUARTER RELATIVE HUMIDITY      = 69.00 %
            AVERAGE 3RD QUARTER RELATIVE HUMIDITY      = 74.00 %
            AVERAGE 4TH QUARTER RELATIVE HUMIDITY      = 70.00 %


        NOTE:  PRECIPITATION DATA FOR    NEW HAVEN                CONNECTICUT

                 WAS ENTERED FROM THE DEFAULT DATA FILE.


        NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                 COEFFICIENTS FOR     NEW HAVEN           CONNECTICUT

                 NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

      JAN/JUL      FEB/AUG      MAR/SEP      APR/OCT      MAY/NOV      JUN/DEC
      -------      -------      -------      -------      -------      -------
       35.20        32.60        42.20        49.50        63.10        69.00
       78.30        78.50        69.80        55.30        44.80        32.00


        NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                 COEFFICIENTS FOR     NEW HAVEN           CONNECTICUT

                       STATION LATITUDE   = 41.30 DEGREES
```

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR 1977
-------------------------------------------------------------------------------

                             JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                             -------  -------  -------  -------  -------  -------

 PRECIPITATION                 2.44     2.89     6.35     4.89     3.92     5.02
                               1.26     4.01     6.23     6.25     6.14     6.58

 RUNOFF                       0.567    0.000    3.335    1.784    0.733    0.000
                              0.000    0.000    0.000    1.915    2.810    5.099

 EVAPOTRANSPIRATION           1.664    1.655    2.723    3.101    3.500    6.131
                              1.666    3.582    2.422    3.097    1.817    1.038

 LATERAL DRAINAGE COLLECTED  0.3581   0.2280   0.3686   0.2839   0.2498   0.1638
   FROM LAYER  2             0.0986   0.0881   0.1324   0.3659   0.3685   0.4067

 PERCOLATION THROUGH         0.4529   0.3405   0.4603   0.3933   0.3743   0.2774
   LAYER  3                  0.1696   0.1509   0.2106   0.4584   0.4537   0.4871

 PERCOLATION THROUGH         0.5149   0.4586   0.4995   0.4784   0.4885   0.4644
   LAYER  6                  0.4690   0.4534   0.4222   0.4072   0.3824   0.3747

-------------------------------------------------------------------------------
               MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

 AVERAGE DAILY HEAD ON       16.274   13.466   16.546   14.553   13.358   10.040
   LAYER  3                   5.555    4.842    7.383   16.475   16.854   17.524

 STD. DEVIATION OF DAILY      0.982    0.967    0.880    1.761    1.665    2.099
   HEAD ON LAYER  3           0.241    0.208    3.508    1.063    1.172    0.336

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                       ANNUAL TOTALS FOR YEAR 1977
```

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-------------------------------------------------------------------------
                                        INCHES      CU. FEET     PERCENT
                                       --------    ----------    -------
  PRECIPITATION                          55.98      203207.344    100.00

  RUNOFF                                 16.242      58957.832     29.01

  EVAPOTRANSPIRATION                     32.397     117601.469     57.87

  DRAINAGE COLLECTED FROM LAYER  2        3.1124     11297.990      5.56

  PERC./LEAKAGE THROUGH LAYER  3          4.229248   15352.169      7.55

  AVG. HEAD ON TOP OF LAYER  3           12.7391

  PERC./LEAKAGE THROUGH LAYER  6          5.413152   19649.740      9.67

  CHANGE IN WATER STORAGE                -1.184      -4299.603     -2.12

  SOIL WATER AT START OF YEAR            57.874     210081.078

  SOIL WATER AT END OF YEAR              56.689     205781.469

  SNOW WATER AT START OF YEAR             0.000          0.000      0.00

  SNOW WATER AT END OF YEAR               0.000          0.000      0.00

  ANNUAL WATER BUDGET BALANCE             0.0000        -0.087      0.00

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                 MONTHLY TOTALS (IN INCHES) FOR YEAR 1978
-------------------------------------------------------------------------
                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

 PRECIPITATION                    9.61    1.34    3.90    1.76    7.65    1.35
                                  4.69    4.18    4.02    2.57    3.72    6.05

 RUNOFF                          7.213   0.833   0.830   0.000   1.058   0.000
                                 0.000   0.000   0.000   0.000   0.000   2.657

 EVAPOTRANSPIRATION              1.075   1.494   1.997   2.769   5.149   4.077
```

```
                                     4.227   4.095   3.248   2.468   1.063   0.750

 LATERAL DRAINAGE COLLECTED          0.3931  0.1226  0.1672  0.2401  0.2830  0.1572
   FROM LAYER  2                     0.0976  0.0994  0.0975  0.1037  0.0905  0.2195

 PERCOLATION THROUGH                 0.4776  0.1885  0.2572  0.3618  0.3962  0.2663
   LAYER  3                          0.1678  0.1711  0.1677  0.1786  0.1554  0.3293

 PERCOLATION THROUGH                 0.3450  0.3191  0.4116  0.3955  0.4034  0.3799
   LAYER  6                          0.4030  0.3911  0.3629  0.3610  0.3365  0.3399

-------------------------------------------------------------------------------
                MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

 AVERAGE DAILY HEAD ON               17.176   7.027   8.886  13.348  14.165   9.598
   LAYER  3                           5.484   5.614   5.696   5.899   5.210  11.641

 STD. DEVIATION OF DAILY              0.677   3.781   4.579   1.117   2.265   2.406
   HEAD ON LAYER  3                   0.227   0.693   0.271   0.462   0.573   3.381
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                      ANNUAL TOTALS FOR YEAR 1978
-------------------------------------------------------------------------------
                                          INCHES         CU. FEET     PERCENT
                                         --------       ----------    -------
   PRECIPITATION                           50.84        184549.234    100.00

   RUNOFF                                  12.591        45704.781     24.77

   EVAPOTRANSPIRATION                      32.412       117654.500     63.75

   DRAINAGE COLLECTED FROM LAYER  2         2.0712        7518.554      4.07

   PERC./LEAKAGE THROUGH LAYER  3           3.117498     11316.518      6.13

   AVG. HEAD ON TOP OF LAYER  3             9.1453

   PERC./LEAKAGE THROUGH LAYER  6           4.449034     16149.992      8.75

   CHANGE IN WATER STORAGE                 -0.683        -2478.641     -1.34

   SOIL WATER AT START OF YEAR             56.689       205781.469
```

```
  SOIL WATER AT END OF YEAR              55.743      202345.641

  SNOW WATER AT START OF YEAR             0.000           0.000       0.00

  SNOW WATER AT END OF YEAR               0.264         957.192       0.52

  ANNUAL WATER BUDGET BALANCE             0.0000          0.038       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR 1979
-------------------------------------------------------------------------------

                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

 PRECIPITATION                 14.58    2.57    4.99    5.35    4.67    2.95
                                0.55    5.35    4.55    4.25    2.25    3.65

 RUNOFF                        13.093   0.145   3.596   0.354   0.000   0.000
                                0.000   0.039   0.000   0.056   0.000   1.277

 EVAPOTRANSPIRATION             1.502   1.505   2.346   3.173   4.755   5.539
                                0.903   3.371   2.796   3.207   1.559   0.718

 LATERAL DRAINAGE COLLECTED    0.2425  0.2750  0.3439  0.2208  0.2653  0.1562
   FROM LAYER  2               0.0976  0.1267  0.1411  0.3082  0.2700  0.1637

 PERCOLATION THROUGH           0.3190  0.3745  0.4426  0.3465  0.3863  0.2647
   LAYER  3                    0.1679  0.2182  0.2423  0.4168  0.3836  0.2717

 PERCOLATION THROUGH           0.3192  0.2992  0.3009  0.2508  0.2562  0.3117
   LAYER  6                    0.3307  0.3508  0.3321  0.3300  0.3070  0.2885

-------------------------------------------------------------------------------
              MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 AVERAGE DAILY HEAD ON         11.189  14.861  15.887  12.747  13.811   9.535
   LAYER  3                     5.489   7.423   8.649  14.936  14.187   9.458

 STD. DEVIATION OF DAILY        5.930   1.262   1.712   1.557   1.295   2.317
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HEAD ON LAYER  3                           0.239   2.037   2.075   1.789   1.093   3.288
***************************************************************************************


***************************************************************************************
                               ANNUAL TOTALS FOR YEAR 1979
---------------------------------------------------------------------------------------
                                              INCHES            CU. FEET      PERCENT
                                             --------          ----------     -------
  PRECIPITATION                               55.71            202227.234     100.00

  RUNOFF                                      18.561            67377.602      33.32

  EVAPOTRANSPIRATION                          31.374           113888.500      56.32

  DRAINAGE COLLECTED FROM LAYER  2             2.6109             9477.539      4.69

  PERC./LEAKAGE THROUGH LAYER  3               3.833938         13917.193      6.88

  AVG. HEAD ON TOP OF LAYER  3                11.5143

  PERC./LEAKAGE THROUGH LAYER  6               3.677181         13348.167      6.60

  CHANGE IN WATER STORAGE                     -0.514            -1864.512     -0.92

  SOIL WATER AT START OF YEAR                 55.743           202345.641

  SOIL WATER AT END OF YEAR                   55.493           201438.312

  SNOW WATER AT START OF YEAR                  0.264               957.192      0.47

  SNOW WATER AT END OF YEAR                    0.000                 0.000      0.00

  ANNUAL WATER BUDGET BALANCE                  0.0000               -0.058      0.00

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                     MONTHLY TOTALS (IN INCHES) FOR YEAR 1980
---------------------------------------------------------------------------------------
                                   JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
```

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                                   -------  -------  -------  -------  -------  -------

 PRECIPITATION                      1.35     1.15    10.65     6.60     2.05     2.60
                                    7.30     1.22     1.70     3.06     4.98     1.04

 RUNOFF                            0.448    0.253    5.304    3.113    0.000    0.000
                                   0.615    0.000    0.000    0.000    0.000    0.012

 EVAPOTRANSPIRATION                1.446    1.670    2.266    3.209    4.162    2.800
                                   3.763    3.507    2.200    2.117    1.315    0.930

 LATERAL DRAINAGE COLLECTED       0.0964   0.1145   0.3084   0.3107   0.2152   0.1209
   FROM LAYER  2                  0.1070   0.1838   0.1156   0.0989   0.1124   0.2457

 PERCOLATION THROUGH              0.1654   0.1956   0.4103   0.4123   0.3453   0.2086
   LAYER  3                       0.1770   0.2984   0.2000   0.1701   0.1832   0.3373

 PERCOLATION THROUGH              0.2896   0.3100   0.3286   0.3238   0.2593   0.2158
   LAYER  6                       0.3368   0.3355   0.3180   0.3252   0.3082   0.3102

-------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

 AVERAGE DAILY HEAD ON             5.199    7.359   14.673   15.275   12.269    7.319
   LAYER  3                        5.832   10.483    6.976    5.572    6.307   11.914

 STD. DEVIATION OF DAILY           0.236    3.252    3.062    2.079    1.382    1.545
   HEAD ON LAYER  3                2.203    2.239    0.737    0.240    3.015    4.793

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                        ANNUAL TOTALS FOR YEAR 1980
-------------------------------------------------------------------------------
                                        INCHES           CU. FEET      PERCENT
                                       --------         ----------     -------
   PRECIPITATION                        43.70           158630.984     100.00

   RUNOFF                                9.746           35377.988      22.30

   EVAPOTRANSPIRATION                   29.384          106664.141      67.24

   DRAINAGE COLLECTED FROM LAYER  2      2.0294           7366.639       4.64

   PERC./LEAKAGE THROUGH LAYER  3        3.103532        11265.819       7.10
```

```
AVG. HEAD ON TOP OF LAYER  3              9.0982

PERC./LEAKAGE THROUGH LAYER  6            3.660923         13289.152        8.38

CHANGE IN WATER STORAGE                  -1.120           -4066.939        -2.56

SOIL WATER AT START OF YEAR              55.493          201438.312

SOIL WATER AT END OF YEAR                54.372          197371.375

SNOW WATER AT START OF YEAR               0.000               0.000         0.00

SNOW WATER AT END OF YEAR                 0.000               0.000         0.00

ANNUAL WATER BUDGET BALANCE               0.0000              0.012         0.00

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                MONTHLY TOTALS (IN INCHES) FOR YEAR 1981
-------------------------------------------------------------------------------

                             JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                             -------  -------  -------  -------  -------  -------

PRECIPITATION                  0.63     6.40     1.05     3.85     3.41     1.55
                               5.62     0.37     3.33     7.66     2.25     6.18

RUNOFF                         0.108    3.469    0.005    0.000    0.000    0.000
                               0.208    0.000    0.000    0.475    0.137    3.573

EVAPOTRANSPIRATION             1.448    1.350    2.052    3.244    3.592    2.982
                               5.058    0.362    3.089    2.137    1.761    1.164

LATERAL DRAINAGE COLLECTED     0.1516   0.0864   0.1523   0.1947   0.1610   0.1182
  FROM LAYER  2                0.1399   0.0951   0.0874   0.1524   0.3488   0.3764

PERCOLATION THROUGH            0.2434   0.1484   0.2607   0.3180   0.2771   0.2044
  LAYER  3                     0.2344   0.1634   0.1499   0.2201   0.4399   0.4658

PERCOLATION THROUGH            0.2735   0.2768   0.3045   0.2835   0.2976   0.2490
  LAYER  6                     0.2957   0.2919   0.2794   0.2810   0.2678   0.2872
```

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-------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON                8.373    5.351    9.050   11.639    9.679    7.150
   LAYER  3                          8.033    5.319    4.996    7.454   16.339   16.748

STD. DEVIATION OF DAILY              3.593    0.212    2.783    1.380    0.616    0.943
   HEAD ON LAYER  3                  2.825    0.233    0.213    5.046    0.675    0.766
***********************************************************************************


***********************************************************************************
                       ANNUAL TOTALS FOR YEAR 1981
-------------------------------------------------------------------------------
                                         INCHES         CU. FEET      PERCENT
                                        --------      ----------     -------
  PRECIPITATION                           42.30        153549.016     100.00

  RUNOFF                                   7.976        28952.348      18.86

  EVAPOTRANSPIRATION                      28.239       102506.344      66.76

  DRAINAGE COLLECTED FROM LAYER  2         2.0642        7493.008       4.88

  PERC./LEAKAGE THROUGH LAYER  3           3.125624     11346.017       7.39

  AVG. HEAD ON TOP OF LAYER  3             9.1775

  PERC./LEAKAGE THROUGH LAYER  6           3.388043     12298.596       8.01

  CHANGE IN WATER STORAGE                  0.633         2298.729       1.50

  SOIL WATER AT START OF YEAR             54.372       197371.375

  SOIL WATER AT END OF YEAR               55.006       199670.109

  SNOW WATER AT START OF YEAR              0.000            0.000       0.00

  SNOW WATER AT END OF YEAR                0.000            0.000       0.00

  ANNUAL WATER BUDGET BALANCE              0.0000          -0.016       0.00

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          AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------------

                          JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                          -------  -------  -------  -------  -------  -------

 PRECIPITATION
 -------------

   TOTALS                   5.72     2.87     5.39     4.49     4.34     2.69
                            3.88     3.03     3.97     4.76     3.87     4.70

   STD. DEVIATIONS          6.11     2.11     3.53     1.82     2.08     1.47
                            2.89     2.12     1.66     2.16     1.71     2.35

 RUNOFF
 ------

   TOTALS                  4.286    0.940    2.614    1.050    0.358    0.000
                           0.165    0.008    0.000    0.489    0.590    2.524

   STD. DEVIATIONS         5.748    1.449    2.163    1.368    0.504    0.000
                           0.268    0.017    0.000    0.822    1.243    1.976

 EVAPOTRANSPIRATION
 ------------------

   TOTALS                  1.427    1.535    2.277    3.099    4.232    4.306
                           3.123    2.983    2.751    2.605    1.503    0.920

   STD. DEVIATIONS         0.216    0.132    0.289    0.192    0.718    1.494
                           1.762    1.491    0.440    0.520    0.315    0.189

 LATERAL DRAINAGE COLLECTED FROM LAYER  2
 ----------------------------------------

   TOTALS                 0.2483   0.1653   0.2681   0.2500   0.2349   0.1433
                          0.1081   0.1186   0.1148   0.2058   0.2380   0.2824

   STD. DEVIATIONS        0.1279   0.0815   0.1013   0.0470   0.0482   0.0218
                          0.0182   0.0393   0.0227   0.1233   0.1303   0.1045

 PERCOLATION/LEAKAGE THROUGH LAYER  3
 ------------------------------------

   TOTALS                 0.3317   0.2495   0.3662   0.3664   0.3558   0.2443
                          0.1833   0.2004   0.1941   0.2888   0.3232   0.3782

   STD. DEVIATIONS        0.1338   0.1009   0.0995   0.0374   0.0480   0.0348
                          0.0288   0.0604   0.0363   0.1379   0.1432   0.0935

 PERCOLATION/LEAKAGE THROUGH LAYER  6
```

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 -------------------------------------------------------------------------
  TOTALS                          0.3484    0.3328    0.3690    0.3464    0.3410    0.3242
                                  0.3671    0.3645    0.3429    0.3409    0.3204    0.3201

  STD. DEVIATIONS                 0.0970    0.0721    0.0856    0.0914    0.1017    0.1004
                                  0.0689    0.0611    0.0535    0.0468    0.0424    0.0372

-------------------------------------------------------------------------------
       AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 DAILY AVERAGE HEAD ACROSS LAYER  3
 -------------------------------------
   AVERAGES                      11.6422    9.6127   13.0085   13.5123   12.6566    8.7282
                                  6.0787    6.7361    6.7399   10.0671   11.7796   13.4568

   STD. DEVIATIONS                5.1111    4.2521    3.7497    1.4417    1.8109    1.3785
                                  1.1020    2.3111    1.4360    5.2244    5.5999    3.5014

*******************************************************************************


*******************************************************************************

      AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------------
                                       INCHES             CU. FEET        PERCENT
                                  -------------------   -------------    ---------
 PRECIPITATION                     49.71     (    6.473)    180432.7       100.00

 RUNOFF                            13.023    (  4.3998)      47274.11       26.200

 EVAPOTRANSPIRATION                30.761    (  1.8732)     111662.99       61.886

 LATERAL DRAINAGE COLLECTED         2.37762 (  0.47637)       8630.747      4.78336
   FROM LAYER  2

 PERCOLATION/LEAKAGE THROUGH        3.48197 (  0.52090)      12639.544      7.00513
   FROM LAYER  3

 AVERAGE HEAD ACROSS TOP           10.335 (     1.692)
   OF LAYER  3

 PERCOLATION/LEAKAGE THROUGH        4.11767 (  0.82509)      14947.130      8.28404
   FROM LAYER  6

 CHANGE IN WATER STORAGE           -0.574    (  0.7321)       -2082.19      -1.154
```

```
********************************************************************************
```

```
*******************************************************************************

              PEAK DAILY VALUES FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------    -------------
    PRECIPITATION                                 5.20        18876.000

    RUNOFF                                        4.617       16761.4238

    DRAINAGE COLLECTED FROM LAYER  2              0.01373        49.83303

    PERCOLATION/LEAKAGE THROUGH LAYER  3          0.016139       58.58405

    AVERAGE HEAD ACROSS LAYER  3                 18.000

    PERCOLATION/LEAKAGE THROUGH LAYER  6          0.019714       71.56209

    SNOW WATER                                    3.68        13344.2305


    MAXIMUM VEG. SOIL WATER (VOL/VOL)                      0.4550

    MINIMUM VEG. SOIL WATER (VOL/VOL)                      0.0399
*******************************************************************************
```

```
*******************************************************************************

           FINAL WATER STORAGE AT END OF YEAR 1981
    ----------------------------------------------------------------------
                LAYER          (INCHES)          (VOL/VOL)
                -----          --------          ---------
                  1             2.5782             0.4297

                  2             5.4839             0.4570

                  3             0.0000             0.0000

                  4             1.2711             0.2118

                  5             1.8201             0.3034
```

```
            6              43.0662          0.2393

        SNOW WATER          0.000
**************************************************************************
**************************************************************************
```

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**                                                                          **
**             HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**              HELP MODEL VERSION 3.01   (14 OCTOBER 1994)                 **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP3\FISHER.D4
TEMPERATURE DATA FILE:        C:\HELP3\FISHER.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\FISHER.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\FISHER.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\FIL33N12.D10
OUTPUT DATA FILE:             C:\HELP3\FIL33N12.OUT


TIME:  17:56     DATE:  10/21/1998


******************************************************************************

     TITLE:  FISHERS ISLAND LANDFILL,EVAP ZONE12",33%SLOPE,NO GEOCOMPOSIT

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
             COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                 LAYER  1
                                 --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   6
            THICKNESS                  =       6.00   INCHES
            POROSITY                   =       0.4530 VOL/VOL
```

```
FIELD CAPACITY                    =       0.1900 VOL/VOL
WILTING POINT                     =       0.0850 VOL/VOL
INITIAL SOIL WATER CONTENT        =       0.1607 VOL/VOL
EFFECTIVE SAT. HYD. COND.         =   0.720000011000E-03 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
       FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                          LAYER  2
                          --------

                TYPE 2 - LATERAL DRAINAGE LAYER
                 MATERIAL TEXTURE NUMBER   5
THICKNESS                         =      12.00    INCHES
POROSITY                          =       0.4570 VOL/VOL
FIELD CAPACITY                    =       0.1310 VOL/VOL
WILTING POINT                     =       0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT        =       0.2061 VOL/VOL
EFFECTIVE SAT. HYD. COND.         =   0.100000005000E-02 CM/SEC
SLOPE                             =      33.00    PERCENT
DRAINAGE LENGTH                   =      18.0     FEET


                          LAYER  3
                          --------

                TYPE 4 - FLEXIBLE MEMBRANE LINER
                 MATERIAL TEXTURE NUMBER  35
THICKNESS                         =       0.06    INCHES
POROSITY                          =       0.0000 VOL/VOL
FIELD CAPACITY                    =       0.0000 VOL/VOL
WILTING POINT                     =       0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT        =       0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.         =   0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY               =       1.00    HOLES/ACRE
FML INSTALLATION DEFECTS          =       3.00    HOLES/ACRE
FML PLACEMENT QUALITY             =   3 - GOOD


                          LAYER  4
                          --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                 MATERIAL TEXTURE NUMBER   5
THICKNESS                         =       6.00    INCHES
```

```
          POROSITY                          =   0.4570 VOL/VOL
          FIELD CAPACITY                    =   0.1310 VOL/VOL
          WILTING POINT                     =   0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT        =   0.1718 VOL/VOL
          EFFECTIVE SAT. HYD. COND.         = 0.100000005000E-02 CM/SEC


                            LAYER  5
                            --------

                 TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER  9
          THICKNESS                         =   6.00   INCHES
          POROSITY                          =   0.5010 VOL/VOL
          FIELD CAPACITY                    =   0.2840 VOL/VOL
          WILTING POINT                     =   0.1350 VOL/VOL
          INITIAL SOIL WATER CONTENT        =   0.2596 VOL/VOL
          EFFECTIVE SAT. HYD. COND.         = 0.190000006000E-03 CM/SEC


                            LAYER  6
                            --------

                 TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER 18
          THICKNESS                         = 180.00   INCHES
          POROSITY                          =   0.6710 VOL/VOL
          FIELD CAPACITY                    =   0.2920 VOL/VOL
          WILTING POINT                     =   0.0770 VOL/VOL
          INITIAL SOIL WATER CONTENT        =   0.2463 VOL/VOL
          EFFECTIVE SAT. HYD. COND.         = 0.100000005000E-02 CM/SEC


               GENERAL DESIGN AND EVAPORATIVE ZONE DATA
               ----------------------------------------

          NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                 SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A
                 FAIR STAND OF GRASS, A SURFACE SLOPE OF 33.%
                 AND A SLOPE LENGTH OF   18. FEET.

          SCS RUNOFF CURVE NUMBER               =    76.20
          FRACTION OF AREA ALLOWING RUNOFF      =   100.0    PERCENT
          AREA PROJECTED ON HORIZONTAL PLANE    =    1.000   ACRES
```

```
       EVAPORATIVE ZONE DEPTH                     =    12.0    INCHES
       INITIAL WATER IN EVAPORATIVE ZONE          =     2.260  INCHES
       UPPER LIMIT OF EVAPORATIVE STORAGE         =     5.460  INCHES
       LOWER LIMIT OF EVAPORATIVE STORAGE         =     0.858  INCHES
       INITIAL SNOW WATER                         =     0.000  INCHES
       INITIAL WATER IN LAYER MATERIALS           =    50.353  INCHES
       TOTAL INITIAL WATER                        =    50.353  INCHES
       TOTAL SUBSURFACE INFLOW                    =     0.00   INCHES/YEAR


                   EVAPOTRANSPIRATION AND WEATHER DATA
                   -----------------------------------

     NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
              NEW HAVEN            CONNECTICUT

           MAXIMUM LEAF AREA INDEX                    =  2.00
           START OF GROWING SEASON (JULIAN DATE)      =    83
           END OF GROWING SEASON (JULIAN DATE)        =   296
           AVERAGE ANNUAL WIND SPEED                  = 12.00 MPH
           AVERAGE 1ST QUARTER RELATIVE HUMIDITY      = 65.00 %
           AVERAGE 2ND QUARTER RELATIVE HUMIDITY      = 69.00 %
           AVERAGE 3RD QUARTER RELATIVE HUMIDITY      = 74.00 %
           AVERAGE 4TH QUARTER RELATIVE HUMIDITY      = 70.00 %


     NOTE:  PRECIPITATION DATA FOR     NEW HAVEN                 CONNECTICUT

              WAS ENTERED FROM THE DEFAULT DATA FILE.


     NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
              COEFFICIENTS FOR     NEW HAVEN            CONNECTICUT

            NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

       JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
       -------     -------     -------     -------     -------     -------
        35.20       32.60       42.20       49.50       63.10       69.00
        78.30       78.50       69.80       55.30       44.80       32.00


     NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
              COEFFICIENTS FOR     NEW HAVEN            CONNECTICUT

                   STATION LATITUDE    = 41.30 DEGREES
```

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                   MONTHLY TOTALS (IN INCHES) FOR YEAR 1977
-------------------------------------------------------------------------------

                                  JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                                  -------  -------  -------  -------  -------  -------

 PRECIPITATION                     2.44     2.89     6.35     4.89     3.92     5.02
                                   1.26     4.01     6.23     6.25     6.14     6.58

 RUNOFF                            0.000    0.000    0.061    0.186    0.037    0.000
                                   0.000    0.000    0.008    0.040    0.007    0.133

 EVAPOTRANSPIRATION                1.727    1.532    2.767    2.824    3.284    3.979
                                   1.625    3.956    2.356    3.183    1.996    1.094

 LATERAL DRAINAGE COLLECTED        1.5737   0.4096   3.9417   2.6363   1.2917   0.3207
   FROM LAYER  2                   0.0047   0.0458   1.9336   3.8171   2.8006   6.0712

 PERCOLATION THROUGH               0.0256   0.0088   0.0513   0.0357   0.0203   0.0066
   LAYER  3                        0.0002   0.0012   0.0255   0.0514   0.0388   0.0746

 PERCOLATION THROUGH               0.3642   0.3065   0.3277   0.2957   0.2936   0.2703
   LAYER  6                        0.2666   0.2526   0.2353   0.2354   0.2168   0.2159

-------------------------------------------------------------------------------
               MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

 AVERAGE DAILY HEAD ON             0.542    0.156    1.357    0.938    0.445    0.114
   LAYER  3                        0.002    0.016    0.688    1.314    0.996    2.089

 STD. DEVIATION OF DAILY           0.279    0.079    0.907    1.032    0.470    0.162
   HEAD ON LAYER  3                0.003    0.053    1.065    0.636    0.745    0.990

*******************************************************************************

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                     ANNUAL TOTALS FOR YEAR 1977
```

```
-------------------------------------------------------------------------------
                                        INCHES          CU. FEET      PERCENT
                                      ----------      ----------     -------
  PRECIPITATION                          55.98          203207.344    100.00

  RUNOFF                                  0.471           1710.148      0.84

  EVAPOTRANSPIRATION                     30.323         110070.812     54.17

  DRAINAGE COLLECTED FROM LAYER  2       24.8468         90193.773     44.39

  PERC./LEAKAGE THROUGH LAYER  3          0.340227        1235.024      0.61

  AVG. HEAD ON TOP OF LAYER  3            0.7212

  PERC./LEAKAGE THROUGH LAYER  6          3.280490       11908.179      5.86

  CHANGE IN WATER STORAGE                -2.941         -10675.532     -5.25

  SOIL WATER AT START OF YEAR            51.139         185635.578

  SOIL WATER AT END OF YEAR              48.198         174960.047

  SNOW WATER AT START OF YEAR             0.000              0.000      0.00

  SNOW WATER AT END OF YEAR               0.000              0.000      0.00

  ANNUAL WATER BUDGET BALANCE             0.0000            -0.038      0.00

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                    MONTHLY TOTALS (IN INCHES) FOR YEAR 1978
-------------------------------------------------------------------------------

                              JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                              -------  -------  -------  -------  -------  -------

  PRECIPITATION                 9.61     1.34     3.90     1.76     7.65     1.35
                                4.69     4.18     4.02     2.57     3.72     6.05

  RUNOFF                        0.786    0.382    0.211    0.000    0.034    0.000
                                0.000    0.008    0.007    0.000    0.000    1.538

  EVAPOTRANSPIRATION            1.104    1.534    2.388    2.581    4.942    1.417
```

```
                                   4.201    4.083    3.249    2.305    1.109    0.787

 LATERAL DRAINAGE COLLECTED        6.1799   1.3854   0.8221   0.9093   1.9772   0.5212
   FROM LAYER  2                   0.0055   0.5770   0.2239   0.3731   0.1789   3.0884

 PERCOLATION THROUGH               0.0834   0.0191   0.0114   0.0146   0.0276   0.0088
   LAYER  3                        0.0003   0.0102   0.0048   0.0076   0.0029   0.0429

 PERCOLATION THROUGH               0.2044   0.1801   0.1928   0.1819   0.1843   0.1731
   LAYER  6                        0.1727   0.1680   0.1590   0.1597   0.1477   0.1506

-------------------------------------------------------------------------------
                 MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

 AVERAGE DAILY HEAD ON              2.596    0.528    0.283    0.323    0.680    0.185
   LAYER  3                         0.002    0.199    0.080    0.128    0.064    1.063

 STD. DEVIATION OF DAILY            3.064    0.886    0.658    0.415    0.686    0.343
   HEAD ON LAYER  3                 0.003    0.262    0.111    0.163    0.215    0.624
*******************************************************************************


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                         ANNUAL TOTALS FOR YEAR 1978
-------------------------------------------------------------------------------
                                            INCHES          CU. FEET      PERCENT
                                           --------        ----------     -------
   PRECIPITATION                            50.84          184549.234     100.00

   RUNOFF                                    2.965          10763.900       5.83

   EVAPOTRANSPIRATION                       29.701         107814.094      58.42

   DRAINAGE COLLECTED FROM LAYER  2         16.2419         58958.059      31.95

   PERC./LEAKAGE THROUGH LAYER  3            0.233402         847.249       0.46

   AVG. HEAD ON TOP OF LAYER  3              0.5109

   PERC./LEAKAGE THROUGH LAYER  6            2.074325        7529.800       4.08

   CHANGE IN WATER STORAGE                  -0.142           -516.707      -0.28

   SOIL WATER AT START OF YEAR              48.198         174960.047
```

```
    SOIL WATER AT END OF YEAR              47.792      173486.156

    SNOW WATER AT START OF YEAR             0.000           0.000       0.00

    SNOW WATER AT END OF YEAR               0.264         957.192       0.52

    ANNUAL WATER BUDGET BALANCE             0.0000          0.083       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR 1979
 ------------------------------------------------------------------------------

                                  JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                                  -------  -------  -------  -------  -------  -------

  PRECIPITATION                    14.58     2.57     4.99     5.35     4.67     2.95
                                    0.55     5.35     4.55     4.25     2.25     3.65

  RUNOFF                            6.973    0.000    0.210    0.175    0.000    0.000
                                    0.000    0.176    0.029    0.011    0.000    1.013

  EVAPOTRANSPIRATION                1.584    1.568    2.411    2.831    4.496    3.032
                                    0.977    3.613    2.070    3.152    1.459    0.717

  LATERAL DRAINAGE COLLECTED        7.0534   1.3140   4.3434   0.4856   1.0830   0.4808
    FROM LAYER  2                   0.0001   1.2069   1.2922   2.3222   0.2079   0.3201

  PERCOLATION THROUGH               0.1059   0.0206   0.0538   0.0074   0.0178   0.0085
    LAYER  3                        0.0000   0.0184   0.0185   0.0343   0.0050   0.0068

  PERCOLATION THROUGH               0.1452   0.1290   0.1367   0.1309   0.1316   0.1247
    LAYER  6                        0.1264   0.1249   0.1185   0.1199   0.1122   0.1150

 ------------------------------------------------------------------------------
                MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
 ------------------------------------------------------------------------------

  AVERAGE DAILY HEAD ON             3.563    0.501    1.495    0.173    0.373    0.171
    LAYER  3                        0.000    0.415    0.460    0.799    0.074    0.110

  STD. DEVIATION OF DAILY           4.776    0.591    1.846    0.442    0.384    0.273
```

```
    HEAD ON LAYER  3                0.000   0.489   0.699   0.592   0.067   0.119
  ******************************************************************************


  ******************************************************************************

                           ANNUAL TOTALS FOR YEAR 1979
  ------------------------------------------------------------------------------
                                            INCHES          CU. FEET     PERCENT
                                           --------        ----------    -------
    PRECIPITATION                            55.71         202227.234    100.00

    RUNOFF                                   8.587          31170.789     15.41

    EVAPOTRANSPIRATION                      27.910         101312.367     50.10

    DRAINAGE COLLECTED FROM LAYER  2        20.1094         72996.984     36.10

    PERC./LEAKAGE THROUGH LAYER  3          0.297037         1078.244      0.53

    AVG. HEAD ON TOP OF LAYER  3            0.6778

    PERC./LEAKAGE THROUGH LAYER  6          1.514903         5499.099      2.72

    CHANGE IN WATER STORAGE                 -2.411          -8751.948     -4.33

    SOIL WATER AT START OF YEAR             47.792         173486.156

    SOIL WATER AT END OF YEAR               45.645         165691.391

    SNOW WATER AT START OF YEAR              0.264            957.192      0.47

    SNOW WATER AT END OF YEAR                0.000              0.000      0.00

    ANNUAL WATER BUDGET BALANCE              0.0000            -0.045      0.00

  ******************************************************************************



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                   MONTHLY TOTALS (IN INCHES) FOR YEAR 1980
  ------------------------------------------------------------------------------

                               JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
```

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                                  -------  -------  -------  -------  -------  -------

PRECIPITATION                      1.35     1.15    10.65     6.60     2.05     2.60
                                   7.30     1.22     1.70     3.06     4.98     1.04

RUNOFF                             0.305    0.214    0.315    0.290    0.000    0.000
                                   1.066    0.000    0.000    0.000    0.029    0.000

EVAPOTRANSPIRATION                 1.443    1.720    2.319    2.949    3.484    1.214
                                   3.848    2.595    1.534    2.118    1.637    1.061

LATERAL DRAINAGE COLLECTED         0.0002   0.0190   6.0800   4.5923   0.4256   0.0002
  FROM LAYER  2                    0.7521   1.5982   0.0018   0.0077   1.2184   1.6791

PERCOLATION THROUGH                0.0000   0.0006   0.0813   0.0575   0.0081   0.0000
  LAYER  3                         0.0088   0.0226   0.0001   0.0004   0.0152   0.0245

PERCOLATION THROUGH                0.1155   0.0993   0.1070   0.1026   0.1037   0.0972
  LAYER  6                         0.0993   0.0976   0.0936   0.0956   0.0905   0.0925

-------------------------------------------------------------------------------
                 MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON               0.000    0.007    2.522    1.633    0.146    0.000
  LAYER  3                          0.259    0.550    0.001    0.003    0.433    0.578

STD. DEVIATION OF DAILY             0.000    0.017    2.978    1.319    0.214    0.000
  HEAD ON LAYER  3                  0.975    0.822    0.001    0.004    1.020    0.759

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                      ANNUAL TOTALS FOR YEAR 1980
-------------------------------------------------------------------------------
                                          INCHES       CU. FEET     PERCENT
                                         --------     ----------    -------
  PRECIPITATION                           43.70       158630.984    100.00

  RUNOFF                                   2.218        8051.843      5.08

  EVAPOTRANSPIRATION                      25.923       94102.102     59.32

  DRAINAGE COLLECTED FROM LAYER  2        16.3745      59439.590     37.47

  PERC./LEAKAGE THROUGH LAYER  3           0.219040      795.114      0.50
```

```
AVG. HEAD ON TOP OF LAYER  3              0.5110

PERC./LEAKAGE THROUGH LAYER  6            1.194263       4335.173      2.73

CHANGE IN WATER STORAGE                  -2.010         -7297.748     -4.60

SOIL WATER AT START OF YEAR              45.645        165691.391

SOIL WATER AT END OF YEAR                43.635        158393.641

SNOW WATER AT START OF YEAR               0.000            0.000      0.00

SNOW WATER AT END OF YEAR                 0.000            0.000      0.00

ANNUAL WATER BUDGET BALANCE               0.0000           0.027      0.00

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             MONTHLY TOTALS (IN INCHES) FOR YEAR 1981
-------------------------------------------------------------------------------

                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION                   0.63    6.40    1.05    3.85    3.41    1.55
                                5.62    0.37    3.33    7.66    2.25    6.18

RUNOFF                         0.038   3.082   0.001   0.000   0.000   0.000
                               0.451   0.000   0.000   0.499   0.000   0.065

EVAPOTRANSPIRATION             1.610   1.152   2.028   3.219   3.134   2.145
                               3.432   0.287   3.205   2.197   1.899   1.203

LATERAL DRAINAGE COLLECTED    0.0394  0.0003  0.6335  1.0309  0.0624  0.0047
  FROM LAYER  2               1.8568  0.0012  0.1260  2.4997  1.4195  3.9276

PERCOLATION THROUGH           0.0014  0.0000  0.0116  0.0172  0.0019  0.0003
  LAYER  3                    0.0255  0.0001  0.0032  0.0281  0.0226  0.0512

PERCOLATION THROUGH           0.0907  0.0814  0.0879  0.0834  0.0853  0.0800
  LAYER  6                    0.0830  0.0804  0.0763  0.0785  0.0753  0.0758
```

```
-------------------------------------------------------------------------------
                 MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON              0.014    0.000    0.218    0.367    0.021    0.002
  LAYER  3                         0.639    0.000    0.045    0.860    0.505    1.352

STD. DEVIATION OF DAILY            0.014    0.000    0.189    0.335    0.029    0.002
  HEAD ON LAYER  3                 0.882    0.001    0.057    1.753    0.469    1.027

*******************************************************************************


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                       ANNUAL TOTALS FOR YEAR 1981
-------------------------------------------------------------------------------
                                        INCHES          CU. FEET     PERCENT
                                       --------        ----------    -------
  PRECIPITATION                          42.30         153549.016    100.00

  RUNOFF                                  4.136         15012.361      9.78

  EVAPOTRANSPIRATION                     25.512         92608.555     60.31

  DRAINAGE COLLECTED FROM LAYER  2       11.6021        42115.773     27.43

  PERC./LEAKAGE THROUGH LAYER  3          0.163121        592.131      0.39

  AVG. HEAD ON TOP OF LAYER  3            0.3352

  PERC./LEAKAGE THROUGH LAYER  6          0.978032       3550.256      2.31

  CHANGE IN WATER STORAGE                 0.072           262.020      0.17

  SOIL WATER AT START OF YEAR            43.635        158393.641

  SOIL WATER AT END OF YEAR              43.707        158655.672

  SNOW WATER AT START OF YEAR             0.000             0.000      0.00

  SNOW WATER AT END OF YEAR               0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE             0.0000            0.043      0.00

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```

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          AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1977 THROUGH 1981
------------------------------------------------------------------------------

                          JAN/JUL   FEB/AUG   MAR/SEP   APR/OCT   MAY/NOV   JUN/DEC
                          -------   -------   -------   -------   -------   -------

 PRECIPITATION
 -------------
   TOTALS                   5.72      2.87      5.39      4.49      4.34      2.69
                            3.88      3.03      3.97      4.76      3.87      4.70

   STD. DEVIATIONS          6.11      2.11      3.53      1.82      2.08      1.47
                            2.89      2.12      1.66      2.16      1.71      2.35

 RUNOFF
 ------
   TOTALS                  1.620     0.735     0.160     0.130     0.014     0.000
                           0.303     0.037     0.009     0.110     0.007     0.550

   STD. DEVIATIONS         3.009     1.321     0.127     0.127     0.020     0.000
                           0.469     0.078     0.012     0.218     0.012     0.690

 EVAPOTRANSPIRATION
 ------------------
   TOTALS                  1.494     1.501     2.383     2.881     3.868     2.357
                           2.817     2.907     2.483     2.591     1.620     0.972

   STD. DEVIATIONS         0.240     0.210     0.264     0.231     0.802     1.153
                           1.428     1.577     0.741     0.530     0.356     0.209

 LATERAL DRAINAGE COLLECTED FROM LAYER  2
 ----------------------------------------
   TOTALS                 2.9693    0.6257    3.1641    1.9309    0.9680    0.2655
                          0.5238    0.6858    0.7155    1.8039    1.1651    3.0173

   STD. DEVIATIONS        3.4035    0.6813    2.3657    1.6973    0.7501    0.2516
                          0.8126    0.7061    0.8537    1.5874    1.0760    2.1924

 PERCOLATION/LEAKAGE THROUGH LAYER  3
 ------------------------------------
   TOTALS                 0.0433    0.0098    0.0419    0.0265    0.0151    0.0048
                          0.0069    0.0105    0.0104    0.0243    0.0169    0.0400

   STD. DEVIATIONS        0.0487    0.0098    0.0301    0.0202    0.0102    0.0044
                          0.0110    0.0100    0.0110    0.0206    0.0146    0.0258

 PERCOLATION/LEAKAGE THROUGH LAYER  6
```

```
-------------------------------------------
  TOTALS                   0.1840   0.1592   0.1704   0.1589   0.1597   0.1490
                           0.1496   0.1447   0.1366   0.1378   0.1285   0.1300

  STD. DEVIATIONS          0.1093   0.0904   0.0964   0.0850   0.0836   0.0764
                           0.0737   0.0688   0.0634   0.0625   0.0564   0.0556

-----------------------------------------------------------------------------
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-----------------------------------------------------------------------------


 DAILY AVERAGE HEAD ACROSS LAYER  3
 -------------------------------------------
   AVERAGES                1.3428   0.2384   1.1749   0.6867   0.3331   0.0944
                           0.1803   0.2360   0.2545   0.6209   0.4143   1.0384

   STD. DEVIATIONS         1.6364   0.2596   0.9567   0.6036   0.2582   0.0895
                           0.2797   0.2430   0.3036   0.5463   0.3827   0.7545

*****************************************************************************


*****************************************************************************

     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1977 THROUGH 1981
-----------------------------------------------------------------------------
                                    INCHES            CU. FEET      PERCENT
                              ------------------    ------------   ---------
  PRECIPITATION                 49.71     (   6.473)    180432.7     100.00

  RUNOFF                         3.675    (  3.0509)     13341.81      7.394

  EVAPOTRANSPIRATION            27.874    (  2.1632)    101181.59     56.077

  LATERAL DRAINAGE COLLECTED    17.83494 (  4.94614)     64740.840    35.88087
    FROM LAYER  2

  PERCOLATION/LEAKAGE THROUGH    0.25057 (  0.06916)       909.553     0.50410
    FROM LAYER  3

  AVERAGE HEAD ACROSS TOP        0.551 (     0.154)
    OF LAYER  3

  PERCOLATION/LEAKAGE THROUGH    1.80840 (  0.92068)      6564.501     3.63820
    FROM LAYER  6

  CHANGE IN WATER STORAGE       -1.486    (  1.3675)     -5395.98     -2.991
```

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******************************************************************************

          PEAK DAILY VALUES FOR YEARS 1977 THROUGH 1981
------------------------------------------------------------------------
                                                 (INCHES)   (CU. FT.)
                                                ----------  -------------
    PRECIPITATION                                  5.20       18876.000

    RUNOFF                                         1.423       5165.6001

    DRAINAGE COLLECTED FROM LAYER  2               0.89198     3237.87354

    PERCOLATION/LEAKAGE THROUGH LAYER  3           0.013549      49.18291

    AVERAGE HEAD ACROSS LAYER  3                  15.063

    PERCOLATION/LEAKAGE THROUGH LAYER  6           0.013987      50.77435

    SNOW WATER                                     3.68       13344.2305


    MAXIMUM VEG. SOIL WATER (VOL/VOL)                   0.4286

    MINIMUM VEG. SOIL WATER (VOL/VOL)                   0.0427

******************************************************************************
```

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              FINAL WATER STORAGE AT END OF YEAR 1981
    ----------------------------------------------------------------------
              LAYER        (INCHES)       (VOL/VOL)
              -----        --------       ---------
                1           1.2252         0.2042

                2           2.5680         0.2140

                3           0.0000         0.0000

                4           0.9429         0.1572

                5           1.4106         0.2351
```

```
                  6            36.7740          0.2043

              SNOW WATER        0.000

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```

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******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**             HELP MODEL VERSION 3.01   (14 OCTOBER 1994)                  **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY                     **
**                  USAE WATERWAYS EXPERIMENT STATION                       **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP3\FISHER.D4
TEMPERATURE DATA FILE:       C:\HELP3\FISHER.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\FISHER.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\FISHER.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\FIL33C12.D10
OUTPUT DATA FILE:            C:\HELP3\FIL33C12.OUT


TIME:  17:59     DATE:  10/21/1998


******************************************************************************

     TITLE:  FISHER ISLAND LANDFILL,EVAP ZONE 12",33% SLOPE,GEOCOMPOSITE

******************************************************************************


      NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
               COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   6
          THICKNESS                    =        6.00   INCHES
          POROSITY                     =      0.4530 VOL/VOL
```

```
   FIELD CAPACITY              =      0.1900 VOL/VOL
   WILTING POINT               =      0.0850 VOL/VOL
   INITIAL SOIL WATER CONTENT  =      0.1610 VOL/VOL
   EFFECTIVE SAT. HYD. COND.   =  0.720000011000E-03 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
       FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                               LAYER  2
                               --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   5
   THICKNESS                   =     12.00    INCHES
   POROSITY                    =      0.4570 VOL/VOL
   FIELD CAPACITY              =      0.1310 VOL/VOL
   WILTING POINT               =      0.0580 VOL/VOL
   INITIAL SOIL WATER CONTENT  =      0.1665 VOL/VOL
   EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                               LAYER  3
                               --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
                      MATERIAL TEXTURE NUMBER  34
   THICKNESS                   =      0.24    INCHES
   POROSITY                    =      0.8500 VOL/VOL
   FIELD CAPACITY              =      0.0100 VOL/VOL
   WILTING POINT               =      0.0050 VOL/VOL
   INITIAL SOIL WATER CONTENT  =      0.0115 VOL/VOL
   EFFECTIVE SAT. HYD. COND.   =    33.0000000000     CM/SEC
   SLOPE                       =     33.00    PERCENT
   DRAINAGE LENGTH             =     18.0     FEET


                               LAYER  4
                               --------

                   TYPE 4 - FLEXIBLE MEMBRANE LINER
                      MATERIAL TEXTURE NUMBER  35
   THICKNESS                   =      0.06    INCHES
   POROSITY                    =      0.0000 VOL/VOL
   FIELD CAPACITY              =      0.0000 VOL/VOL
   WILTING POINT               =      0.0000 VOL/VOL
```

```
 INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
 EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
 FML PINHOLE DENSITY          =       1.00   HOLES/ACRE
 FML INSTALLATION DEFECTS     =       3.00   HOLES/ACRE
 FML PLACEMENT QUALITY        =  3 - GOOD


                          LAYER  5
                          --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER   5
 THICKNESS                    =       6.00   INCHES
 POROSITY                     =      0.4570 VOL/VOL
 FIELD CAPACITY               =      0.1310 VOL/VOL
 WILTING POINT                =      0.0580 VOL/VOL
 INITIAL SOIL WATER CONTENT   =      0.1243 VOL/VOL
 EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                          LAYER  6
                          --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER   9
 THICKNESS                    =       6.00   INCHES
 POROSITY                     =      0.5010 VOL/VOL
 FIELD CAPACITY               =      0.2840 VOL/VOL
 WILTING POINT                =      0.1350 VOL/VOL
 INITIAL SOIL WATER CONTENT   =      0.2595 VOL/VOL
 EFFECTIVE SAT. HYD. COND.    =  0.190000006000E-03 CM/SEC


                          LAYER  7
                          --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER  18
 THICKNESS                    =     180.00   INCHES
 POROSITY                     =      0.6710 VOL/VOL
 FIELD CAPACITY               =      0.2920 VOL/VOL
 WILTING POINT                =      0.0770 VOL/VOL
 INITIAL SOIL WATER CONTENT   =      0.2460 VOL/VOL
 EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC
```

```
               GENERAL DESIGN AND EVAPORATIVE ZONE DATA
               ----------------------------------------

     NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
              SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A
              FAIR STAND OF GRASS, A SURFACE SLOPE OF 33.%
              AND A SLOPE LENGTH OF   18. FEET.

    SCS RUNOFF CURVE NUMBER               =     76.20
    FRACTION OF AREA ALLOWING RUNOFF      =    100.0    PERCENT
    AREA PROJECTED ON HORIZONTAL PLANE    =      1.000  ACRES
    EVAPORATIVE ZONE DEPTH                =     12.0    INCHES
    INITIAL WATER IN EVAPORATIVE ZONE     =      1.601  INCHES
    UPPER LIMIT OF EVAPORATIVE STORAGE    =      5.460  INCHES
    LOWER LIMIT OF EVAPORATIVE STORAGE    =      0.858  INCHES
    INITIAL SNOW WATER                    =      0.000  INCHES
    INITIAL WATER IN LAYER MATERIALS      =     49.550  INCHES
    TOTAL INITIAL WATER                   =     49.550  INCHES
    TOTAL SUBSURFACE INFLOW               =      0.00   INCHES/YEAR


                 EVAPOTRANSPIRATION AND WEATHER DATA
                 -----------------------------------

      NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
               NEW HAVEN         CONNECTICUT

           MAXIMUM LEAF AREA INDEX                    =  2.00
           START OF GROWING SEASON (JULIAN DATE)      =    83
           END OF GROWING SEASON (JULIAN DATE)        =   296
           AVERAGE ANNUAL WIND SPEED                  = 12.00 MPH
           AVERAGE 1ST QUARTER RELATIVE HUMIDITY      = 65.00 %
           AVERAGE 2ND QUARTER RELATIVE HUMIDITY      = 69.00 %
           AVERAGE 3RD QUARTER RELATIVE HUMIDITY      = 74.00 %
           AVERAGE 4TH QUARTER RELATIVE HUMIDITY      = 70.00 %


      NOTE:  PRECIPITATION DATA FOR     NEW HAVEN             CONNECTICUT

               WAS ENTERED FROM THE DEFAULT DATA FILE.


      NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
```

```
              COEFFICIENTS FOR     NEW HAVEN          CONNECTICUT

          NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
      35.20       32.60       42.20       49.50       63.10       69.00
      78.30       78.50       69.80       55.30       44.80       32.00


    NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
             COEFFICIENTS FOR     NEW HAVEN          CONNECTICUT

                       STATION LATITUDE  = 41.30 DEGREES




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               MONTHLY TOTALS (IN INCHES) FOR YEAR 1977
-------------------------------------------------------------------------------

                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

 PRECIPITATION                   2.44    2.89    6.35    4.89    3.92    5.02
                                 1.26    4.01    6.23    6.25    6.14    6.58

 RUNOFF                          0.000   0.000   0.049   0.170   0.033   0.000
                                 0.000   0.000   0.009   0.028   0.002   0.104

 EVAPOTRANSPIRATION              1.765   1.138   2.772   2.334   2.466   3.337
                                 1.701   3.783   2.158   3.247   2.132   1.139

 LATERAL DRAINAGE COLLECTED      1.2902  0.5753  4.3739  2.7473  1.8633  0.7781
   FROM LAYER  3                 0.1432  0.4082  3.0693  3.0310  3.3215  5.2881

 PERCOLATION THROUGH             0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   LAYER  4                      0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

 PERCOLATION THROUGH             0.3607  0.3058  0.3195  0.2908  0.2848  0.2613
   LAYER  7                      0.2568  0.2444  0.2256  0.2231  0.2068  0.2054

-------------------------------------------------------------------------------
                MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------
```

```
AVERAGE DAILY HEAD ON              0.000    0.000    0.000    0.000    0.000    0.000
  LAYER  4                         0.000    0.000    0.000    0.000    0.000    0.001

STD. DEVIATION OF DAILY            0.000    0.000    0.001    0.001    0.001    0.000
  HEAD ON LAYER  4                 0.000    0.000    0.001    0.000    0.001    0.001

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                       ANNUAL TOTALS FOR YEAR 1977
-------------------------------------------------------------------------------
                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                          55.98         203207.344     100.00

  RUNOFF                                  0.397          1440.072       0.71

  EVAPOTRANSPIRATION                     27.973        101540.516      49.97

  DRAINAGE COLLECTED FROM LAYER  3       26.8894        97608.633      48.03

  PERC./LEAKAGE THROUGH LAYER  4          0.000058          0.210       0.00

  AVG. HEAD ON TOP OF LAYER  4            0.0003

  PERC./LEAKAGE THROUGH LAYER  7          3.185055      11561.751       5.69

  CHANGE IN WATER STORAGE                -2.464         -8943.533      -4.40

  SOIL WATER AT START OF YEAR            50.336        182718.969

  SOIL WATER AT END OF YEAR              47.872        173775.437

  SNOW WATER AT START OF YEAR             0.000             0.000       0.00

  SNOW WATER AT END OF YEAR               0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE             0.0000           -0.096       0.00

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                 MONTHLY TOTALS (IN INCHES) FOR YEAR 1978
-------------------------------------------------------------------------------

                            JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                            -------  -------  -------  -------  -------  -------

 PRECIPITATION                9.61     1.34     3.90     1.76     7.65     1.35
                              4.69     4.18     4.02     2.57     3.72     6.05

 RUNOFF                      1.056    0.384    0.252    0.000    0.034    0.000
                             0.000    0.006    0.007    0.000    0.000    1.475

 EVAPOTRANSPIRATION          1.128    1.569    2.319    2.006    4.338    1.191
                             3.069    3.926    3.144    1.923    1.207    0.835

 LATERAL DRAINAGE COLLECTED 6.5983   0.7176   1.6437   0.6834   2.8944   0.4971
   FROM LAYER  3            0.8432   0.8903   0.8955   0.3046   0.7018   3.2433

 PERCOLATION THROUGH        0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
   LAYER  4                 0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

 PERCOLATION THROUGH        0.1965   0.1715   0.1827   0.1707   0.1703   0.1595
   LAYER  7                 0.1591   0.1543   0.1445   0.1449   0.1360   0.1364

-------------------------------------------------------------------------------
                MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 AVERAGE DAILY HEAD ON        0.001    0.000    0.000    0.000    0.000    0.000
   LAYER  4                   0.000    0.000    0.000    0.000    0.000    0.000

 STD. DEVIATION OF DAILY      0.001    0.000    0.001    0.000    0.001    0.000
   HEAD ON LAYER  4           0.000    0.000    0.000    0.000    0.000    0.000

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                       ANNUAL TOTALS FOR YEAR 1978
-------------------------------------------------------------------------------
                                              INCHES      CU. FEET    PERCENT
                                             --------    ----------   -------

   PRECIPITATION                                50.84    184549.234    100.00

   RUNOFF                                       3.214     11667.439      6.32
```

```
EVAPOTRANSPIRATION                        26.654        96752.234     52.43

DRAINAGE COLLECTED FROM LAYER  3          19.9131       72284.516     39.17

PERC./LEAKAGE THROUGH LAYER  4             0.000044         0.158      0.00

AVG. HEAD ON TOP OF LAYER  4               0.0002

PERC./LEAKAGE THROUGH LAYER  7             1.926480      6993.124      3.79

CHANGE IN WATER STORAGE                   -0.867        -3148.091     -1.71

SOIL WATER AT START OF YEAR               47.872       173775.437

SOIL WATER AT END OF YEAR                 46.741       169670.156

SNOW WATER AT START OF YEAR                0.000            0.000      0.00

SNOW WATER AT END OF YEAR                  0.264          957.192      0.52

ANNUAL WATER BUDGET BALANCE                0.0000           0.009      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR 1979
-------------------------------------------------------------------------------

                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION                  14.58    2.57    4.99    5.35    4.67    2.95
                                0.55    5.35    4.55    4.25    2.25    3.65

RUNOFF                          6.636   0.000   0.179   0.181   0.000   0.000
                                0.000   0.217   0.055   0.008   0.000   1.017

EVAPOTRANSPIRATION              1.689   1.651   1.974   2.527   3.645   2.369
                                1.032   3.426   1.881   2.783   1.623   0.572

LATERAL DRAINAGE COLLECTED      7.3068  1.0515  4.3775  1.9945  1.3600  0.4773
  FROM LAYER  3                 0.1127  1.5166  1.9216  2.0907  0.6748  0.2542

PERCOLATION THROUGH             0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
  LAYER  4                     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

PERCOLATION THROUGH            0.1327   0.1168   0.1258   0.1188   0.1195   0.1129
  LAYER  7                     0.1136   0.1109   0.1049   0.1059   0.1005   0.1010

-------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON            0.001    0.000    0.001    0.000    0.000    0.000
  LAYER  4                       0.000    0.000    0.000    0.000    0.000    0.000

STD. DEVIATION OF DAILY          0.002    0.000    0.001    0.001    0.000    0.000
  HEAD ON LAYER  4               0.000    0.000    0.001    0.000    0.000    0.000

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                       ANNUAL TOTALS FOR YEAR 1979
-------------------------------------------------------------------------------
                                        INCHES          CU. FEET      PERCENT
                                       --------        ----------     -------
  PRECIPITATION                          55.71         202227.234     100.00

  RUNOFF                                  8.293         30102.746      14.89

  EVAPOTRANSPIRATION                     25.171         91370.602      45.18

  DRAINAGE COLLECTED FROM LAYER  3       23.1381        83991.414      41.53

  PERC./LEAKAGE THROUGH LAYER  4          0.000047          0.169       0.00

  AVG. HEAD ON TOP OF LAYER  4            0.0002

  PERC./LEAKAGE THROUGH LAYER  7          1.363319       4948.847       2.45

  CHANGE IN WATER STORAGE                -2.255         -8186.381      -4.05

  SOIL WATER AT START OF YEAR            46.741        169670.156

  SOIL WATER AT END OF YEAR              44.750        162440.969

  SNOW WATER AT START OF YEAR             0.264           957.192       0.47

  SNOW WATER AT END OF YEAR               0.000             0.000       0.00
```

```
 ANNUAL WATER BUDGET BALANCE                   0.0000             0.013       0.00

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                    MONTHLY TOTALS (IN INCHES) FOR YEAR 1980
----------------------------------------------------------------------------------

                                    JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                                    -------  -------  -------  -------  -------  -------

PRECIPITATION                         1.35     1.15    10.65     6.60     2.05     2.60
                                      7.30     1.22     1.70     3.06     4.98     1.04

RUNOFF                               0.304    0.223    0.434    0.287    0.000    0.000
                                     1.060    0.000    0.000    0.000    0.018    0.000

EVAPOTRANSPIRATION                   1.243    1.496    2.325    2.906    2.977    1.274
                                     3.654    2.597    1.412    2.167    1.690    1.078

LATERAL DRAINAGE COLLECTED          0.0885   0.0618   6.3804   4.4178   0.6767   0.0986
  FROM LAYER  3                     1.4853   1.0467   0.0995   0.0822   2.4101   0.9168

PERCOLATION THROUGH                 0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  LAYER  4                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

PERCOLATION THROUGH                 0.1022   0.0876   0.0950   0.0901   0.0912   0.0865
  LAYER  7                          0.0876   0.0860   0.0816   0.0828   0.0786   0.0798

----------------------------------------------------------------------------------
                    MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
----------------------------------------------------------------------------------


 AVERAGE DAILY HEAD ON               0.000    0.000    0.001    0.001    0.000    0.000
   LAYER  4                          0.000    0.000    0.000    0.000    0.000    0.000

 STD. DEVIATION OF DAILY             0.000    0.000    0.001    0.001    0.000    0.000
   HEAD ON LAYER  4                  0.001    0.000    0.000    0.000    0.001    0.000

**********************************************************************************
```

```
*******************************************************************************

                       ANNUAL TOTALS FOR YEAR 1980
-------------------------------------------------------------------------------
                                              INCHES        CU. FEET     PERCENT
                                             --------      ----------    -------
 PRECIPITATION                                43.70        158630.984    100.00

 RUNOFF                                        2.327         8445.600      5.32

 EVAPOTRANSPIRATION                           24.820        90095.242     56.80

 DRAINAGE COLLECTED FROM LAYER  3             17.7641       64483.590     40.65

 PERC./LEAKAGE THROUGH LAYER  4                0.000037         0.134      0.00

 AVG. HEAD ON TOP OF LAYER  4                  0.0002

 PERC./LEAKAGE THROUGH LAYER  7                1.048917      3807.569      2.40

 CHANGE IN WATER STORAGE                      -2.259        -8200.997     -5.17

 SOIL WATER AT START OF YEAR                  44.750       162440.969

 SOIL WATER AT END OF YEAR                    42.490       154239.969

 SNOW WATER AT START OF YEAR                   0.000            0.000      0.00

 SNOW WATER AT END OF YEAR                     0.000            0.000      0.00

 ANNUAL WATER BUDGET BALANCE                   0.0000          -0.015      0.00

*******************************************************************************


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                  MONTHLY TOTALS (IN INCHES) FOR YEAR 1981
-------------------------------------------------------------------------------

                              JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                              -------  -------  -------  -------  -------  -------

 PRECIPITATION                  0.63     6.40     1.05     3.85     3.41     1.55
                                5.62     0.37     3.33     7.66     2.25     6.18

 RUNOFF                         0.033    3.091    0.001    0.000    0.000    0.000
```

```
                                  0.517   0.000   0.000   0.441   0.000   0.090

EVAPOTRANSPIRATION                1.291   0.941   1.964   2.786   2.906   2.090
                                  3.375   0.286   2.727   2.157   1.975   1.226

LATERAL DRAINAGE COLLECTED        0.1043  0.0438  0.6125  1.3646  0.3153  0.1463
  FROM LAYER  3                   1.8418  0.0996  0.3815  3.0589  0.9098  3.8695

PERCOLATION THROUGH               0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  4                        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

PERCOLATION THROUGH               0.0783  0.0697  0.0758  0.0722  0.0732  0.0698
  LAYER  7                        0.0709  0.0699  0.0663  0.0676  0.0644  0.0656

-------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON               0.000   0.000   0.000   0.000   0.000   0.000
  LAYER  4                          0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY             0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON LAYER  4                  0.001   0.000   0.000   0.001   0.000   0.001

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                        ANNUAL TOTALS FOR YEAR 1981
-------------------------------------------------------------------------------
                                           INCHES        CU. FEET      PERCENT
                                          --------      ----------     -------
   PRECIPITATION                            42.30       153549.016     100.00

   RUNOFF                                    4.174       15150.217       9.87

   EVAPOTRANSPIRATION                       23.724       86117.656      56.08

   DRAINAGE COLLECTED FROM LAYER  3         12.7478      46274.680      30.14

   PERC./LEAKAGE THROUGH LAYER  4            0.000031        0.111       0.00

   AVG. HEAD ON TOP OF LAYER  4              0.0001

   PERC./LEAKAGE THROUGH LAYER  7            0.843638     3062.407       1.99

   CHANGE IN WATER STORAGE                   0.811        2944.030       1.92
```

```
   SOIL WATER AT START OF YEAR             42.490        154239.969

   SOIL WATER AT END OF YEAR               43.301        157184.000

   SNOW WATER AT START OF YEAR              0.000             0.000         0.00

   SNOW WATER AT END OF YEAR                0.000             0.000         0.00

   ANNUAL WATER BUDGET BALANCE              0.0000            0.024         0.00

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        AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1977 THROUGH 1981
------------------------------------------------------------------------------

                         JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                         -------  -------  -------  -------  -------  -------
   PRECIPITATION
   -------------
     TOTALS                5.72     2.87     5.39     4.49     4.34     2.69
                           3.88     3.03     3.97     4.76     3.87     4.70

     STD. DEVIATIONS       6.11     2.11     3.53     1.82     2.08     1.47
                           2.89     2.12     1.66     2.16     1.71     2.35

   RUNOFF
   ------
     TOTALS               1.606    0.740    0.183    0.128    0.014    0.000
                          0.316    0.045    0.014    0.095    0.004    0.537

     STD. DEVIATIONS      2.844    1.325    0.172    0.125    0.019    0.000
                          0.473    0.096    0.023    0.194    0.008    0.668

   EVAPOTRANSPIRATION
   ------------------
     TOTALS               1.423    1.359    2.271    2.512    3.266    2.052
                          2.566    2.803    2.264    2.455    1.726    0.970

     STD. DEVIATIONS      0.285    0.305    0.331    0.360    0.733    0.880
                          1.139    1.499    0.684    0.545    0.357    0.266

   LATERAL DRAINAGE COLLECTED FROM LAYER  3
   ----------------------------------------
```

```
  TOTALS                     3.0776    0.4900    3.4776    2.2415    1.4219    0.3995
                             0.8852    0.7923    1.2735    1.7135    1.6036    2.7144

  STD. DEVIATIONS            3.5795    0.4350    2.3244    1.4361    1.0182    0.2800
                             0.7785    0.5537    1.2208    1.4435    1.1999    2.0930

PERCOLATION/LEAKAGE THROUGH LAYER  4
------------------------------------
  TOTALS                     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
                             0.0000    0.0000    0.0000    0.0000    0.0000    0.0000

  STD. DEVIATIONS            0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
                             0.0000    0.0000    0.0000    0.0000    0.0000    0.0000

PERCOLATION/LEAKAGE THROUGH LAYER  7
------------------------------------
  TOTALS                     0.1741    0.1503    0.1597    0.1485    0.1478    0.1380
                             0.1376    0.1331    0.1246    0.1249    0.1173    0.1176

  STD. DEVIATIONS            0.1133    0.0951    0.0980    0.0878    0.0849    0.0768
                             0.0745    0.0699    0.0637    0.0622    0.0569    0.0558

-------------------------------------------------------------------------------
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


DAILY AVERAGE HEAD ACROSS LAYER  4
-------------------------------------
  AVERAGES                   0.0004    0.0001    0.0004    0.0003    0.0002    0.0000
                             0.0001    0.0001    0.0002    0.0002    0.0002    0.0003

  STD. DEVIATIONS            0.0004    0.0001    0.0003    0.0002    0.0001    0.0000
                             0.0001    0.0001    0.0001    0.0002    0.0001    0.0002

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      AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------------
                                         INCHES            CU. FEET     PERCENT
                                   -------------------   ------------  ---------
  PRECIPITATION                      49.71   (   6.473)     180432.7    100.00

  RUNOFF                             3.681   (  2.9304)     13361.21     7.405

  EVAPOTRANSPIRATION                25.668   (  1.6605)     93175.24    51.640
```

```
LATERAL DRAINAGE COLLECTED        20.09052 (   5.35891)      72928.570   40.41870
  FROM LAYER  3

PERCOLATION/LEAKAGE THROUGH        0.00004 (   0.00001)          0.157     0.00009
  FROM LAYER  4

AVERAGE HEAD ACROSS TOP            0.000 (     0.000)
  OF LAYER  4

PERCOLATION/LEAKAGE THROUGH        1.67348 (   0.93859)       6074.740     3.36676
  FROM LAYER  7

CHANGE IN WATER STORAGE           -1.407     (  1.3941)      -5106.99     -2.830
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```

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                 PEAK DAILY VALUES FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------------
                                                  (INCHES)     (CU. FT.)
                                                 ----------  -------------
    PRECIPITATION                                   5.20       18876.000

    RUNOFF                                          1.431       5192.9995

    DRAINAGE COLLECTED FROM LAYER  3                1.60993     5844.04883

    PERCOLATION/LEAKAGE THROUGH LAYER  4            0.000002       0.00730

    AVERAGE HEAD ACROSS LAYER  4                    0.006

    PERCOLATION/LEAKAGE THROUGH LAYER  7            0.012429      45.11599

    SNOW WATER                                      3.68       13344.2305


    MAXIMUM VEG. SOIL WATER (VOL/VOL)                       0.3495

    MINIMUM VEG. SOIL WATER (VOL/VOL)                       0.0390

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```

```
******************************************************************************

            FINAL WATER STORAGE AT END OF YEAR 1981
    ----------------------------------------------------------------------
               LAYER         (INCHES)        (VOL/VOL)
               -----        ---------        ---------
                 1           1.2466           0.2078

                 2           3.0493           0.2541

                 3           0.0029           0.0121

                 4           0.0000           0.0000

                 5           0.6712           0.1119

                 6           1.3978           0.2330

                 7          36.1476           0.2008

             SNOW WATER      0.000

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******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**             HELP MODEL VERSION 3.01   (14 OCTOBER 1994)                  **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY                     **
**                  USAE WATERWAYS EXPERIMENT STATION                       **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP3\FISHER.D4
TEMPERATURE DATA FILE:        C:\HELP3\FISHER.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\FISHER.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\FISHER.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\FIL4G12.D10
OUTPUT DATA FILE:             C:\HELP3\FIL4G12.OUT


TIME:  17:59     DATE:  10/16/1998


******************************************************************************

    TITLE:  FISHER ISLAND LANDFILL, EVAP ZONE 12",4%SLOPE,GEOCOMPOSITE

******************************************************************************


      NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
               COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   6
          THICKNESS                       =      6.00   INCHES
          POROSITY                        =      0.4530 VOL/VOL
```

```
          FIELD CAPACITY                =      0.1900 VOL/VOL
          WILTING POINT                 =      0.0850 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.1614 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.720000011000E-03 CM/SEC
       NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
              FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                   LAYER  2
                                   --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   5
          THICKNESS                     =     12.00   INCHES
          POROSITY                      =      0.4570 VOL/VOL
          FIELD CAPACITY                =      0.1310 VOL/VOL
          WILTING POINT                 =      0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.1966 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.100000005000E-02 CM/SEC


                                   LAYER  3
                                   --------

                        TYPE 2 - LATERAL DRAINAGE LAYER
                           MATERIAL TEXTURE NUMBER  34
          THICKNESS                     =      0.24   INCHES
          POROSITY                      =      0.8500 VOL/VOL
          FIELD CAPACITY                =      0.0100 VOL/VOL
          WILTING POINT                 =      0.0050 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.0151 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =    33.0000000000      CM/SEC
          SLOPE                         =      4.00   PERCENT
          DRAINAGE LENGTH               =    200.0    FEET


                                   LAYER  4
                                   --------

                        TYPE 4 - FLEXIBLE MEMBRANE LINER
                           MATERIAL TEXTURE NUMBER  35
          THICKNESS                     =      0.06   INCHES
          POROSITY                      =      0.0000 VOL/VOL
          FIELD CAPACITY                =      0.0000 VOL/VOL
          WILTING POINT                 =      0.0000 VOL/VOL
```

```
          INITIAL SOIL WATER CONTENT    =       0.0000 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.199999996000E-12 CM/SEC
          FML PINHOLE DENSITY           =        1.00   HOLES/ACRE
          FML INSTALLATION DEFECTS      =        3.00   HOLES/ACRE
          FML PLACEMENT QUALITY         =  3 - GOOD


                                 LAYER  5
                                 --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   5
          THICKNESS                     =        6.00   INCHES
          POROSITY                      =        0.4570 VOL/VOL
          FIELD CAPACITY                =        0.1310 VOL/VOL
          WILTING POINT                 =        0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT    =        0.1252 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.100000005000E-02 CM/SEC


                                 LAYER  6
                                 --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   9
          THICKNESS                     =        6.00   INCHES
          POROSITY                      =        0.5010 VOL/VOL
          FIELD CAPACITY                =        0.2840 VOL/VOL
          WILTING POINT                 =        0.1350 VOL/VOL
          INITIAL SOIL WATER CONTENT    =        0.2595 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.190000006000E-03 CM/SEC


                                 LAYER  7
                                 --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER  18
          THICKNESS                     =      180.00   INCHES
          POROSITY                      =        0.6710 VOL/VOL
          FIELD CAPACITY                =        0.2920 VOL/VOL
          WILTING POINT                 =        0.0770 VOL/VOL
          INITIAL SOIL WATER CONTENT    =        0.2460 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.100000005000E-02 CM/SEC
```

```
             GENERAL DESIGN AND EVAPORATIVE ZONE DATA
             ----------------------------------------

   NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
            SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A
            FAIR STAND OF GRASS, A SURFACE SLOPE OF  4.%
            AND A SLOPE LENGTH OF  200. FEET.

   SCS RUNOFF CURVE NUMBER                  =      70.50
   FRACTION OF AREA ALLOWING RUNOFF         =     100.0     PERCENT
   AREA PROJECTED ON HORIZONTAL PLANE       =       1.000   ACRES
   EVAPORATIVE ZONE DEPTH                   =      12.0     INCHES
   INITIAL WATER IN EVAPORATIVE ZONE        =       1.935   INCHES
   UPPER LIMIT OF EVAPORATIVE STORAGE       =       5.460   INCHES
   LOWER LIMIT OF EVAPORATIVE STORAGE       =       0.858   INCHES
   INITIAL SNOW WATER                       =       0.000   INCHES
   INITIAL WATER IN LAYER MATERIALS         =      49.918   INCHES
   TOTAL INITIAL WATER                      =      49.918   INCHES
   TOTAL SUBSURFACE INFLOW                  =       0.00    INCHES/YEAR


               EVAPOTRANSPIRATION AND WEATHER DATA
               -----------------------------------

    NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
              NEW HAVEN            CONNECTICUT

       MAXIMUM LEAF AREA INDEX                    =  2.00
       START OF GROWING SEASON (JULIAN DATE)      =    83
       END OF GROWING SEASON (JULIAN DATE)        =   296
       AVERAGE ANNUAL WIND SPEED                  = 12.00 MPH
       AVERAGE 1ST QUARTER RELATIVE HUMIDITY      = 65.00 %
       AVERAGE 2ND QUARTER RELATIVE HUMIDITY      = 69.00 %
       AVERAGE 3RD QUARTER RELATIVE HUMIDITY      = 74.00 %
       AVERAGE 4TH QUARTER RELATIVE HUMIDITY      = 70.00 %


    NOTE:  PRECIPITATION DATA FOR     NEW HAVEN                  CONNECTICUT

              WAS ENTERED FROM THE DEFAULT DATA FILE.


    NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
```

```
            COEFFICIENTS FOR     NEW HAVEN            CONNECTICUT

         NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

   JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
   -------     -------     -------     -------     -------     -------
    35.20       32.60       42.20       49.50       63.10       69.00
    78.30       78.50       69.80       55.30       44.80       32.00


      NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
              COEFFICIENTS FOR     NEW HAVEN            CONNECTICUT

                    STATION LATITUDE  = 41.30 DEGREES




*******************************************************************************

                MONTHLY TOTALS (IN INCHES) FOR YEAR 1977
-------------------------------------------------------------------------------

                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

 PRECIPITATION                  2.44    2.89    6.35    4.89    3.92    5.02
                                1.26    4.01    6.23    6.25    6.14    6.58

 RUNOFF                        0.000   0.000   0.003   0.051   0.000   0.000
                               0.000   0.000   0.000   0.000   0.000   0.016

 EVAPOTRANSPIRATION            1.753   1.309   2.772   2.643   2.485   3.372
                               1.691   3.805   2.166   3.238   2.113   1.132

 LATERAL DRAINAGE COLLECTED   1.3569  0.7077  4.4279  2.5662  1.8864  0.7487
   FROM LAYER  3              0.1359  0.3689  3.0777  3.0537  3.3593  5.7456

 PERCOLATION THROUGH          0.0002  0.0001  0.0005  0.0003  0.0002  0.0001
   LAYER  4                   0.0000  0.0001  0.0004  0.0004  0.0004  0.0006

 PERCOLATION THROUGH          0.3603  0.3059  0.3192  0.2911  0.2846  0.2614
   LAYER  7                   0.2563  0.2444  0.2257  0.2231  0.2069  0.2049

-------------------------------------------------------------------------------
               MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------
```

```
                                      0.001   0.001   0.004   0.002   0.002   0.001
AVERAGE DAILY HEAD ON                 0.000   0.000   0.003   0.003   0.003   0.005
  LAYER  4

                                      0.001   0.001   0.005   0.003   0.004   0.001
STD. DEVIATION OF DAILY               0.000   0.000   0.005   0.003   0.004   0.006
  HEAD ON LAYER  4
***************************************************************************************

***************************************************************************************
                       ANNUAL TOTALS FOR YEAR 1977
---------------------------------------------------------------------------------------
                                        INCHES          CU. FEET         PERCENT
                                        --------        ----------       -------
  PRECIPITATION                          55.98          203207.344       100.00

  RUNOFF                                  0.069            251.558         0.12

  EVAPOTRANSPIRATION                     28.478         103375.555        50.87

  DRAINAGE COLLECTED FROM LAYER  3       27.4350         99589.109        49.01

  PERC./LEAKAGE THROUGH LAYER  4          0.003547          12.875         0.01

  AVG. HEAD ON TOP OF LAYER  4            0.0020

  PERC./LEAKAGE THROUGH LAYER  7          3.183747       11557.003         5.69

  CHANGE IN WATER STORAGE                -3.186         -11565.848        -5.69

  SOIL WATER AT START OF YEAR            50.704         184056.969

  SOIL WATER AT END OF YEAR              47.518         172491.125

  SNOW WATER AT START OF YEAR             0.000              0.000         0.00

  SNOW WATER AT END OF YEAR               0.000              0.000         0.00

  ANNUAL WATER BUDGET BALANCE             0.0000            -0.039         0.00
***************************************************************************************
```

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                   MONTHLY TOTALS (IN INCHES) FOR YEAR 1978
-------------------------------------------------------------------------------

                             JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                             -------  -------  -------  -------  -------  -------

 PRECIPITATION                 9.61     1.34     3.90     1.76     7.65     1.35
                               4.69     4.18     4.02     2.57     3.72     6.05

 RUNOFF                        0.587    0.384    0.180    0.000    0.000    0.000
                               0.000    0.000    0.000    0.000    0.000    1.475

 EVAPOTRANSPIRATION            1.124    1.563    2.315    2.003    4.155    1.133
                               3.093    3.715    3.151    1.930    1.204    0.835

 LATERAL DRAINAGE COLLECTED    6.7043   0.7216   1.7216   0.6880   3.3208   0.3302
   FROM LAYER  3               0.8318   1.1071   0.9025   0.2978   0.7002   3.2427

 PERCOLATION THROUGH           0.0007   0.0001   0.0002   0.0001   0.0004   0.0001
   LAYER  4                    0.0001   0.0002   0.0001   0.0001   0.0001   0.0004

 PERCOLATION THROUGH           0.1967   0.1711   0.1830   0.1707   0.1703   0.1592
   LAYER  7                    0.1589   0.1544   0.1442   0.1449   0.1362   0.1364

-------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

 AVERAGE DAILY HEAD ON         0.006    0.001    0.001    0.001    0.003    0.000
   LAYER  4                    0.001    0.001    0.001    0.000    0.001    0.003

 STD. DEVIATION OF DAILY       0.010    0.001    0.005    0.000    0.005    0.000
   HEAD ON LAYER  4            0.001    0.001    0.001    0.000    0.001    0.003
*******************************************************************************

*******************************************************************************

                      ANNUAL TOTALS FOR YEAR 1978
-------------------------------------------------------------------------------
                                        INCHES          CU. FEET     PERCENT
                                       --------        ----------    -------
 PRECIPITATION                           50.84         184549.234    100.00

 RUNOFF                                  2.625           9529.780      5.16
```

```
EVAPOTRANSPIRATION                        26.222       95185.094     51.58
DRAINAGE COLLECTED FROM LAYER  3          20.5685      74663.625     40.46
PERC./LEAKAGE THROUGH LAYER  4             0.002648        9.611      0.01
AVG. HEAD ON TOP OF LAYER  4               0.0015
PERC./LEAKAGE THROUGH LAYER  7             1.926053     6991.574      3.79
CHANGE IN WATER STORAGE                   -0.502       -1820.878     -0.99
SOIL WATER AT START OF YEAR               47.518      172491.125
SOIL WATER AT END OF YEAR                 46.753      169713.047
SNOW WATER AT START OF YEAR                0.000           0.000      0.00
SNOW WATER AT END OF YEAR                  0.264         957.192      0.52
ANNUAL WATER BUDGET BALANCE                0.0000          0.038      0.00
***************************************************************************


***************************************************************************
                  MONTHLY TOTALS (IN INCHES) FOR YEAR 1979
---------------------------------------------------------------------------
                                JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                                -------  -------  -------  -------  -------  -------
PRECIPITATION                    14.58     2.57     4.99     5.35     4.67     2.95
                                  0.55     5.35     4.55     4.25     2.25     3.65

RUNOFF                           5.968    0.000    0.048    0.053    0.000    0.000
                                 0.000    0.078    0.005    0.000    0.000    1.017

EVAPOTRANSPIRATION               1.690    1.652    2.358    2.549    4.126    2.372
                                 1.021    3.188    1.860    2.757    1.594    0.572

LATERAL DRAINAGE COLLECTED      7.9726   1.0475   4.0597   1.3649   1.6963   0.4580
  FROM LAYER  3                 0.1068   1.9688   1.9431   2.1149   0.6959   0.2601

PERCOLATION THROUGH             0.0007   0.0002   0.0005   0.0002   0.0003   0.0001
```

```
                                   0.0000   0.0002   0.0002   0.0003   0.0001   0.0001
 LAYER  4

PERCOLATION THROUGH                0.1329   0.1167   0.1259   0.1187   0.1198   0.1126
  LAYER  7                         0.1138   0.1110   0.1048   0.1059   0.1002   0.1012

-------------------------------------------------------------------------------
                MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON                0.007    0.001    0.004    0.001    0.001    0.000
  LAYER  4                           0.000    0.002    0.002    0.002    0.001    0.000

STD. DEVIATION OF DAILY              0.013    0.001    0.006    0.002    0.002    0.000
  HEAD ON LAYER  4                   0.000    0.005    0.005    0.003    0.001    0.000
*******************************************************************************

*******************************************************************************
                       ANNUAL TOTALS FOR YEAR 1979
-------------------------------------------------------------------------------
                                        INCHES          CU. FEET      PERCENT
                                       --------        ----------     -------
  PRECIPITATION                          55.71         202227.234     100.00

  RUNOFF                                  7.170         26027.477      12.87

  EVAPOTRANSPIRATION                     25.739         93432.789      46.20

  DRAINAGE COLLECTED FROM LAYER  3       23.6884        85988.930      42.52

  PERC./LEAKAGE THROUGH LAYER  4          0.002888         10.483       0.01

  AVG. HEAD ON TOP OF LAYER  4            0.0017

  PERC./LEAKAGE THROUGH LAYER  7          1.363436       4949.271       2.45

  CHANGE IN WATER STORAGE                -2.251         -8171.149      -4.04

  SOIL WATER AT START OF YEAR            46.753        169713.047

  SOIL WATER AT END OF YEAR              44.766        162499.094

  SNOW WATER AT START OF YEAR             0.264           957.192       0.47

  SNOW WATER AT END OF YEAR               0.000             0.000       0.00
```

```
ANNUAL WATER BUDGET BALANCE                   0.0000          -0.070       0.00

***************************************************************************




***************************************************************************

                    MONTHLY TOTALS (IN INCHES) FOR YEAR 1980
---------------------------------------------------------------------------

                                 JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                 ------- ------- ------- ------- ------- -------

PRECIPITATION                      1.35    1.15   10.65    6.60    2.05    2.60
                                   7.30    1.22    1.70    3.06    4.98    1.04

RUNOFF                            0.307   0.227   0.247   0.122   0.000   0.000
                                  0.615   0.000   0.000   0.000   0.000   0.000

EVAPOTRANSPIRATION                1.225   1.471   2.311   2.900   2.974   1.278
                                  3.654   2.593   1.419   2.150   1.682   1.075

LATERAL DRAINAGE COLLECTED       0.0890  0.0762  6.2569  4.9309  0.6765  0.1025
  FROM LAYER  3                  1.9210  1.0564  0.1001  0.0836  2.4417  0.9203

PERCOLATION THROUGH              0.0000  0.0000  0.0006  0.0006  0.0001  0.0000
  LAYER  4                       0.0002  0.0002  0.0000  0.0000  0.0003  0.0002

PERCOLATION THROUGH              0.1023  0.0875  0.0951  0.0902  0.0910  0.0866
  LAYER  7                       0.0875  0.0861  0.0816  0.0827  0.0786  0.0799

---------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
---------------------------------------------------------------------------

AVERAGE DAILY HEAD ON             0.000   0.000   0.005   0.004   0.001   0.000
  LAYER  4                        0.002   0.001   0.000   0.000   0.002   0.001

STD. DEVIATION OF DAILY           0.000   0.000   0.009   0.007   0.001   0.000
  HEAD ON LAYER  4                0.007   0.001   0.000   0.000   0.005   0.001
***************************************************************************
```

```
*******************************************************************************

                    ANNUAL TOTALS FOR YEAR 1980
-------------------------------------------------------------------------------
                                          INCHES        CU. FEET     PERCENT
                                         --------      ----------    -------
 PRECIPITATION                             43.70       158630.984    100.00

 RUNOFF                                     1.519        5514.257      3.48

 EVAPOTRANSPIRATION                        24.733       89781.461     56.60

 DRAINAGE COLLECTED FROM LAYER  3          18.6549      67717.383     42.69

 PERC./LEAKAGE THROUGH LAYER  4             0.002269        8.237      0.01

 AVG. HEAD ON TOP OF LAYER  4               0.0014

 PERC./LEAKAGE THROUGH LAYER  7             1.049194     3808.575      2.40

 CHANGE IN WATER STORAGE                   -2.256       -8190.708     -5.16

 SOIL WATER AT START OF YEAR               44.766      162499.094

 SOIL WATER AT END OF YEAR                 42.509      154308.391

 SNOW WATER AT START OF YEAR                0.000           0.000      0.00

 SNOW WATER AT END OF YEAR                  0.000           0.000      0.00

 ANNUAL WATER BUDGET BALANCE                0.0000          0.022      0.00

*******************************************************************************


*******************************************************************************

             MONTHLY TOTALS (IN INCHES) FOR YEAR 1981
-------------------------------------------------------------------------------

                          JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                          -------  -------  -------  -------  -------  -------

 PRECIPITATION              0.63     6.40     1.05     3.85     3.41     1.55
                            5.62     0.37     3.33     7.66     2.25     6.18

 RUNOFF                    0.033    3.092    0.001    0.000    0.000    0.000
```

```
                              0.277    0.000    0.000    0.233    0.000    0.005

EVAPOTRANSPIRATION            1.292    0.941    1.962    2.784    2.902    2.072
                              3.387    0.281    2.725    2.164    1.980    1.227

LATERAL DRAINAGE COLLECTED    0.1042   0.0438   0.6125   1.3671   0.3187   0.1610
  FROM LAYER  3               2.0636   0.1001   0.3955   3.2607   0.9062   3.9510

PERCOLATION THROUGH           0.0000   0.0000   0.0001   0.0002   0.0001   0.0000
  LAYER  4                    0.0003   0.0000   0.0001   0.0003   0.0002   0.0005

PERCOLATION THROUGH           0.0785   0.0697   0.0758   0.0721   0.0734   0.0698
  LAYER  7                    0.0709   0.0698   0.0666   0.0676   0.0646   0.0655

-------------------------------------------------------------------------------
                 MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON          0.000    0.000    0.001    0.001    0.000    0.000
  LAYER  4                     0.002    0.000    0.000    0.003    0.001    0.003

STD. DEVIATION OF DAILY        0.000    0.000    0.001    0.001    0.000    0.000
  HEAD ON LAYER  4             0.003    0.000    0.000    0.007    0.001    0.005
*******************************************************************************

*******************************************************************************
                      ANNUAL TOTALS FOR YEAR 1981
-------------------------------------------------------------------------------
                                        INCHES          CU. FEET      PERCENT
                                       --------        ----------     -------
  PRECIPITATION                          42.30         153549.016     100.00

  RUNOFF                                  3.641         13217.549       8.61

  EVAPOTRANSPIRATION                     23.719         86101.531      56.07

  DRAINAGE COLLECTED FROM LAYER  3       13.2845        48222.719      31.41

  PERC./LEAKAGE THROUGH LAYER  4          0.001882          6.832       0.00

  AVG. HEAD ON TOP OF LAYER  4            0.0010

  PERC./LEAKAGE THROUGH LAYER  7          0.844165       3064.319       2.00

  CHANGE IN WATER STORAGE                 0.811          2942.922       1.92
```

```
 SOIL WATER AT START OF YEAR              42.509       154308.391

 SOIL WATER AT END OF YEAR                43.320       157251.312

 SNOW WATER AT START OF YEAR               0.000            0.000       0.00

 SNOW WATER AT END OF YEAR                 0.000            0.000       0.00

 ANNUAL WATER BUDGET BALANCE               0.0000          -0.031       0.00

*******************************************************************************




*******************************************************************************

          AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------------

                          JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                          -------  -------  -------  -------  -------  -------

  PRECIPITATION
  -------------
    TOTALS                  5.72     2.87     5.39     4.49     4.34     2.69
                            3.88     3.03     3.97     4.76     3.87     4.70

    STD. DEVIATIONS         6.11     2.11     3.53     1.82     2.08     1.47
                            2.89     2.12     1.66     2.16     1.71     2.35

  RUNOFF
  ------
    TOTALS                 1.379    0.741    0.096    0.045    0.000    0.000
                           0.179    0.016    0.001    0.047    0.000    0.502

    STD. DEVIATIONS        2.576    1.324    0.112    0.050    0.000    0.000
                           0.272    0.035    0.002    0.104    0.000    0.698

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                 1.417    1.387    2.344    2.576    3.329    2.045
                           2.569    2.716    2.264    2.448    1.715    0.968

    STD. DEVIATIONS        0.285    0.280    0.288    0.347    0.765    0.907
                           1.150    1.445    0.687    0.538    0.356    0.265

  LATERAL DRAINAGE COLLECTED FROM LAYER  3
  ----------------------------------------
```

```
   TOTALS                        3.2454    0.5194    3.4157    2.1834    1.5797    0.3601
                                 1.0118    0.9203    1.2838    1.7621    1.6206    2.8240

   STD. DEVIATIONS               3.7982    0.4410    2.2494    1.6784    1.1774    0.2586
                                 0.9423    0.7296    1.2236    1.5000    1.2155    2.2460

 PERCOLATION/LEAKAGE THROUGH LAYER  4
 ------------------------------------
   TOTALS                        0.0003    0.0001    0.0004    0.0003    0.0002    0.0001
                                 0.0001    0.0001    0.0002    0.0002    0.0002    0.0004

   STD. DEVIATIONS               0.0003    0.0001    0.0002    0.0002    0.0001    0.0000
                                 0.0001    0.0001    0.0001    0.0002    0.0001    0.0002

 PERCOLATION/LEAKAGE THROUGH LAYER  7
 ------------------------------------
   TOTALS                        0.1741    0.1502    0.1598    0.1485    0.1478    0.1379
                                 0.1375    0.1331    0.1246    0.1248    0.1173    0.1176

   STD. DEVIATIONS               0.1131    0.0952    0.0979    0.0880    0.0848    0.0768
                                 0.0743    0.0699    0.0636    0.0622    0.0569    0.0556


-------------------------------------------------------------------------------
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 DAILY AVERAGE HEAD ACROSS LAYER  4
 ------------------------------------
   AVERAGES                      0.0028    0.0005    0.0029    0.0019    0.0014    0.0003
                                 0.0009    0.0008    0.0011    0.0015    0.0014    0.0024

   STD. DEVIATIONS               0.0033    0.0004    0.0019    0.0015    0.0010    0.0002
                                 0.0008    0.0006    0.0011    0.0013    0.0011    0.0019

*******************************************************************************


*******************************************************************************

      AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------------
                                      INCHES              CU. FEET      PERCENT
                                 -------------------    ------------   ---------
 PRECIPITATION                   49.71     (   6.473)     180432.7      100.00

 RUNOFF                           3.005    (  2.6797)      10908.12       6.046

 EVAPOTRANSPIRATION              25.778    (  1.7901)      93575.29      51.862
```

```
LATERAL DRAINAGE COLLECTED     20.72627 (   5.32627)      75236.359   41.69773
  FROM LAYER  3

PERCOLATION/LEAKAGE THROUGH     0.00265 (   0.00063)          9.608     0.00532
  FROM LAYER  4

AVERAGE HEAD ACROSS TOP         0.002 (     0.000)
  OF LAYER  4

PERCOLATION/LEAKAGE THROUGH     1.67332 (   0.93786)       6074.148     3.36643
  FROM LAYER  7

CHANGE IN WATER STORAGE        -1.477     (  1.6057)      -5361.13     -2.971
*******************************************************************************
```

```
******************************************************************************

            PEAK DAILY VALUES FOR YEARS 1977 THROUGH 1981
-------------------------------------------------------------------------
                                            (INCHES)      (CU. FT.)
                                           ----------   -------------
  PRECIPITATION                               5.20       18876.000

  RUNOFF                                      1.421       5156.9385

  DRAINAGE COLLECTED FROM LAYER  3            1.82873     6638.30566

  PERCOLATION/LEAKAGE THROUGH LAYER  4        0.000121       0.43929

  AVERAGE HEAD ACROSS LAYER  4                0.049

  PERCOLATION/LEAKAGE THROUGH LAYER  7        0.012192      44.25743

  SNOW WATER                                  3.68       13344.2305


  MAXIMUM VEG. SOIL WATER (VOL/VOL)                    0.3524

  MINIMUM VEG. SOIL WATER (VOL/VOL)                    0.0390

******************************************************************************
```

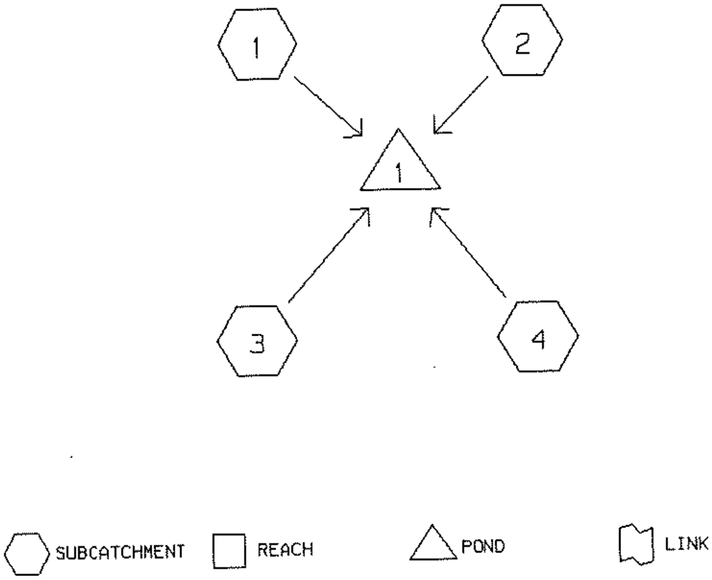
```
*******************************************************************************

          FINAL WATER STORAGE AT END OF YEAR 1981
    ----------------------------------------------------------------------
              LAYER          (INCHES)         (VOL/VOL)
              -----          --------         ---------
                1             1.2465           0.2078

                2             3.0491           0.2541

                3             0.0043           0.0177

                4             0.0000           0.0000

                5             0.6865           0.1144

                6             1.3978           0.2330

                7            36.1498           0.2008

            SNOW WATER        0.000

*******************************************************************************
*******************************************************************************
```

Appendix D

APPENDIX D

HYDROCAD RESULTS

ATERSHED ROUTING ==



```
SUBCATCHMENT 1    = FIL 1, FISHER ISLAND LANDFILL      ->   POND 1
SUBCATCHMENT 2    = FIL-2, FISHER ISLAND LANDFILL      ->   POND 1
SUBCATCHMENT 3    = FIL 3, FISHER ISLAND LANDFILL      ->   POND 1
SUBCATCHMENT 4    = FIL-4, FISHER ISLAND LANDFILL      ->   POND 1
POND 1            = EXISTING EASTERLY WETLANDS         ->
```

```
   RUNOFF BY SCS TR-20 METHOD: TYPE III 24-HOUR RAINFALL= 6.0 IN, SCS U.H.

              RUNOFF SPAN = 10-20 HRS,  dt= .10 HRS,  101 POINTS

UBCAT   AREA     Tc                              WGT'D       PEAK   Tpeak    VOL
UMBER  (ACRE)  (MIN)  --GROUND COVERS (%CN)--     CN    C   (CFS)   (HRS)   (AF)

  1     1.61   20.2   100%71   -     -     -      71    -    3.6    12.24    .36

  2      .95   17.2   100%71   -     -     -      71    -    2.3    12.21    .21

  3      .88   15.7   100%71   -     -     -      71    -    2.1    12.19    .20

  4     1.12   11.6   100%71   -     -     -      71    -    3.1    12.12    .25
```

REACH ROUTING BY STOR-IND+TRANS METHOD

EACH NO.	DIAM (IN)	BOTTOM WIDTH (FT)	DEPTH (FT)	SIDE SLOPES (FT/FT)	n	LENGTH (FT)	SLOPE (FT/FT)	PEAK VEL. (FPS)	TRAVEL TIME (MIN)	PEAK Qout (CFS)

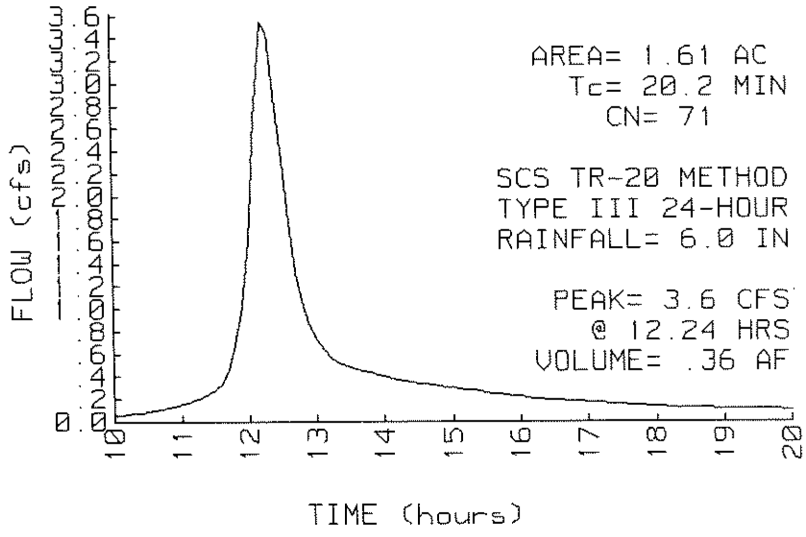
POND ROUTING BY STOR-IND METHOD

```
OND  START   FLOOD   PEAK    PEAK    ------ PEAK FLOW -------    ---Qout---
NO.  ELEV.   ELEV.   ELEV.  STORAGE  Qin   Qout   Qpri   Qsec  ATTEN. LAG
     (FT)    (FT)    (FT)    (AF)   (CFS) (CFS)  (CFS)  (CFS)   (%)  (MIN)

 1    6.0     8.0     6.1    1.01   10.6   0.0                  100  468.5
```

```
                                                                    Qout
INK
NO.  NAME                             SOURCE                       (CFS)
```

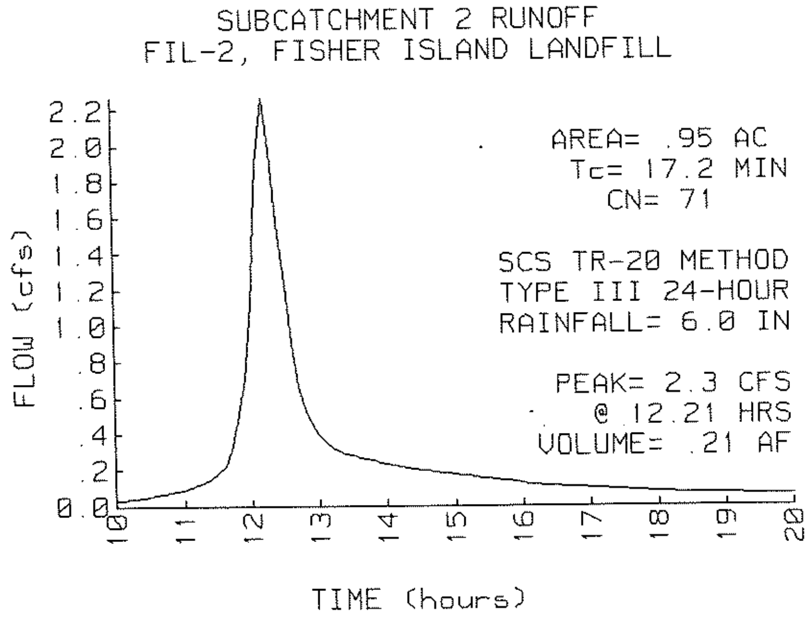
```
JBCATCHMENT 1                FIL 1, FISHER ISLAND LANDFILL

PEAK=   3.6 CFS @ 12.24 HRS,  VOLUME=   .36 AF

  ACRES    CN                                        SCS TR-20 METHOD
   1.61    71    HELP MODEL RCN                      TYPE III 24-HOUR
                                                     RAINFALL= 6.0 IN
                                                     SPAN= 10-20 HRS, dt=.1 HRS

ethod                                  Comment                          Tc (min)
R-55 SHEET FLOW                        FISHER ISLAND LANDFILL               18.9
rass: Dense   n=.24   L=205'   P2=3.3 in   s=.04 '/'
HALLOW CONCENTRATED/UPLAND FLOW        FISHER ISLAND LANDFILL                1.3
npaved    Kv=16.1345    L=275'   s=.045 '/'   V=3.42 fps
                                                                      ----------
                                       Total Length=  480 ft    Total Tc=   20.2
```

SUBCATCHMENT 1 RUNOFF
FIL 1, FISHER ISLAND LANDFILL



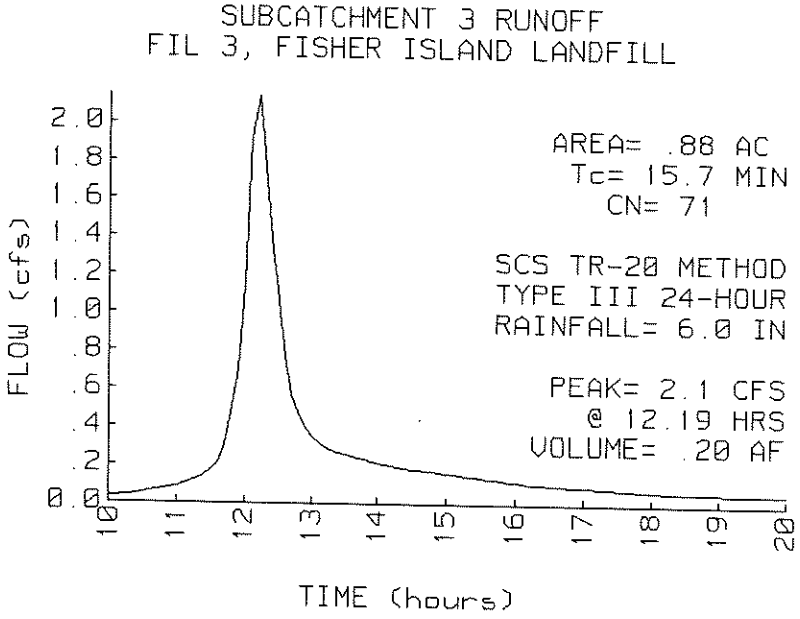
```
               SUBCATCHMENT 1 RUNOFF PEAK= 3.6 CFS @ 12.24 HOURS

  HOUR      0.00    .10    .20    .30    .40    .50    .60    .70    .80    .90
 10.00 |     0.0     .1     .1     .1     .1     .1     .1     .1     .1     .1
 11.00 |      .2     .2     .2     .2     .2     .3     .3     .5     .7    1.0
 12.00 |     1.6    2.7    3.5    3.5    2.9    2.3    1.8    1.3    1.0     .8
 13.00 |      .7     .6     .6     .5     .5     .5     .5     .4     .4     .4
 14.00 |      .4     .4     .4     .4     .3     .3     .3     .3     .3     .3
 15.00 |      .3     .3     .3     .3     .3     .3     .3     .2     .2     .2
 16.00 |      .2     .2     .2     .2     .2     .2     .2     .2     .2     .2
 17.00 |      .2     .2     .2     .2     .2     .2     .1     .1     .1     .1
 18.00 |      .1     .1     .1     .1     .1     .1     .1     .1     .1     .1
 19.00 |      .1     .1     .1     .1     .1     .1     .1     .1     .1     .1
 20.00 |      .1
```

```
UBCATCHMENT 2                    FIL-2, FISHER ISLAND LANDFILL

PEARK=   2.3 CFS @ 12.21 HRS,   VOLUME=   .21 AF

  ACRES    CN                                       SCS TR-20 METHOD
   .95     71   HELP MODEL RCN                      TYPE III 24-HOUR
                                                    RAINFALL= 6.0 IN
                                                    SPAN= 10-20 HRS, dt=.1 HRS

ethod                                  Comment                             Tc (min)
R-55 SHEET FLOW                        FISHER ISLAND LANDFILL                 17.0
rass: Dense    n=.24    L=180'   P2=3.3 in    s=.04 '/'
HALLOW CONCENTRATED/UPLAND FLOW        FISHER ISLAND LANDFILL                   .2
npaved    Kv=16.1345    L=90'    s=.15 '/'    V=6.25 fps
                                                                        ----------
                                       Total Length=  270 ft    Total Tc=     17.2
```



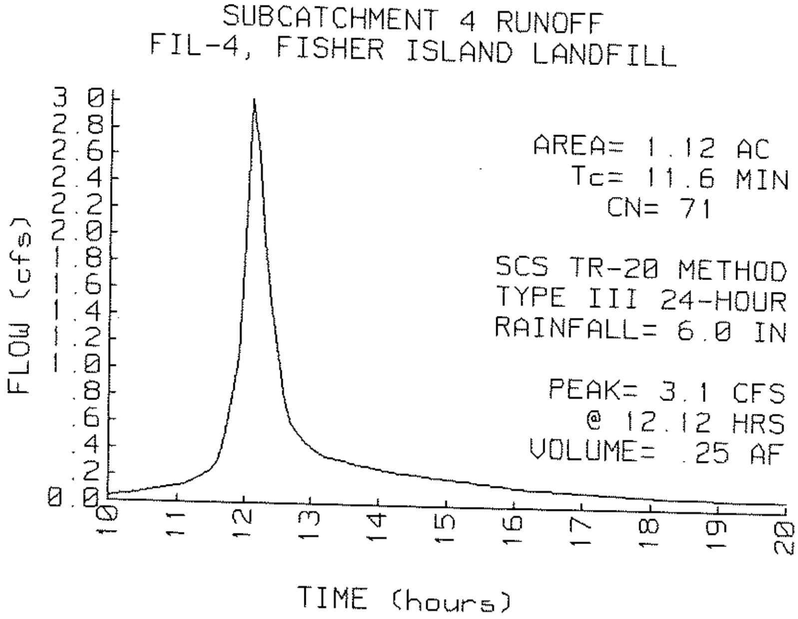
```
                    SUBCATCHMENT 2 RUNOFF PEAK= 2.3 CFS @ 12.21 HOURS

 HOUR     0.00   .10   .20   .30   .40   .50   .60   .70   .80   .90
 10.00 |   0.0   0.0   0.0   0.0   0.0    .1    .1    .1    .1    .1
 11.00 |    .1    .1    .1    .1    .2    .2    .2    .3    .5    .7
 12.00 |   1.1   1.9   2.3   2.0   1.6   1.2    .9    .7    .5    .4
 13.00 |    .4    .4    .3    .3    .3    .3    .3    .3    .3    .2
 14.00 |    .2    .2    .2    .2    .2    .2    .2    .2    .2    .2
 15.00 |    .2    .2    .2    .2    .2    .2    .1    .1    .1    .1
 16.00 |    .1    .1    .1    .1    .1    .1    .1    .1    .1    .1
 17.00 |    .1    .1    .1    .1    .1    .1    .1    .1    .1    .1
 18.00 |    .1    .1    .1    .1    .1    .1    .1    .1    .1    .1
 19.00 |    .1    .1    .1    .1    .1    .1    .1    .1    .1    .1
 20.00 |    .1
```

```
UBCATCHMENT 3                 FIL 3, FISHER ISLAND LANDFILL

PEAK=   2.1 CFS @ 12.19 HRS,   VOLUME=   .20 AF

  ACRES     CN
    .88     71    HELP MODEL RCN                        SCS TR-20 METHOD
                                                        TYPE III 24-HOUR
                                                        RAINFALL= 6.0 IN
                                                        SPAN= 10-20 HRS, dt=.1 HRS

ethod                                   Comment                              Tc (min)
R-55 SHEET FLOW                         FISHER ISLAND LANDFILL                 15.5
rass: Dense    n=.24    L=160'   P2=3.3 in    s=.04 '/'
HALLOW CONCENTRATED/UPLAND FLOW         FISHER ISLAND LANDFILL                   .2
npaved    Kv=16.1345    L=65'    s=.15 '/'    V=6.25 fps
                                                                          ----------
                                        Total Length=  225 ft    Total Tc=     15.7
```



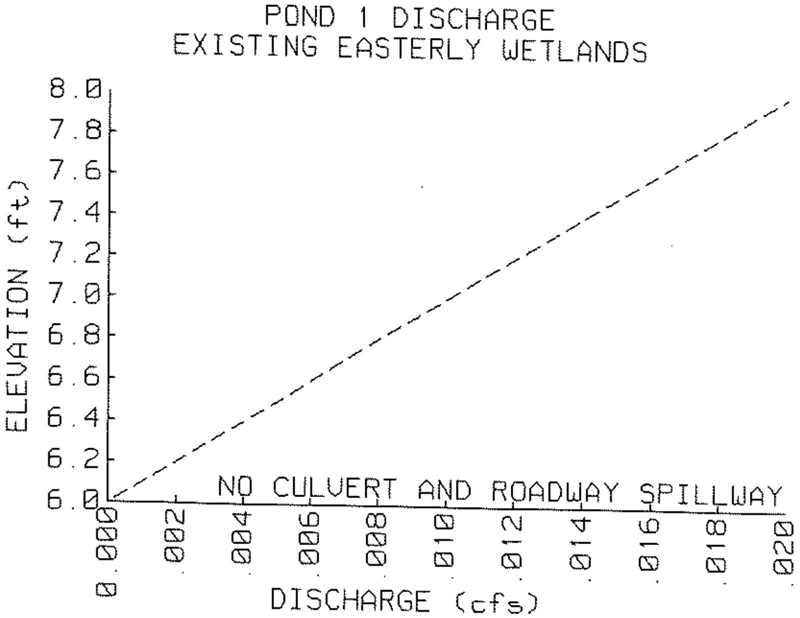
```
                 SUBCATCHMENT 3 RUNOFF PEAK= 2.1 CFS @ 12.19 HOURS

 HOUR      0.00     .10     .20     .30     .40     .50     .60     .70     .80     .90
10.00 |     0.0     0.0     0.0     0.0     0.0      .1      .1      .1      .1      .1
11.00 |      .1      .1      .1      .1      .1      .2      .2      .3      .5      .7
12.00 |     1.1     1.9     2.1     1.8     1.4     1.1      .8      .6      .5      .4
13.00 |      .4      .3      .3      .3      .3      .3      .2      .2      .2      .2
14.00 |      .2      .2      .2      .2      .2      .2      .2      .2      .2      .2
15.00 |      .2      .2      .2      .1      .1      .1      .1      .1      .1      .1
16.00 |      .1      .1      .1      .1      .1      .1      .1      .1      .1      .1
17.00 |      .1      .1      .1      .1      .1      .1      .1      .1      .1      .1
18.00 |      .1      .1      .1      .1      .1      .1      .1      .1      .1      .1
19.00 |      .1      .1      .1      .1      .1      .1      .1      .1      .1      .1
20.00 |      .1
```

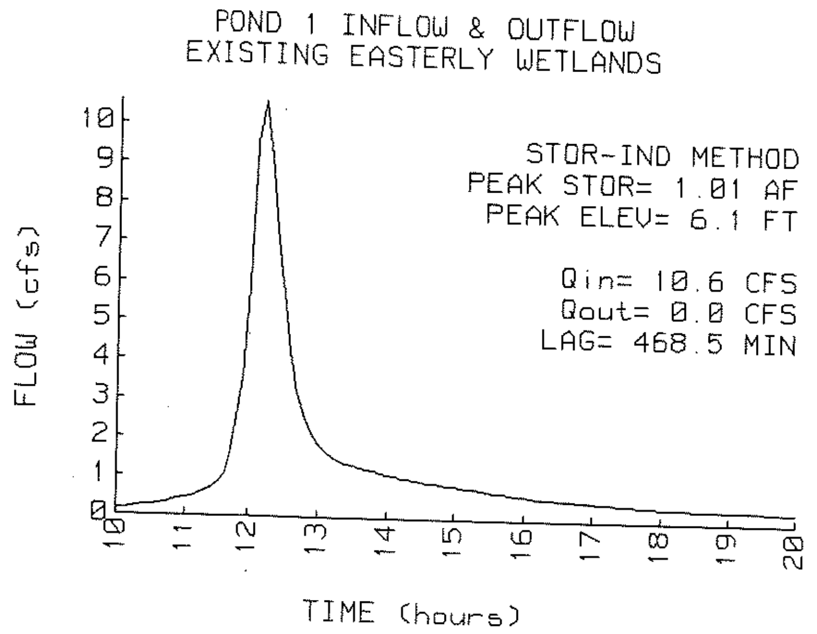
```
UBCATCHMENT 4                  FIL-4, FISHER ISLAND LANDFILL

PEAK=   3.1 CFS @ 12.12 HRS,  VOLUME=   .25 AF

  ACRES    CN
   1.12    71   HELP MODEL RCN                       SCS TR-20 METHOD
                                                     TYPE III 24-HOUR
                                                     RAINFALL= 6.0 IN
                                                     SPAN= 10-20 HRS, dt=.1 HRS
ethod                                Comment                                   Tc (min)
R-55 SHEET FLOW                      FISHERS ISLAND LANDFILL
rass: Dense   n=.24   L=100'   P2=3.3 in   s=.04 '/'                          10.6
ECT/VEE/TRAP CHANNEL                 FISHER ISLAND LANDFILL
=3'    D=1.5'    SS= 1 & 2 '/'   a=6.19 sq-ft   Pw=6.8'   r=.91'              .9
=.02 '/'   n=.033   V=5.98 fps   L=310'   Capacity=37 cfs
ECT/VEE/TRAP CHANNEL                 FISHERS ISLAND LANDFILL
W=3'    D=1.5'    SS= 1 & 2 '/'   a=6.19 sq-ft   Pw=6.8'   r=.91'             .1
=.15 '/'   n=.033   V=16.38 fps   L=50'   Capacity=101.3 cfs
                                                                           ----------
                                     Total Length=  460 ft    Total Tc=      11.6
```



```
               SUBCATCHMENT 4 RUNOFF PEAK= 3.1 CFS @ 12.12 HOURS

  HOUR     0.00    .10    .20    .30    .40    .50    .60    .70    .80    .90
 10.00 |    0.0    0.0     .1     .1     .1     .1     .1     .1     .1     .1
 11.00 |     .1     .1     .2     .2     .2     .2     .3     .5     .8    1.1
 12.00 |    1.9    3.0    2.6    2.0    1.5    1.1     .8     .6     .5     .5
 13.00 |     .4     .4     .4     .3     .3     .3     .3     .3     .3     .3
 14.00 |     .3     .3     .2     .2     .2     .2     .2     .2     .2     .2
 15.00 |     .2     .2     .2     .2     .2     .2     .2     .2     .2     .1
 16.00 |     .1     .1     .1     .1     .1     .1     .1     .1     .1     .1
 17.00 |     .1     .1     .1     .1     .1     .1     .1     .1     .1     .1
 18.00 |     .1     .1     .1     .1     .1     .1     .1     .1     .1     .1
 19.00 |     .1     .1     .1     .1     .1     .1     .1     .1     .1     .1
 20.00 |     .1
```

```
OND 1                                EXISTING EASTERLY WETLANDS

 Qin =   10.6 CFS @ 12.19 HRS,  VOLUME=  1.01 AF
 Qout=    0.0 CFS @ 20.00 HRS,  VOLUME=  0.00 AF,  ATTEN=100%,  LAG=  468.5 MIN

ELEVATION    AREA    INC.STOR   CUM.STOR              STOR-IND METHOD
   (FT)      (AC)      (AF)       (AF)                PEAK STORAGE =      1.01 AF
    6.0      6.00      0.00       0.00                PEAK  ELEVATION=    6.1 FT
    8.0      8.70     14.70      14.70                FLOOD ELEVATION=    8.0 FT
                                                      START ELEVATION=    6.0 FT
                                                      SPAN= 10-20 HRS, dt=.1 HRS

 # ROUTE  INVERT         OUTLET DEVICES

 1   P       6.0'  NO CULVERT AND ROADWAY SPILLWAY  ELEV(FT)  DISCH(CFS)
                                                      6.0       0.00
                                                      7.0        .01
                                                      8.0        .02
                                                      8.5      93.00
                                                      9.0     349.00

                  POND 1 TOTAL DISCHARGE (CFS) vs ELEVATION

  FEET      0.0     .1      .2      .3      .4      .5      .6      .7      .8      .9
   6.0 |   0.00    0.00    0.00    0.00    0.00     .01     .01     .01     .01     .01
   7.0 |    .01     .01     .01     .01     .01     .02     .02     .02     .02     .02
   8.0 |    .02
```





POND 1 INFLOW PEAK= 10.6 CFS @ 12.19 HOURS

HOUR	0.00	.10	.20	.30	.40	.50	.60	.70	.80	.90
10.00	.1	.2	.2	.2	.2	.3	.3	.3	.4	.4
11.00	.4	.5	.6	.6	.8	.9	1.1	1.6	2.4	3.5
12.00	5.8	9.5	10.6	9.1	7.3	5.7	4.2	3.1	2.5	2.1
13.00	1.9	1.7	1.5	1.5	1.4	1.3	1.3	1.2	1.2	1.2
14.00	1.1	1.1	1.0	1.0	1.0	.9	.9	.9	.9	.9
15.00	.8	.8	.8	.8	.7	.7	.7	.7	.7	.6
16.00	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5
17.00	.5	.5	.5	.4	.4	.4	.4	.4	.4	.4
18.00	.4	.4	.4	.3	.3	.3	.3	.3	.3	.3
19.00	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3
20.00	.3									

POND 1 TOTAL OUTFLOW PEAK= 0.0 CFS @ 20.00 HOURS

HOUR	0.00	.10	.20	.30	.40	.50	.60	.70	.80	.90
10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20.00	0.0									