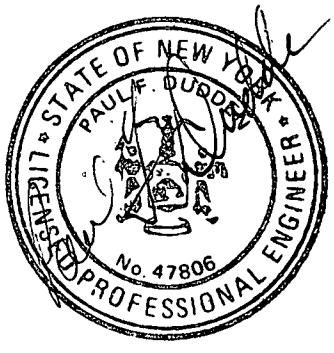
CORTLAND COUNTY, NEW YORK
OLD CORTLAND COUNTY LANDFILL CLOSURE

BASIS OF DESIGN REPORT

MAY, 2000



Barton & Loguidice, P.C.
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290 Elwood Davis Road
Box 3107
Syracuse, New York 13220

BASIS OF DESIGN REPORT

FOR

OLD CORTLAND COUNTY LANDFILL CLOSURE

MAY, 2000

PREPARED FOR: RALPH K. PITMAN
DIRECTOR
CORTLAND COUNTY SOLID WASTE DEPT.
TOWN LINE ROAD
McGRAW, NEW YORK 13101

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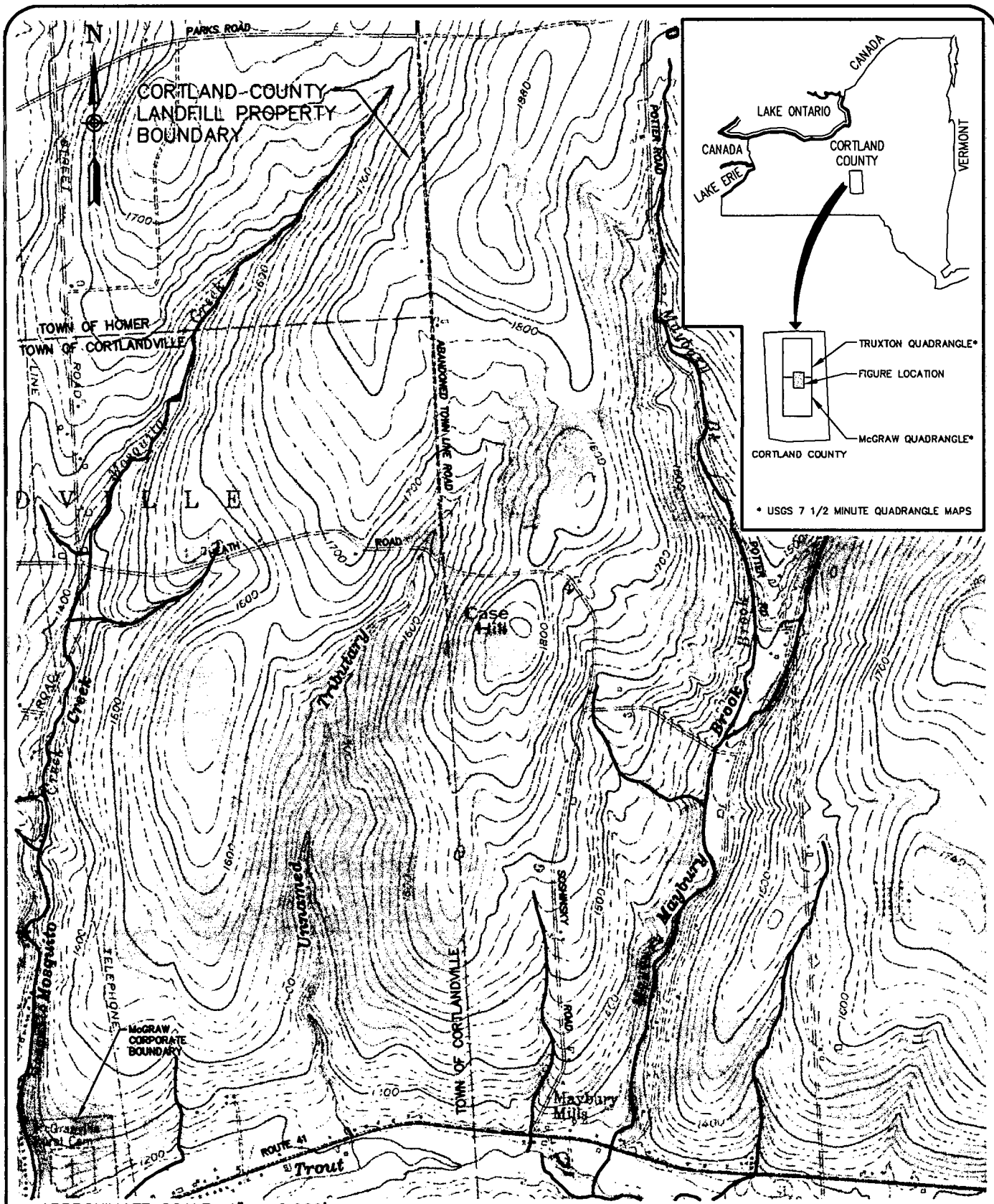
1.0 INTRODUCTION

The Old Cortland County Landfill is designated by the New York State Department of Environmental Conservation (NYSDEC) as a Class 2 inactive hazardous waste disposal site (Registry Site Number 7-12-001). In March of 2000, the NYSDEC issued the Record of Decision (ROD) for the landfill closure. The ROD was based largely on the results of the Remedial Investigation and Feasibility Study completed at the site in accordance with NYSDEC Order on Consent #B7-0486-12-95, effective May 31, 1996. The following "Basis of Design" report presents the specific components of the selected site remedy with regard to construction materials, the sequence of remedial construction activities and any modifications to the proposed remedy as presented in the July 1998 Feasibility Study Report. The approved "Basis of Design" will serve as the format from which the closure system design is developed. The Site Location Map is presented as Figure 1.

The selected site remedy was developed to meet the remedial objectives set forth as part of the Feasibility Study by implementing source control measures and eliminating potential environmental risks associated with surface debris and contamination. The scope of the remedial construction activities includes:

- the reduction of leachate generation through capping of the landfill areas with a low permeability cap system;
- the remediation of sludge and contaminated soils through excavation and relocation;
- the recovery and relocation of exposed scrap metal and drums, and;
- consolidation of the areas to be capped through relocation of thin waste areas.



APPROXIMATE SCALE: 1" = 2,000'

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OLD CORTLAND COUNTY LANDFILL
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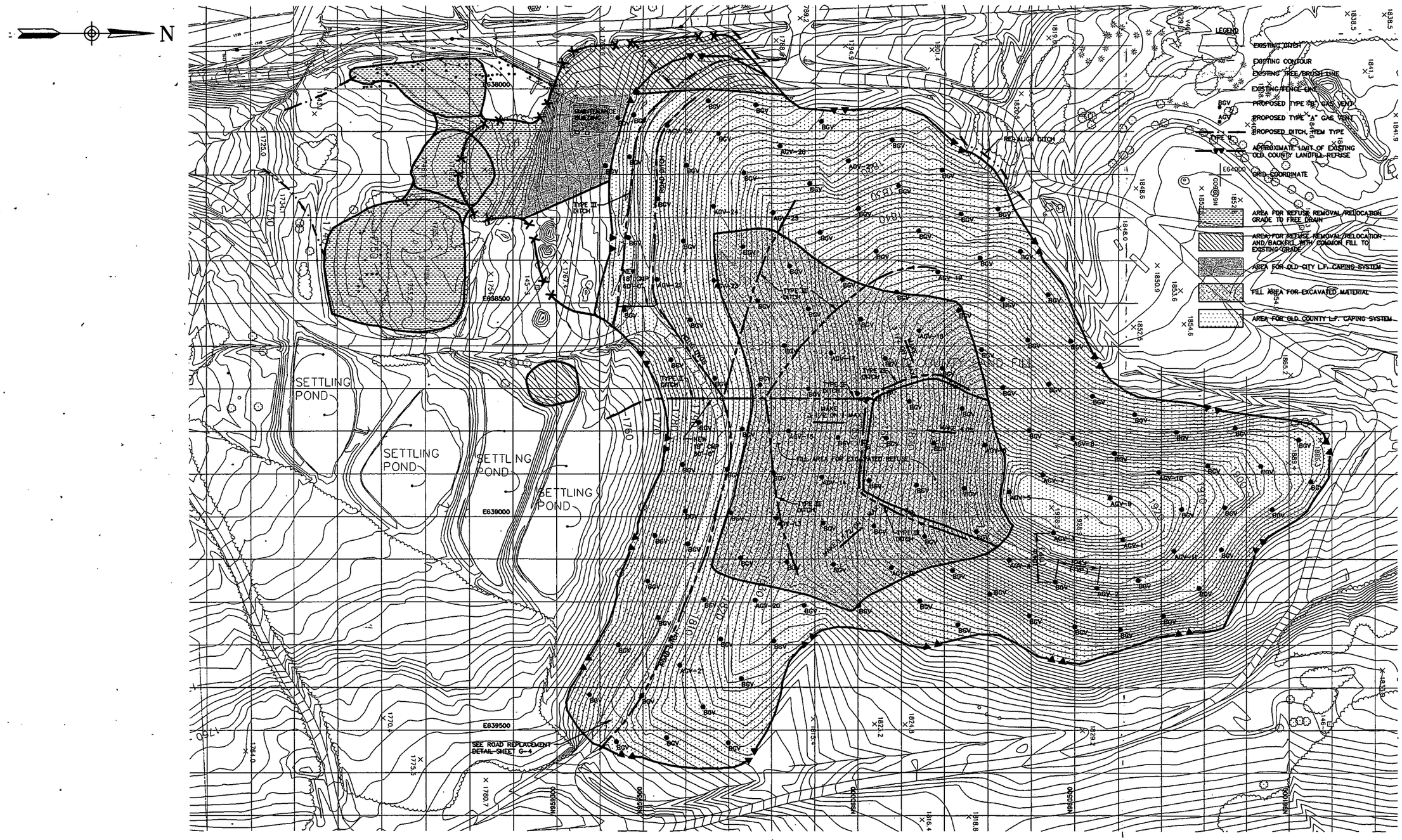
SITE LOCATION MAP

TOWN OF SOLON CORTLAND COUNTY

Figure
1
Project No.
331.032

The combination of the solutions presented above will provide the greatest benefit to the environment while remaining cost effective. Moreover, these solutions rely on technologies which are passive in nature and, therefore, will significantly reduce operational and maintenance costs. Figure 2 presents the Site Plan for construction work elements associated with the closure of the Old County Landfill.



In charge of: PFD Designed by: JPS Drawn by: AES Checked by:	Date: APRIL, 2000 Scale: NOT TO SCALE RD ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW	REVISIONS	COMPLETED CONSTRUCTION Significant Construction Changes Are Shown By _____ Date _____ Ck'd _____ Date _____

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OLD CORTLAND COUNTY LANDFILL
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SITE PLAN

TOWN OF SOLON — CORTLAND COUNTY, NEW YORK

Figure 2

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2.0 SCRAP METAL/DRUM HANDLING AND RELOCATION

A number of drums (in various states of disintegration) occur at the surface and partially buried within an area to the south of the Abandoned City of Cortland Landfill, and to the north of the former Buckbee-Mears sludge disposal areas. This area was referred to as the "Scrap Metal Area" in the Feasibility Study Report. A smaller waste disposal area, also including a few drums and buried scrap metal, occurs adjacent to the two ponds located closest to the Old County Landfill.

Excavation and relocation of the wastes within these areas will include overpacking those drums containing liquid waste residues. The overpacked drums will then be transported to an appropriate off-site incineration facility. It is estimated that approximately 13 drums will require this level of handling and disposal. The remaining empty drums, miscellaneous wastes and scattered scrap metals will be relocated to the Old County Landfill prior to its capping. Due to the high water table adjacent to the isolated smaller scrap metal disposal area, excavation will not continue beyond the point that groundwater begins to enter the excavation.

3.0 CONTAMINATED SOILS/SLUDGE EXCAVATION AND RELOCATION

Contaminated soils and sludge were identified within the former Buckbee-Mears disposal areas, the scrap metal area, and the isolated buried waste area. For purposes mentioned above, only those wastes and associated contaminated soils above the water table will be removed from the small isolated buried waste area and relocated to the Old County Landfill. However, the contaminated soils within the former Buckbee-Mears sludge disposal areas and the scrap metal area will be completely excavated and then relocated to the Old County Landfill. The FS Report indicated that since the depth of these soils was relatively shallow (approximately 10 feet), it would be more cost effective to relocate them than it would be to cap over them.

Due to their close proximity, the excavations associated with the two Buckbee-Mears disposal areas and the Exposed Scrap Metal Area will be combined for ease of operation and to provide better drainage upon completion. The excavation areas will maintain the maximum recommended slopes for establishing vegetative growth and erosion control. Culverts will be placed appropriately in areas requiring drainage beneath existing access roads.

4.0 CONSOLIDATION OF THIN WASTE AREAS

Thin and/or odd-shaped waste disposal areas contiguous to larger waste masses are often consolidated with these larger waste areas as a means to reduce the overall area to be capped, thereby lowering capping construction costs. Most of the waste area associated with the Abandoned City of Cortland Landfill is relatively thin (less than 10 feet thick). Complete excavation and consolidation of this waste area is not possible, however, due to the presence of the County's maintenance facility. Nonetheless, two areas have been designated (one to the south and the other to the east of the maintenance facility) for excavation and consolidation with the Old County Landfill prior to capping. The removal of the ash waste from the southern area will be completed coincident with the excavation of contaminated soil and sludge from the adjacent scrap metal area and the former Buckbee-Mears disposal areas. Accordingly, this area will be graded such that surface water drainage is maintained with the contiguous waste excavation areas.

5.0 CAP CONSTRUCTION

A properly designed landfill cap provides satisfactory waste containment while reducing surface water (precipitation) infiltration, controls emissions of explosive gases and odors, limits the potential damage caused by vectors, and eliminates possible dermal contact and incidental ingestion of exposed waste by foraging wildlife.

A NYSDEC Part 360 landfill cap system will be constructed as the final cover for both the Old County Landfill and the Abandoned City Landfill. In both cases, the landfill cap will primarily serve to reduce the quantity of leachate produced by the landfill by limiting the amount of precipitation that will infiltrate through the top and sideslopes of the landfill. Due to distinct differences in the functions of these two areas, however, modifications to the standard Part 360 capping system have been incorporated into the closure of the Abandoned City Landfill. Both systems are described in detail below.

5.1 Part 360 Capping System

As indicated above, a NYSDEC Part 360 capping system will be implemented as the final cover for the Old County Landfill. Essentially, there are two types of capping systems that constitute a Part 360 cap; one that uses a low permeability soil as the barrier protection layer and the other that incorporates a geomembrane to serve as this layer. The preliminary evaluation performed as part of the July 1998 Feasibility Study (FS) Report indicated that a Part 360 geomembrane cap system would be more cost effective at this site.

The FS Report selected PVC (polyvinyl chloride) as the geomembrane to be used in this capping system. This selection was largely based on the cost of this material at the time the FS was prepared. Since that time, however, the cost of alternate geomembrane materials (e.g., linear low-density polyethylene - LLDPE) has become competitive with

PVC. As a result, the design calculations presented herein (specifically for slope stability) were performed using both types of geomembrane to evaluate and pre-qualify the use of either material.

Implementation of the proposed Part 360 geomembrane capping system within the limits of the Old County Landfill will include:

- Stripping away the existing topsoil and vegetative cover;
- Relocation of excavated materials from former Buckbee-Mears sludge disposal areas, scrap metal area and isolated buried waste area;
- Regrading and smoothing of cap subgrade with the addition of supplemental bedding materials, as necessary, to provide an appropriate base for the geomembrane;
- Placement of geomembrane above prepared subgrade;
- Placement of 1-foot thick granular drainage layer above geomembrane;
- Placement of 6-ounce geotextile above granular drainage layer;
- Placement of 1-foot thick barrier protection layer above the geotextile;
- Placement of 6-inch topsoil layer above the barrier protection layer; and
- Creation of vegetative cover layer.

The effectiveness of this capping system at reducing the amount of future infiltration into the waste mass was evaluated using the HELP Model (Schroeder et al., Hydrologic Evaluation of Landfill Performance – HELP Model, 1996). To perform this evaluation, it was necessary to initially model the volume of leachate generated under existing site conditions.

A preliminary model was run for a period of 5 years to simulate the measured water level within the waste mass (water level recorded at EB-1). This simulation was developed by calibrating the permeability of the material underlying the waste until the computer-

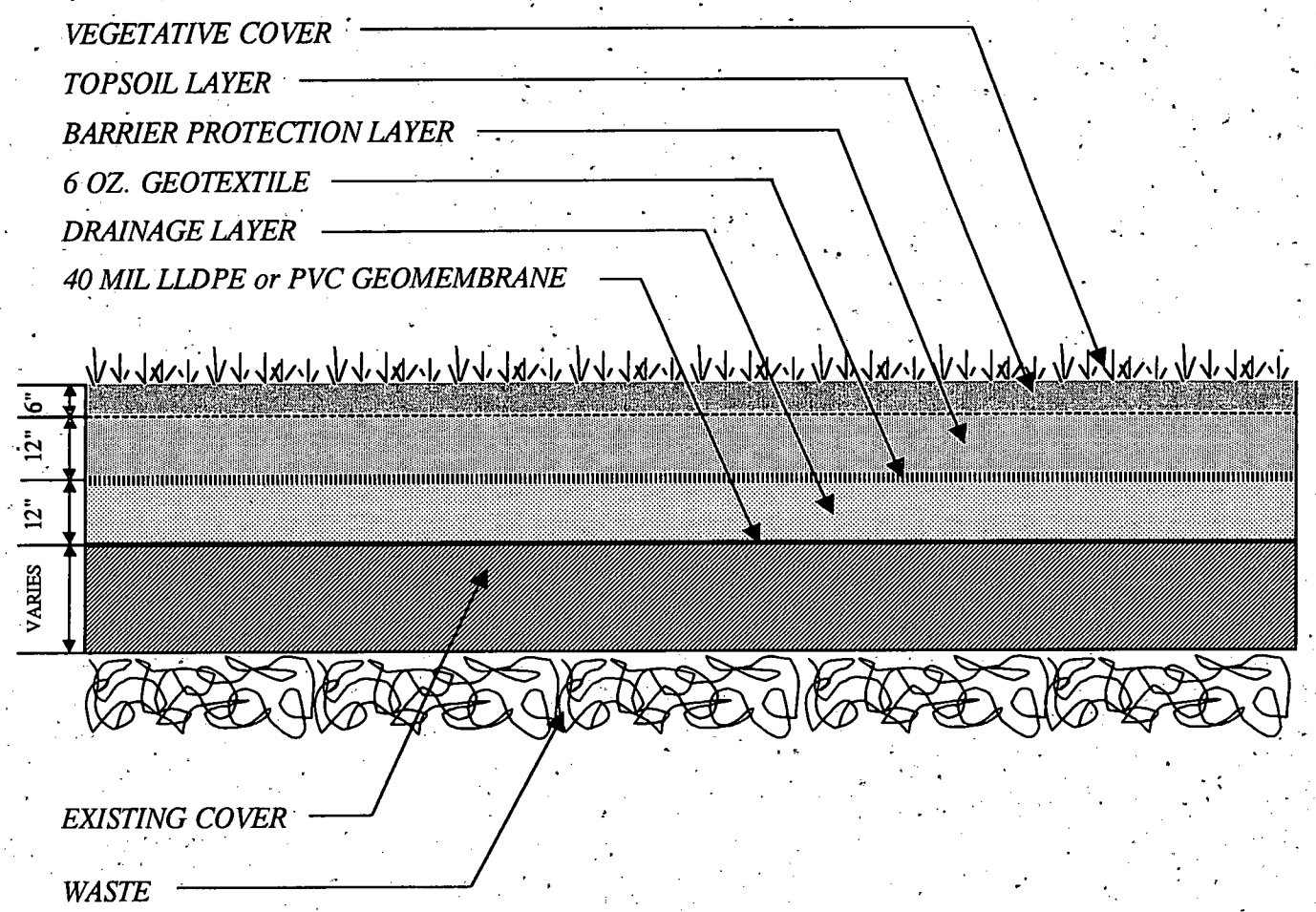
generated water level within the waste equaled the known values. Calibration of the model yielded a vertical permeability value of the thin till layer underlying the waste of 6.7×10^{-8} cm/sec. This value is reasonable when compared to the test results for samples of on-site soils collected and analyzed during the Remedial Investigation.

The cross-section for the Part 360 geomembrane cap was then added to the existing conditions model. Six consecutive five-year blocks were run to simulate the regression of leachate generation during the 30-year post-closure monitoring period. Successive runs were initialized with the ending moisture content values from the previous run. Separate analyses were performed for the use of LLDPE and PVC as the geomembrane material.

The results of this analysis indicate that under current conditions, approximately 5½ million gallons of leachate discharges from the landfill each year. The modeling results further indicate that, for either LLDPE or PVC, the volume of leachate discharged from the landfill during the first ten years following capping, will be reduced by approximately 50%. The model also predicts that this regression continues to the point that over the next ten years, leachate discharge will be reduced to approximately 80% of existing conditions, and then to within 95%-99% by the end of the 30-year post-closure period.

It is noted that the results of this modeling exercise are based on conservative input values and, therefore, likely represent a worst-case scenario. That is, the actual unloading of leachate within the landfill is likely to occur within a shorter time frame. Appendix A includes the HELP model results for existing conditions and the estimated reduction in future leachate generation.

Figure 3 presents a schematic drawing of the Typical Part 360 geomembrane cap. Appendix B presents the stability analysis used to evaluate the capping system preliminary design.



NOTE: This cap to be installed over the limits of the Old Cortland County Landfill.

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OLD CORLAND COUNTY LANDFILL
BASIS OF DESIGN REPORT

TYPICAL PART 360 CAP DETAIL

TOWN OF SOLON CORTLAND COUNTY, NY

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5.2 Modified Part 360 Capping System

The 1998 Final Remedial Investigation Report characterized the wastes within the Abandoned City of Cortland Landfill as predominantly ash with scattered debris. The nature of these wastes does not suggest that a significant contaminant contribution to groundwater is possible from the leachate generated within the ash. Nonetheless, this waste disposal area will be capped, along with the Old County Landfill, as part of the overall landfill closure program.

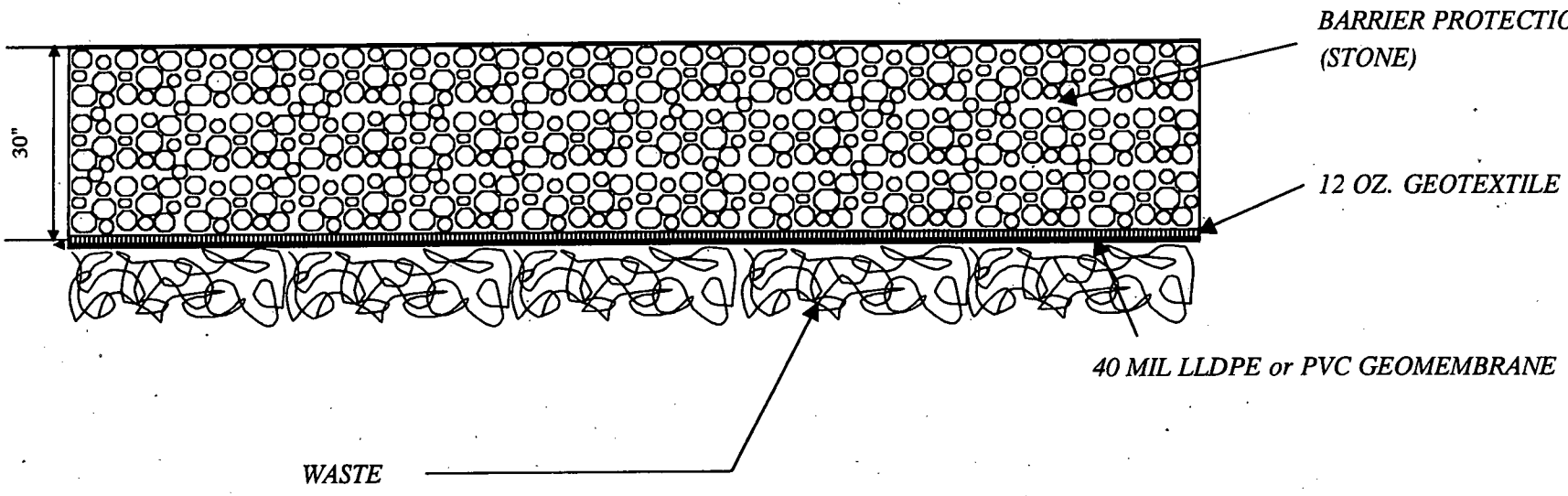
The 1998 Final Feasibility Study Report indicated that a modified NYSDEC Part 360 capping system would be implemented as the final cover for the Abandoned City of Cortland Landfill. The location of the County's landfill maintenance facility within the limits of this waste area, and its continued use beyond the closure of the inactive landfills, necessitated the use of materials which would be able to stand up to the weight of daily landfill operation vehicle traffic. Obviously, the same construction materials used to cap the Old County Landfill would not be conducive to these conditions. As a result, the entire 30-inch barrier protection layer above the geomembrane (previously indicated as a 12-inch granular drainage layer, underlying a 12-inch barrier protection (soil) layer, underlying a 6-inch topsoil/vegetative cover layer), was proposed to consist entirely of stone. This substitution will not only accommodate the daily vehicle traffic, but will also serve to promote drainage from above the geomembrane and away from the maintenance facility.

A puncture resistance analysis was performed to evaluate the factors of safety associated with maintaining the integrity of the geomembrane under typical and worst-case loading for landfill operations equipment. Separate analyses were performed to evaluate the resistance of both LLDPE and PVC. The analyses simulated the distribution of the forces applied through a 2½-foot thick crushed stone layer above the geomembrane resulting from the impact of a standard landfill compactor. The typical loading case represented the normal distribution of the landfill compactor's weight, while the worst-case

loading simulated all of the compactor's weight brought to a single point source. In both cases, the analysis indicated that the 2½ feet of crushed stone adequately protects the LLDPE or PVC geomembrane against puncture. The puncture resistance analyses are presented as parts of Appendix B.

Placement of the crushed stone directly against the LLDPE or PVC during construction is typically not a recommended practice, as this could potentially result in damaging the geomembrane prior to achieving the final 2½-foot thickness. A 12-ounce geotextile will be placed directly above the geomembrane to provide necessary protection during cap construction. This added protection will also ensure the long-term protection of the geomembrane in the event that certain landfill operations (e.g., snow removal) results in the "thinning" of the stone layer in areas. Periodic spot surveying within the modified cap area is recommended to maintain an appropriate thickness of the stone.

Installation of the modified Part 360 cap within the vicinity of the maintenance facility will require partial removal of the waste ash to a depth of 2½ feet to prepare an appropriate subgrade for the geomembrane. At this time, it is anticipated that the geomembrane will be placed directly above the waste ash. However, it may be necessary to provide a thin bedding layer in areas that cannot establish a smooth and even surface. In these areas, an additional six inches of waste will be removed to accommodate the bedding layer below the geomembrane. Figure 4 presents a schematic drawing of the modified Part 360 cap.



NOTE: This cap to be installed over a portion of the Abandoned City of Cortland Landfill.
If necessary, a thin bedding layer will be placed above the waste for protection of the geomembrane.

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OLD CORLAND COUNTY LANDFILL
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MODIFIED PART 360 CAP DETAIL

TOWN OF SOLON CORTLAND COUNTY, NY

Figure
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6.0 SLOPE STABILITY

The stability of the proposed capping system and the relocated waste mass was evaluated to verify the constructability of these remedial design elements. Figure 2 identifies the area within the Old County Landfill designated to receive the relocated sludge and contaminated soils prior to capping. As shown, the relocated wastes are to be placed such that the new surface does not exceed a slope of 3½:1. A stability analysis was performed using the computer modeling software PCSTABLE6™ to evaluate the factor of safety associated with the placement of the soil/sludge mixture within this area both during construction and under post-closure conditions. This analysis demonstrated acceptable factors of safety for both conditions. Appendix B includes the input parameters used in the analyses as well as the resulting factors of safety.

A veneer stability analysis was also performed to evaluate the constructability of the proposed geomembrane capping system. Separate analyses were completed for scenarios involving the use of either LLDPE or PVC as the geomembrane material. The output from the HELP model was used to identify the estimated head of water which will develop within the sand drainage layer above the geomembrane. In both scenarios, the steepest slope of 3½:1 was used to calculate the worst-case factor of safety. The factors of safety for the PVC geomembrane was determined to be 1.56 under these conditions, while the LLDPE geomembrane indicated a factor of safety of 1.78. Therefore, the use of either material is appropriate for maintaining adequate factors of safety for slope stability. The veneer stability analysis is included as part of Appendix B.

7.0 LANDFILL GAS MANAGEMENT SYSTEM

Landfill gases generated within the waste mass will be managed passively through the installation of gas vents, at a frequency of four vents per acre. One of these will be installed as a deep vent to relieve gases within the deeper portions of the waste. NYSDEC Part 360 typically requires a 12-inch thick gas venting layer beneath the barrier layer (in this case the geomembrane) with one vent per acre. The greater frequency of gas vents in lieu of the gas venting layer, however, as recommended by the 1993 NYSDEC Guidance of Landfill Closure Regulatory Relief, is an acceptable variance from Part 360.

It is not possible at this point to evaluate the concentrations and types of emissions resulting from the installation of the landfill gas management system as described above. Immediately following the completion of the cap construction, however, representative emission sampling will be conducted from both shallow and deep gas vents. In addition, a qualitative study will be conducted to evaluate odor strength and potential migration to off-site receptors. Once these conditions have been characterized, it will be possible to evaluate the need to implement emission controls.

A line of shallow gas vents will be installed within the Abandoned City of Cortland Landfill waste limits, adjacent to the Old Cortland County Landfill perimeter, to relieve gases potentially migrating to this area of the site. No gas vents will be installed within the high traffic areas.

8.0 STORM WATER RUNOFF MANAGEMENT SYSTEM

Proper storm water management is essential to maintain the integrity of the landfill cover system. NYSDEC Part 360-2.15(k)2 requires that "drainage control structures must be designed, graded, and maintained to prevent ponding and erosion to the cover. The surface drainage system must be designed and constructed to protect the cover from, at a minimum, the peak discharge from a 24-hour, 25-year frequency storm". For the Cortland County area, the 24-hour/25-year storm event used was 4.6 inches. The following section presents the analysis of storm water runoff at the Old Cortland County Landfill relative to post-closure conditions, in order to assess the adequacy of the proposed storm water management system. Figure 2 identifies the locations of the proposed storm water runoff management features.

The capping system for the Old County Landfill proposes a combination of three stone-lined ditch types as components of the storm water management system. These include Type II ditches to serve as downchutes essentially perpendicular to the landfill slopes; Type III ditches which will oriented roughly diagonal to the slopes; and the Road Ditch located along the access road between the ponds and the landfill. Manning's equation was used to analyze the hydraulic capacity of the proposed stone-lined ditches at the site, while the Rational Method for runoff analysis was used to estimate the site specific maximum flows within each of the ditch types. The results of these calculations were then used to determine appropriate factors of safety for the ditches. In each case, the size of the ditch was determined to be adequate to manage peak flows, as demonstrated by acceptable factors of safety.

Manning's equation was also used to size two culverts to be installed at specific locations along the site access road to direct storm water flow away from the landfill. This analysis considered the results from the previous exercise, which determined flows within the ditches leading to the culverts. The "eastern" culvert, located to the west of the maintenance facility and north of the former Buckbee-Mears sludge disposal area (western disposal area), will require a minimum 24-inch diameter CMP culvert. The "western" culvert, however, located

approximately north of the settlement ponds, will receive less storm water volume, and therefore, will only require an 18-inch CMP culvert.

Appendix C includes the storm water runoff calculations used to determine the factors of safety for the storm water diversion ditches, as well as the sizing calculations for the two culverts required as part of the cap installation.

9.0 CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL

A Construction Quality Assurance/Quality Control Plan will be prepared and submitted by the contractor awarded this project. The requirements of this plan will be outlined in the forthcoming technical construction specifications. Throughout the construction project, the contractor will remain responsible for the collection and analysis of QA/QC samples from all materials requiring such documentation, including samples collected and analyzed from material failure areas. The Construction Certification Report will provide documentation all QA/QC test data collected by the contractor during the construction project.

10.0 INSTITUTIONAL CONTROLS

In order to prevent the private or commercial usage of contaminated groundwater, deed restrictions will be imposed for the area of the site where landfill leachate impacts to groundwater have been or could be observed. In addition, a sign will be posted at the site entrance indicating the Old Cortland County Landfill and associated waste areas as a closed Inactive Hazardous Waste Disposal Site.

11.0 POST-CLOSURE MONITORING AND SITE MAINTENANCE

Prior to the completion of the construction program, a Post-Closure Monitoring and Site Maintenance Plan will be prepared to identify the site activities required during the post-closure period. This plan will address specific site activities to be undertaken in order to maintain the integrity of the various closure systems. This will include maintenance of the capping system, the storm water management system and the landfill gas management system, as well as requirements associated with the maintenance and sampling of designated groundwater and surface water monitoring locations. Protocols for laboratory testing and a proposed sampling schedule will be included with this submittal.

A contingency plan will also be included as part of this Post-Closure Monitoring and Maintenance Plan. This plan will establish response and/or corrective actions to be undertaken in the event that undesirable conditions develop at the site, which may result in impacts to any of the systems mentioned above or which may result in potential harm to site workers, wildlife or the environment.

12.0 CONSTRUCTION COST ESTIMATE

Table 1 presents the updated construction cost estimate for the items presented in this Basis of Design Report.

TABLE 1
CONSTRUCTION COST ESTIMATE
Basis Of Design Report
Old Cortland County Landfill, Cortland County, NY

Construction Item #	Construction Item Description	Quantity	Units	Unit Cost	Total Item Cost
1	**WASTE AREA EXCAVATION, RELOCATION & REGRADING**				
	Buckbee-Mears Sludge Disposal Areas				
	A. Clearing & grubbing	2.50	acres	$5,000	$12,500
	B. Strip existing topsoil to 3 ft. below grade; replace topsoil along slopes and bottom of excavation	12,100	cy	$4	$48,400
	C. Excavate, haul & spread sludge waste & soil to a depth of 10 ft.	28,300	cy	$5	$141,500
	D. Seeding & mulching	2.50	acres	$1,400	$3,500
	Exposed Scrap Metal Area - Contaminated Soils				
	A. Excavate, haul & spread contaminated soils and scrap metal to 10 ft.	17,000	cy	$5	$85,000
	B. Purchase, delivery & placement of topsoil	1,700	cy	$8	$13,600
	C. Seeding & mulching	1.05	acres	$1,400	$1,470
	Isolated Buried Waste Area - Contaminated Soils				
	A. Excavate, haul & spread contaminated soils and buried wastes to a depth of approx. 3 ft.	1,210	cy	$5	$6,050
	B. Purchase, delivery & placement of topsoil	400	cy	$3	$1,200
	C. Seeding & mulching	0.25	acres	$1,400	$350
	Abandoned City of Cortland Landfill - Thin Waste Area Relocation				
	A. Clearing & grubbing	2.15	acres	$5,000	$10,750
	B. Strip existing topsoil and stockpile (~1 ft.)	2.15	acres	$2,500	$5,375
	C. Excavate, haul & spread waste to approx. 8 ft. below grade	24,300	cy	$5	$121,500
	D. Load, haul & backfill on-site materials	22,600	cy	$3	$67,800
	E. Purchase, delivery & placement of stone protective cover to match Modified Part 360 Cap in high-traffic area (30-inch layer)	1,700	cy	$10	$17,000
	D. Seeding & mulching (remaining area not covered by stone)	0.83	acres	$1,400	$1,162
	SUBTOTAL:				$537,157
2	**DRUM HANDLING & DISPOSAL**				
	A. Clearing & grubbing	1.05	acres	$2,500	$2,625
	B. Isolate, Overpack, Ship & Dispose of Drums Containing Liquid Wastes	13	drums	$600	$7,800
	SUBTOTAL:				$10,425
3	**NYSDEC PART 360 GEOMEMBRANE CAP**				
	A. Strip existing topsoil	39.3	acres	$2,500	$98,250
	B. Remove rocks & grade existing soil	39.3	acres	$1,000	$39,300
	C. Purchase, delivery & placement of 40 mil geomembrane	1,712,000	sf	$0.40	$684,800
	D. Purchase, delivery & placement of sand drainage layer (12", 1E-3 cm/s)	64,000	cy	$12	$768,000
	E. Purchase, delivery & placement of 6 oz/sy geotextile	1,712,000	sf	$0.12	$205,440
	F. Purchase, delivery & placement of protective cover soil (18 in.)	96,000	cy	$15	$1,440,000
	G. Purchase & placement of gas vents				
	1. Shallow Gas Vents (3/acre)	117	each	$1,000	$117,000
	2. Deep Gas Vents (1/acre)	39	each	$2,600	$101,400
	H. Seeding & mulching	39.3	acres	$1,400	$55,020
	I. Purchase, delivery & placement of Type III riprap for downchutes TYPE II DITCH (~620 LF)	400	cy	$50	$20,000
	J. Purchase, delivery & placement of Type II riprap for diversion berm ditch (TYPE III) and road ditch (~4,550 LF)	760	cy	$45	$34,200
	K. Purchase, delivery & placement of Type D stone for landfill perimeter trenches and toe drain (~6,000 LF)	4,000	cy	$18	$72,000
	L. Side slope diversion berm construction (~2,950 LF)	700	cy	$8	$5,600
	M. Materials testing	39.3	acres	$3,000	$118,000
	SUBTOTAL:				$3,759,010
4	**MODIFIED PART 360 GEOMEMBRANE CAP**				
	A. Strip existing topsoil	1	acres	$2,500	$2,500
	B. Excavate, haul & spread existing cover soil and waste to 2½' below grade (haul road and adjacent to maint. fac.)	4,050	cy	$5	$20,250
	C. Remove rocks & grade existing surface	1	acres	$1,000	$1,000
	D. Purchase, delivery & placement of 40 mil geomembrane	43,560	sf	$0.40	$17,424
	E. Purchase, delivery & placement of 12 oz.sy geotextile	43,560	sf	$0.16	$6,970
	F. Purchase, delivery & placement of stone protective cover soil (30 in)	4,050	cy	$10	$40,500
	G. Purchase & placement of gas vents				
	A. Shallow Gas Vents (4/acre)	5	each	$1,000	$5,000
	H. Purchase, delivery & placement of stone for landfill perimeter trenches and toe drain (~570 LF)	380	cy	$18	$6,840
	I. Materials testing	1	acres	$2,500	$2,500
	SUBTOTAL:				$102,984

TOTAL CONSTRUCTION COSTS: **$4,409,576**

APPENDIX A

HELP MODEL RESULTS

- Existing Conditions
- Leachate Regression Analysis
  - *LLDPE Geomembrane*
  - *PVC Geomembrane*

EXISTING CONDITIONS MODEL

EXISTING CONDITIONS MODEL

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**                                                                  **
**                                                                  **
**            HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE          **
**                 HELP MODEL VERSION 3.05a  (5 JUNE 1996)           **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY            **
**                   USAE WATERWAYS EXPERIMENT STATION              **
**           FOR USEPA RISK REDUCTION ENGINEERING LABORATORY         **
**                                                                  **
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OUTPUT DATA FILE:           C:\HELP305\CORTEXT.OUT


TIME:   8:44     DATE:   5/19/2000


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    TITLE:  OLD CORTLAND CO. LF CLOSURE: LEACHATE REDUCTION ANALYSIS

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.


                                LAYER  1
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   0
          THICKNESS                     =     24.00   INCHES
          POROSITY                      =      0.5010 VOL/VOL
          FIELD CAPACITY                =      0.2840 VOL/VOL
          WILTING POINT                 =      0.1350 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.2840 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-05 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.6710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 9 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER. = 82.20

FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.680	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	10.020	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.700	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	225.828	INCHES
TOTAL INITIAL WATER	=	225.828	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK
WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	6.839	24826.613	18.47
EVAPOTRANSPIRATION	23.327	84677.531	63.01
PERC./LEAKAGE THROUGH LAYER 4	5.223144	18960.014	14.11
AVG. HEAD ON TOP OF LAYER 4	126.7148		
CHANGE IN WATER STORAGE	1.630	5918.469	4.40
SOIL WATER AT START OF YEAR	225.828	819755.437	
SOIL WATER AT END OF YEAR	227.458	825673.875	
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	-0.055	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	8.507	30878.645	20.76
EVAPOTRANSPIRATION	25.113	91158.383	61.28
PERC./LEAKAGE THROUGH LAYER 4	5.194410	18855.709	12.68
AVG. HEAD ON TOP OF LAYER 4	125.8596		
CHANGE IN WATER STORAGE	2.167	7864.647	5.29
SOIL WATER AT START OF YEAR	227.458	825673.875	
SOIL WATER AT END OF YEAR	227.302	825106.625	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.024	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	12.930	46934.352	29.09
EVAPOTRANSPIRATION	26.151	94929.062	58.83
PERC./LEAKAGE THROUGH LAYER 4	5.310610	19277.516	11.95
AVG. HEAD ON TOP OF LAYER 4	128.7943		
CHANGE IN WATER STORAGE	0.059	212.506	0.13
SOIL WATER AT START OF YEAR	227.302	825106.625	
SOIL WATER AT END OF YEAR	228.029	827744.937	
SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.085	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	14.140	51329.242	30.54
EVAPOTRANSPIRATION	24.120	87553.906	52.09
PERC./LEAKAGE THROUGH LAYER 4	5.318691	19306.850	11.49
AVG. HEAD ON TOP OF LAYER 4	129.4599		

CHANGE IN WATER STORAGE	2.721	9879.020	5.88
SOIL WATER AT START OF YEAR	228.029	827744.937	
SOIL WATER AT END OF YEAR	232.139	842665.937	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00
RUNOFF	9.008	32698.463	28.11
EVAPOTRANSPIRATION	20.486	74363.437	63.94
PERC./LEAKAGE THROUGH LAYER 4	5.567645	20210.551	17.38
AVG. HEAD ON TOP OF LAYER 4	136.6513		
CHANGE IN WATER STORAGE	-3.021	-10967.323	-9.43
SOIL WATER AT START OF YEAR	232.139	842665.937	
SOIL WATER AT END OF YEAR	227.478	825743.937	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	0.061	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	0.650	0.617	3.650	2.514	0.051	0.166
	0.510	0.041	0.887	0.525	0.077	0.597
STD. DEVIATIONS	0.900	0.741	1.300	2.723	0.029	0.191
	1.068	0.031	1.133	0.635	0.124	1.002
EVAPOTRANSPIRATION						
TOTALS	0.435	0.476	0.412	1.126	2.980	3.596
	5.297	3.213	3.021	1.762	1.073	0.449
STD. DEVIATIONS	0.055	0.051	0.126	0.529	0.624	0.603
	0.660	0.832	0.535	0.077	0.101	0.094
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.4578	0.4144	0.4525	0.4349	0.4497	0.4381
	0.4519	0.4516	0.4354	0.4482	0.4347	0.4538
STD. DEVIATIONS	0.0149	0.0134	0.0154	0.0147	0.0130	0.0140
	0.0140	0.0135	0.0130	0.0125	0.0108	0.0123

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4						
AVERAGES	131.5092	130.7782	129.7172	128.6505	128.7639	129.7861
	129.5038	129.4134	128.8236	128.2655	128.5867	130.1535
STD. DEVIATIONS	5.0451	5.2818	5.2423	5.1459	4.4049	4.9048
	4.7497	4.6025	4.5685	4.2578	3.7932	4.1865

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	10.285	(3.1034)	37333.46	25.611
EVAPOTRANSPIRATION	23.839	(2.1537)	86536.46	59.364
PERCOLATION/LEAKAGE THROUGH LAYER 4	5.32290	(0.14708)	19322.127	13.25489
AVERAGE HEAD ON TOP OF LAYER 4	129.496	(4.262)		
CHANGE IN WATER STORAGE	0.711	(2.3109)	2581.46	1.771

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.200	7986.9487
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.015586	56.57553
AVERAGE HEAD ON TOP OF LAYER 4	140.129	
SNOW WATER	7.10	25775.8906
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4784	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1424	

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	8.4594	0.3525
2	119.1423	0.2920
3	88.5720	0.6710
4	11.3040	0.4710
SNOW WATER	1.906	

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LEACHATE REGRESSION ANALYSIS for LLDPE GEOMEMBRANE

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**                                                                           **
**                                                                           **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)                 **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                     USAE WATERWAYS EXPERIMENT STATION                     **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY            **
**                                                                           **
**                                                                           **
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PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\DT1-5PE.D10
OUTPUT DATA FILE:            C:\HELP305\CTPE1-5.OUT


TIME:   8:59     DATE:   5/25/2000


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     TITLE:  OLD CORTLAND CO LF CLOSURE: LLDPE REDUCTION YEARS 1-5

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                LAYER  1
                                --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER   0
          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    =    0.1310 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     = 0.999999975000E-05 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1310	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0450	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	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.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3525	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.6710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.448	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	230.370	INCHES
TOTAL INITIAL WATER	=	232.276	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	15.203	55188.207	41.07
EVAPOTRANSPIRATION	19.220	69767.359	51.92
DRAINAGE COLLECTED FROM LAYER 3	0.5919	2148.649	1.60
PERC./LEAKAGE THROUGH LAYER 4	0.008176	29.680	0.02
AVG. HEAD ON TOP OF LAYER 4	0.8150		
PERC./LEAKAGE THROUGH LAYER 8	5.237165	19010.908	14.15
AVG. HEAD ON TOP OF LAYER 8	127.1231		
CHANGE IN WATER STORAGE	-3.232	-11732.508	-8.73
SOIL WATER AT START OF YEAR	234.600	851597.937	
SOIL WATER AT END OF YEAR	233.274	846784.250	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.040	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.459	56114.555	37.72

EVAPOTRANSPIRATION	21.480	77970.992	52.41
DRAINAGE COLLECTED FROM LAYER 3	2.0433	7417.357	4.99
PERC./LEAKAGE THROUGH LAYER 4	0.026825	97.375	0.07
AVG. HEAD ON TOP OF LAYER 4	2.8225		
PERC./LEAKAGE THROUGH LAYER 8	4.840958	17572.678	11.81
AVG. HEAD ON TOP OF LAYER 8	115.6950		
CHANGE IN WATER STORAGE	-2.842	-10318.199	-6.94
SOIL WATER AT START OF YEAR	233.274	846784.250	
SOIL WATER AT END OF YEAR	228.109	828034.125	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.028	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.665	78642.766	48.74
EVAPOTRANSPIRATION	22.297	80939.781	50.16
DRAINAGE COLLECTED FROM LAYER 3	2.3889	8671.803	5.37
PERC./LEAKAGE THROUGH LAYER 4	0.031092	112.864	0.07
AVG. HEAD ON TOP OF LAYER 4	3.3017		
PERC./LEAKAGE THROUGH LAYER 8	4.446113	16139.389	10.00
AVG. HEAD ON TOP OF LAYER 8	103.9405		
CHANGE IN WATER STORAGE	-6.347	-23040.244	-14.28
SOIL WATER AT START OF YEAR	228.109	828034.125	
SOIL WATER AT END OF YEAR	222.430	807419.687	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.024	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.425	85034.523	50.60
EVAPOTRANSPIRATION	19.740	71656.617	42.64
DRAINAGE COLLECTED FROM LAYER 3	1.8559	6737.066	4.01
PERC./LEAKAGE THROUGH LAYER 4	0.024530	89.045	0.05
AVG. HEAD ON TOP OF LAYER 4	2.5686		
PERC./LEAKAGE THROUGH LAYER 8	4.048271	14695.223	8.74
AVG. HEAD ON TOP OF LAYER 8	92.8224		
CHANGE IN WATER STORAGE	-2.770	-10054.464	-5.98
SOIL WATER AT START OF YEAR	222.430	807419.687	
SOIL WATER AT END OF YEAR	221.049	802407.187	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.059	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.278	48197.609	41.44
EVAPOTRANSPIRATION	16.736	60753.043	52.24
DRAINAGE COLLECTED FROM LAYER 3	2.6999	9800.548	8.43
PERC./LEAKAGE THROUGH LAYER 4	0.034816	126.383	0.11
AVG. HEAD ON TOP OF LAYER 4	3.7407		
PERC./LEAKAGE THROUGH LAYER 8	3.697203	13420.847	11.54
AVG. HEAD ON TOP OF LAYER 8	82.6915		
CHANGE IN WATER STORAGE	-4.371	-15866.904	-13.64
SOIL WATER AT START OF YEAR	221.049	802407.187	
SOIL WATER AT END OF YEAR	215.037	780585.625	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	0.046	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.230	0.579	3.821	2.698	0.504	1.037
	1.329	1.095	2.363	1.755	0.480	0.916
STD. DEVIATIONS	1.453	0.791	1.301	3.240	0.253	0.617
	1.553	0.169	2.194	1.454	0.611	1.205

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.416	1.051	2.933	3.508
	4.123	2.067	2.193	1.411	0.860	0.433
STD. DEVIATIONS	0.060	0.051	0.122	0.507	0.579	0.551
	0.901	0.741	0.480	0.131	0.118	0.094

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1589	0.1237	0.1155	0.1027	0.1275	0.1349
	0.1541	0.1865	0.1893	0.2057	0.1975	0.2197
STD. DEVIATIONS	0.1091	0.0854	0.0792	0.0640	0.0815	0.0909
	0.0839	0.0698	0.0529	0.0485	0.0491	0.0704

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0021	0.0016	0.0015	0.0014	0.0017	0.0018
	0.0020	0.0024	0.0025	0.0027	0.0026	0.0028
STD. DEVIATIONS	0.0014	0.0011	0.0010	0.0008	0.0011	0.0012
	0.0010	0.0009	0.0006	0.0006	0.0006	0.0008

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.3926	0.3548	0.3875	0.3725	0.3822	0.3673
	0.3769	0.3741	0.3595	0.3688	0.3543	0.3634
STD. DEVIATIONS	0.0522	0.0476	0.0524	0.0508	0.0524	0.0507
	0.0522	0.0520	0.0502	0.0516	0.0497	0.0511

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.5935	2.2101	1.8841	1.7317	2.0803	2.2750
	2.5148	3.0425	3.1917	3.3573	3.3308	3.5844
STD. DEVIATIONS	1.7799	1.5163	1.2921	1.0792	1.3304	1.5326
	1.3696	1.1388	0.8913	0.7907	0.8279	1.1492

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	109.3533	108.4975	107.6431	106.7529	105.8500	104.9403
	104.0273	103.0988	102.1860	101.2751	100.3671	99.4624
STD. DEVIATIONS	17.7311	17.7719	17.8115	17.8261	17.8136	17.7810
	17.7335	17.6738	17.6061	17.5316	17.4515	17.3667

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.16 (5.757)	145773.5	100.00
RUNOFF	17.806 (4.4514)	64635.54	44.340
EVAPOTRANSPIRATION	19.895 (2.1645)	72217.55	49.541
LATERAL DRAINAGE COLLECTED FROM LAYER 3	1.91600 (0.80795)	6955.084	4.77116
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02509 (0.01025)	91.069	0.06247
AVERAGE HEAD ON TOP OF LAYER 4	2.650 (1.120)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	4.45394 (0.61248)	16167.809	11.09104
AVERAGE HEAD ON TOP OF LAYER 8	104.454 (17.674)		
CHANGE IN WATER STORAGE	-3.913 (1.5043)	-14202.46	-9.743

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.567	9318.5732
DRAINAGE COLLECTED FROM LAYER 3	0.01045	37.93473
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000132	0.47819
AVERAGE HEAD ON TOP OF LAYER 4	5.286	
MAXIMUM HEAD ON TOP OF LAYER 4	10.195	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	2.2 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.014812	53.76845
AVERAGE HEAD ON TOP OF LAYER 8	131.986	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2856
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0669	0.3445
2	1.7399	0.1450
3	1.6728	0.1394
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	68.0717	0.5157
8	11.3040	0.4710
SNOW WATER	1.906	

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**                                                                  **
**            HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE          **
**                 HELP MODEL VERSION 3.05a  (5 JUNE 1996)           **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY            **
**                   USAE WATERWAYS EXPERIMENT STATION              **
**            FOR USEPA RISK REDUCTION ENGINEERING LABORATORY        **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:    C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP305\DT6-10PE.D10
OUTPUT DATA FILE:           C:\HELP305\CTPE6-10.OUT

TIME:   9: 8     DATE:   5/25/2000

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

     TITLE:  OLD CORTLAND CO LF CLOSURE: LLDPE REDUCTION YEARS 6-10

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.

                              LAYER  1
                              --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER   0
          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    =      0.3445 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1450	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1394	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	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.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.5157	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.086	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	210.808	INCHES
TOTAL INITIAL WATER	=	212.714	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.257	59014.684	43.92
EVAPOTRANSPIRATION	19.625	71238.547	53.01
DRAINAGE COLLECTED FROM LAYER 3	1.4471	5252.982	3.91
PERC./LEAKAGE THROUGH LAYER 4	0.019565	71.021	0.05
AVG. HEAD ON TOP OF LAYER 4	2.0043		
PERC./LEAKAGE THROUGH LAYER 8	3.373097	12244.343	9.11
AVG. HEAD ON TOP OF LAYER 8	73.3407		
CHANGE IN WATER STORAGE	-3.683	-13367.935	-9.95
SOIL WATER AT START OF YEAR	214.216	777604.687	
SOIL WATER AT END OF YEAR	212.440	771155.562	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.048	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.387	55853.238	37.55

EVAPOTRANSPIRATION	22.101	80226.289	53.93
DRAINAGE COLLECTED FROM LAYER 3	2.1598	7839.952	5.27
PERC./LEAKAGE THROUGH LAYER 4	0.028287	102.682	0.07
AVG. HEAD ON TOP OF LAYER 4	2.9869		
PERC./LEAKAGE THROUGH LAYER 8	3.083693	11193.804	7.52
AVG. HEAD ON TOP OF LAYER 8	64.9872		
CHANGE IN WATER STORAGE	-1.751	-6355.862	-4.27
SOIL WATER AT START OF YEAR	212.440	771155.562	
SOIL WATER AT END OF YEAR	208.366	756367.812	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	-0.010	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.548	78219.609	48.48
EVAPOTRANSPIRATION	22.139	80364.641	49.81
DRAINAGE COLLECTED FROM LAYER 3	2.2388	8126.696	5.04
PERC./LEAKAGE THROUGH LAYER 4	0.029264	106.229	0.07
AVG. HEAD ON TOP OF LAYER 4	3.0928		
PERC./LEAKAGE THROUGH LAYER 8	2.824111	10251.521	6.35
AVG. HEAD ON TOP OF LAYER 8	57.2660		
CHANGE IN WATER STORAGE	-4.300	-15608.979	-9.67
SOIL WATER AT START OF YEAR	208.366	756367.812	
SOIL WATER AT END OF YEAR	204.734	743184.625	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.031	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.486	85255.758	50.73
EVAPOTRANSPIRATION	19.173	69597.914	41.41
DRAINAGE COLLECTED FROM LAYER 3	2.2176	8049.999	4.79
PERC./LEAKAGE THROUGH LAYER 4	0.028949	105.085	0.06
AVG. HEAD ON TOP OF LAYER 4	3.0672		
PERC./LEAKAGE THROUGH LAYER 8	2.572360	9337.667	5.56
AVG. HEAD ON TOP OF LAYER 8	50.2315		
CHANGE IN WATER STORAGE	-1.149	-4172.441	-2.48
SOIL WATER AT START OF YEAR	204.734	743184.625	
SOIL WATER AT END OF YEAR	204.974	744054.125	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.127	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.279	48201.793	41.44
EVAPOTRANSPIRATION	16.834	61108.996	52.54
DRAINAGE COLLECTED FROM LAYER 3	2.7582	10012.240	8.61
PERC./LEAKAGE THROUGH LAYER 4	0.035517	128.927	0.11
AVG. HEAD ON TOP OF LAYER 4	3.8230		
PERC./LEAKAGE THROUGH LAYER 8	2.350584	8532.618	7.34
AVG. HEAD ON TOP OF LAYER 8	43.8315		
CHANGE IN WATER STORAGE	-3.182	-11550.463	-9.93
SOIL WATER AT START OF YEAR	204.974	744054.125	
SOIL WATER AT END OF YEAR	200.151	726549.000	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	0.003	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.125	0.658	3.910	2.788	0.517	1.037
	1.320	1.078	2.372	1.756	0.496	0.935
STD. DEVIATIONS	1.298	0.738	1.310	3.179	0.279	0.621
	1.555	0.170	2.208	1.453	0.627	1.225

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.425	1.078	2.831	3.376
	4.312	2.117	2.196	1.427	0.879	0.433
STD. DEVIATIONS	0.060	0.051	0.118	0.518	0.546	0.695
	0.669	0.767	0.453	0.198	0.098	0.096

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1914	0.1485	0.1391	0.1222	0.1544	0.1627
	0.1784	0.2044	0.2065	0.2226	0.2103	0.2237
STD. DEVIATIONS	0.0603	0.0466	0.0439	0.0325	0.0486	0.0610
	0.0593	0.0479	0.0373	0.0366	0.0412	0.0639

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0025	0.0020	0.0019	0.0016	0.0020	0.0021
	0.0023	0.0027	0.0027	0.0029	0.0027	0.0029
STD. DEVIATIONS	0.0007	0.0006	0.0005	0.0004	0.0006	0.0007
	0.0007	0.0006	0.0005	0.0004	0.0005	0.0008

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.2506	0.2269	0.2477	0.2379	0.2439	0.2343
	0.2403	0.2384	0.2290	0.2349	0.2256	0.2313
STD. DEVIATIONS	0.0348	0.0323	0.0354	0.0340	0.0349	0.0335
	0.0343	0.0341	0.0327	0.0336	0.0322	0.0330

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	3.1237	2.6627	2.2706	2.0611	2.5200	2.7437
	2.9110	3.3347	3.4816	3.6323	3.5466	3.6501
STD. DEVIATIONS	0.9839	0.8390	0.7159	0.5487	0.7934	1.0290
	0.9678	0.7814	0.6285	0.5975	0.6944	1.0431

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	61.1290	60.7546	60.1334	59.4975	58.8666	58.2413
	57.6211	56.9961	56.3865	55.7819	55.1818	54.5864
STD. DEVIATIONS	11.8072	12.1243	12.0340	11.9413	11.8498	11.7584
	11.6673	11.5755	11.4863	11.3980	11.3103	11.2232

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.991	(4.3257)	65309.02	44.802
EVAPOTRANSPIRATION	19.974	(2.2266)	72507.28	49.740
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.16429	(0.46784)	7856.374	5.38944
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02832	(0.00570)	102.789	0.07051
AVERAGE HEAD ON TOP OF LAYER 4	2.995	(0.648)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	2.84077	(0.40466)	10311.991	7.07398
AVERAGE HEAD ON TOP OF LAYER 8	57.931	(11.681)		
CHANGE IN WATER STORAGE	-2.813	(1.3228)	-10211.14	-7.005

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.565	9310.5566
DRAINAGE COLLECTED FROM LAYER 3	0.01137	41.27279
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000143	0.51761
AVERAGE HEAD ON TOP OF LAYER 4	5.751	
MAXIMUM HEAD ON TOP OF LAYER 4	11.066	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.4 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.009665	35.08539
AVERAGE HEAD ON TOP OF LAYER 8	77.785	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2857
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0549

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0671	0.3445
2	1.7821	0.1485
3	1.6279	0.1357
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	54.0101	0.4092
8	11.3040	0.4710
SNOW WATER	1.906	

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**                                                                           **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)                  **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                     USAE WATERWAYS EXPERIMENT STATION                     **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                           **
**                                                                           **
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PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\DT11-15P.D10
OUTPUT DATA FILE:            C:\HELP305\CTP11-15.OUT


TIME:   9:16     DATE:   5/25/2000


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     TITLE:  OLD CORTLAND CO LF CLOSURE: LLDPE REDUCTION YEARS 11-15

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.


                                LAYER  1
                                --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER   0
          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   =      0.3445 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1485	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1357	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	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.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4092	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.120	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	196.748	INCHES
TOTAL INITIAL WATER	=	198.654	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.243	58961.344	43.88
EVAPOTRANSPIRATION	19.589	71108.758	52.92
DRAINAGE COLLECTED FROM LAYER 3	1.5150	5499.370	4.09
PERC./LEAKAGE THROUGH LAYER 4	0.020373	73.953	0.06
AVG. HEAD ON TOP OF LAYER 4	2.0963		
PERC./LEAKAGE THROUGH LAYER 8	2.137713	7759.898	5.77
AVG. HEAD ON TOP OF LAYER 8	37.6948		
CHANGE IN WATER STORAGE	-2.465	-8946.753	-6.66
SOIL WATER AT START OF YEAR	200.156	726565.500	
SOIL WATER AT END OF YEAR	199.597	724537.500	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.042	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.179	55101.410	37.04

EVAPOTRANSPIRATION	21.145	76757.094	51.60
DRAINAGE COLLECTED FROM LAYER 3	2.4490	8890.042	5.98
PERC./LEAKAGE THROUGH LAYER 4	0.031807	115.458	0.08
AVG. HEAD ON TOP OF LAYER 4	3.3919		
PERC./LEAKAGE THROUGH LAYER 8	1.963324	7126.867	4.79
AVG. HEAD ON TOP OF LAYER 8	32.6562		
CHANGE IN WATER STORAGE	0.243	881.927	0.59
SOIL WATER AT START OF YEAR	199.597	724537.500	
SOIL WATER AT END OF YEAR	197.517	716987.562	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.074	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.611	78448.367	48.62
EVAPOTRANSPIRATION	22.795	82747.406	51.28
DRAINAGE COLLECTED FROM LAYER 3	2.4241	8799.471	5.45
PERC./LEAKAGE THROUGH LAYER 4	0.031509	114.379	0.07
AVG. HEAD ON TOP OF LAYER 4	3.3491		
PERC./LEAKAGE THROUGH LAYER 8	1.799196	6531.083	4.05
AVG. HEAD ON TOP OF LAYER 8	27.7733		
CHANGE IN WATER STORAGE	-4.180	-15172.844	-9.40
SOIL WATER AT START OF YEAR	197.517	716987.562	
SOIL WATER AT END OF YEAR	194.006	704240.500	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.032	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.273	84479.859	50.26
EVAPOTRANSPIRATION	19.357	70265.070	41.81
DRAINAGE COLLECTED FROM LAYER 3	2.2314	8099.972	4.82
PERC./LEAKAGE THROUGH LAYER 4	0.029131	105.744	0.06
AVG. HEAD ON TOP OF LAYER 4	3.0871		
PERC./LEAKAGE THROUGH LAYER 8	1.639804	5952.487	3.54
AVG. HEAD ON TOP OF LAYER 8	23.3203		
CHANGE IN WATER STORAGE	-0.201	-728.439	-0.43
SOIL WATER AT START OF YEAR	194.006	704240.500	
SOIL WATER AT END OF YEAR	195.194	708554.000	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.081	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.354	48473.945	41.68
EVAPOTRANSPIRATION	16.880	61273.824	52.68
DRAINAGE COLLECTED FROM LAYER 3	2.7129	9847.720	8.47
PERC./LEAKAGE THROUGH LAYER 4	0.034972	126.950	0.11
AVG. HEAD ON TOP OF LAYER 4	3.7598		
PERC./LEAKAGE THROUGH LAYER 8	1.499488	5443.141	4.68
AVG. HEAD ON TOP OF LAYER 8	19.2711		
CHANGE IN WATER STORAGE	-2.406	-8733.413	-7.51
SOIL WATER AT START OF YEAR	195.194	708554.000	
SOIL WATER AT END OF YEAR	191.148	693865.937	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.027	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.126	0.659	3.920	2.771	0.500	1.038
	1.314	1.081	2.357	1.755	0.483	0.929
STD. DEVIATIONS	1.299	0.733	1.251	3.172	0.250	0.629
	1.553	0.169	2.191	1.450	0.604	1.217

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.437	1.097	2.845	3.288
	4.316	2.136	2.265	1.363	0.871	0.435
STD. DEVIATIONS	0.060	0.051	0.108	0.537	0.636	0.592
	0.759	0.824	0.381	0.099	0.116	0.105

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.2119	0.1644	0.1540	0.1320	0.1526	0.1701
	0.1869	0.2092	0.2079	0.2226	0.2129	0.2419
STD. DEVIATIONS	0.0556	0.0433	0.0404	0.0349	0.0457	0.0615
	0.0601	0.0517	0.0367	0.0347	0.0363	0.0521

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0027	0.0022	0.0020	0.0018	0.0020	0.0022
	0.0024	0.0027	0.0027	0.0029	0.0028	0.0031
STD. DEVIATIONS	0.0007	0.0005	0.0005	0.0004	0.0006	0.0008
	0.0007	0.0006	0.0004	0.0004	0.0004	0.0006

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.1579	0.1445	0.1577	0.1515	0.1554	0.1492
	0.1531	0.1519	0.1459	0.1496	0.1437	0.1474
STD. DEVIATIONS	0.0194	0.0205	0.0224	0.0215	0.0221	0.0212
	0.0217	0.0216	0.0207	0.0212	0.0204	0.0209

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	3.4580	2.9476	2.5135	2.2258	2.4901	2.8688
	3.0501	3.4130	3.5062	3.6325	3.5893	3.9474
STD. DEVIATIONS	0.9078	0.7738	0.6599	0.5892	0.7460	1.0378
	0.9812	0.8439	0.6191	0.5659	0.6118	0.8506

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	29.6234	29.9807	29.5874	29.1844	28.7844	28.3882
	27.9955	27.6000	27.2142	26.8318	26.4521	26.0757
STD. DEVIATIONS	6.5845	7.6727	7.6154	7.5566	7.4984	7.4400
	7.3818	7.3232	7.2663	7.2103	7.1548	7.0999

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.16 (5.757)	145773.5	100.00
RUNOFF	17.932 (4.2851)	65092.98	44.653
EVAPOTRANSPIRATION	19.953 (2.2041)	72430.43	49.687
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.26648 (0.45371)	8227.314	5.64390
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02956 (0.00554)	107.297	0.07361
AVERAGE HEAD ON TOP OF LAYER 4	3.137 (0.629)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	1.80790 (0.25317)	6562.695	4.50198
AVERAGE HEAD ON TOP OF LAYER 8	28.143 (7.309)		
CHANGE IN WATER STORAGE	-1.802 (1.8169)	-6539.90	-4.486

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.558	9285.9736
DRAINAGE COLLECTED FROM LAYER 3	0.01112	40.36459
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000140	0.50689
AVERAGE HEAD ON TOP OF LAYER 4	5.625	
MAXIMUM HEAD ON TOP OF LAYER 4	10.829	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.1 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.006150	22.32351
AVERAGE HEAD ON TOP OF LAYER 8	40.762	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2858
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0655	0.3443
2	1.7302	0.1442
3	1.5653	0.1304
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	45.1227	0.3418
8	11.3040	0.4710
SNOW WATER	1.906	

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**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY       **
**                                                                  **
**                                                                  **
**********************************************************************
**********************************************************************

PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\DT16-20P.D10
OUTPUT DATA FILE:            C:\HELP305\CTP16-20.OUT

TIME:   9:22     DATE:   5/25/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LLDPE REDUCTION YEARS 16-20

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   0
          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   =      0.3443 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1442	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1304	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	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.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3418	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.057	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	187.735	INCHES
TOTAL INITIAL WATER	=	189.641	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.136	58574.504	43.59
EVAPOTRANSPIRATION	20.095	72943.930	54.28
DRAINAGE COLLECTED FROM LAYER 3	1.2330	4475.625	3.33
PERC./LEAKAGE THROUGH LAYER 4	0.016905	61.364	0.05
AVG. HEAD ON TOP OF LAYER 4	1.7084		
PERC./LEAKAGE THROUGH LAYER 8	1.353909	4914.691	3.66
AVG. HEAD ON TOP OF LAYER 8	15.0800		
CHANGE IN WATER STORAGE	-1.798	-6526.180	-4.86
SOIL WATER AT START OF YEAR	191.143	693847.500	
SOIL WATER AT END OF YEAR	191.251	694240.125	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.002	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.461	56123.016	37.73

EVAPOTRANSPIRATION	21.994	79837.273	53.67
DRAINAGE COLLECTED FROM LAYER 3	2.0131	7307.733	4.91
PERC./LEAKAGE THROUGH LAYER 4	0.026466	96.073	0.06
AVG. HEAD ON TOP OF LAYER 4	2.7816		
PERC./LEAKAGE THROUGH LAYER 8	1.253630	4550.678	3.06
AVG. HEAD ON TOP OF LAYER 8	12.1763		
CHANGE IN WATER STORAGE	0.259	938.756	0.63
SOIL WATER AT START OF YEAR	191.251	694240.125	
SOIL WATER AT END OF YEAR	189.186	686747.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	-0.048	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.532	78162.070	48.44
EVAPOTRANSPIRATION	22.536	81805.281	50.70
DRAINAGE COLLECTED FROM LAYER 3	1.9376	7033.326	4.36
PERC./LEAKAGE THROUGH LAYER 4	0.025612	92.971	0.06
AVG. HEAD ON TOP OF LAYER 4	2.6773		
PERC./LEAKAGE THROUGH LAYER 8	1.149453	4172.513	2.59
AVG. HEAD ON TOP OF LAYER 8	9.0764		
CHANGE IN WATER STORAGE	-2.705	-9819.734	-6.09
SOIL WATER AT START OF YEAR	189.186	686747.000	
SOIL WATER AT END OF YEAR	187.150	679353.062	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.057	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.493	85278.891	50.74
EVAPOTRANSPIRATION	19.010	69005.875	41.06
DRAINAGE COLLECTED FROM LAYER 3	2.2046	8002.533	4.76
PERC./LEAKAGE THROUGH LAYER 4	0.028774	104.449	0.06
AVG. HEAD ON TOP OF LAYER 4	3.0476		
PERC./LEAKAGE THROUGH LAYER 8	1.048209	3804.999	2.26
AVG. HEAD ON TOP OF LAYER 8	6.2484		
CHANGE IN WATER STORAGE	0.545	1976.668	1.18
SOIL WATER AT START OF YEAR	187.150	679353.062	
SOIL WATER AT END OF YEAR	189.083	686371.625	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.055	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.280	48206.023	41.45
EVAPOTRANSPIRATION	16.861	61205.484	52.62
DRAINAGE COLLECTED FROM LAYER 3	2.8752	10436.969	8.97
PERC./LEAKAGE THROUGH LAYER 4	0.036911	133.989	0.12
AVG. HEAD ON TOP OF LAYER 4	3.9840		
PERC./LEAKAGE THROUGH LAYER 8	0.959706	3483.734	3.00
AVG. HEAD ON TOP OF LAYER 8	3.6944		
CHANGE IN WATER STORAGE	-1.936	-7026.977	-6.04
SOIL WATER AT START OF YEAR	189.083	686371.625	
SOIL WATER AT END OF YEAR	185.507	673390.062	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.044	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.125	0.657	3.915	2.794	0.518	1.036
	1.328	1.080	2.374	1.754	0.484	0.916
STD. DEVIATIONS	1.298	0.738	1.317	3.170	0.280	0.617
	1.551	0.170	2.211	1.454	0.617	1.205

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.416	1.065	2.838	3.438
	4.159	2.208	2.206	1.480	0.944	0.443
STD. DEVIATIONS	0.060	0.051	0.122	0.516	0.623	0.753
	0.802	0.777	0.457	0.243	0.139	0.102

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1760	0.1365	0.1279	0.1132	0.1420	0.1551
	0.1762	0.2033	0.1985	0.2147	0.1995	0.2097
STD. DEVIATIONS	0.0729	0.0564	0.0531	0.0382	0.0478	0.0642
	0.0707	0.0693	0.0547	0.0495	0.0526	0.0789

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0023	0.0018	0.0017	0.0015	0.0019	0.0020
	0.0023	0.0026	0.0026	0.0028	0.0026	0.0027
STD. DEVIATIONS	0.0009	0.0007	0.0007	0.0005	0.0006	0.0008
	0.0009	0.0008	0.0007	0.0006	0.0006	0.0009

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0987	0.0923	0.1008	0.0968	0.0993	0.0954
	0.0978	0.0971	0.0932	0.0956	0.0919	0.0942
STD. DEVIATIONS	0.0101	0.0130	0.0142	0.0137	0.0140	0.0135
	0.0138	0.0137	0.0131	0.0135	0.0129	0.0133

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.8715	2.4476	2.0871	1.9090	2.3178	2.6147
	2.8754	3.3178	3.3465	3.5038	3.3639	3.4225
STD. DEVIATIONS	1.1902	1.0149	0.8658	0.6437	0.7804	1.0822
	1.1543	1.1311	0.9227	0.8079	0.8863	1.2882

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	9.5214	10.4829	10.2328	9.9764	9.7222	9.4707
	9.2215	8.9711	8.7269	8.4849	8.2446	8.0061
STD. DEVIATIONS	3.4298	4.8734	4.8362	4.7982	4.7609	4.7233
	4.6855	4.6473	4.6104	4.5739	4.5378	4.5017

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.980	(4.3257)	65268.90	44.774
EVAPOTRANSPIRATION	20.099	(2.3021)	72959.57	50.050
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.05268	(0.58872)	7451.237	5.11152
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02693	(0.00717)	97.769	0.06707
AVERAGE HEAD ON TOP OF LAYER 4	2.840	(0.816)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	1.15298	(0.15720)	4185.323	2.87111
AVERAGE HEAD ON TOP OF LAYER 8	9.255	(4.540)		
CHANGE IN WATER STORAGE	-1.127	(1.4412)	-4091.49	-2.807

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.563	9303.0225
DRAINAGE COLLECTED FROM LAYER 3	0.01151	41.79898
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000144	0.52381
AVERAGE HEAD ON TOP OF LAYER 4	5.825	
MAXIMUM HEAD ON TOP OF LAYER 4	11.203	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.6 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.003912	14.19970
AVERAGE HEAD ON TOP OF LAYER 8	17.194	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2857
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0643	0.3441
2	1.6478	0.1373
3	1.6434	0.1370
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	39.4874	0.2991
8	11.3040	0.4710
SNOW WATER	1.906	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)                 **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                     USAE WATERWAYS EXPERIMENT STATION                     **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                           **
**                                                                           **
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PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\DT21-25P.D10
OUTPUT DATA FILE:            C:\HELP305\CTP21-25.OUT

TIME:   9:26     DATE:   5/25/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LLDPE REDUCTION YEARS 21-25

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER   0
          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    =      0.3441 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1373	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1370	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	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.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2991	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.986	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	182.093	INCHES
TOTAL INITIAL WATER	=	183.999	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.234	58930.430	43.85
EVAPOTRANSPIRATION	19.690	71475.008	53.19
DRAINAGE COLLECTED FROM LAYER 3	1.3702	4973.700	3.70
PERC./LEAKAGE THROUGH LAYER 4	0.018617	67.580	0.05
AVG. HEAD ON TOP OF LAYER 4	1.8985		
PERC./LEAKAGE THROUGH LAYER 8	0.876743	3182.579	2.37
AVG. HEAD ON TOP OF LAYER 8	1.3010		
CHANGE IN WATER STORAGE	-1.151	-4179.165	-3.11
SOIL WATER AT START OF YEAR	185.501	673370.062	
SOIL WATER AT END OF YEAR	186.256	676109.625	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.025	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.443	56057.340	37.68

EVAPOTRANSPIRATION	21.573	78311.695	52.64
DRAINAGE COLLECTED FROM LAYER 3	2.0685	7508.487	5.05
PERC./LEAKAGE THROUGH LAYER 4	0.027172	98.636	0.07
AVG. HEAD ON TOP OF LAYER 4	2.8602		
PERC./LEAKAGE THROUGH LAYER 8	0.106267	385.749	0.26
AVG. HEAD ON TOP OF LAYER 8	0.0101		
CHANGE IN WATER STORAGE	1.789	6494.147	4.37
SOIL WATER AT START OF YEAR	186.256	676109.625	
SOIL WATER AT END OF YEAR	185.722	674171.937	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.558	78256.258	48.50
EVAPOTRANSPIRATION	23.027	83586.336	51.80
DRAINAGE COLLECTED FROM LAYER 3	2.0357	7389.691	4.58
PERC./LEAKAGE THROUGH LAYER 4	0.026807	97.310	0.06
AVG. HEAD ON TOP OF LAYER 4	2.8122		
PERC./LEAKAGE THROUGH LAYER 8	0.026807	97.310	0.06
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-2.197	-7976.098	-4.94
SOIL WATER AT START OF YEAR	185.722	674171.937	
SOIL WATER AT END OF YEAR	184.193	668621.625	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.022	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.414	84992.406	50.57
EVAPOTRANSPIRATION	19.298	70050.711	41.68
DRAINAGE COLLECTED FROM LAYER 3	2.0443	7420.688	4.42
PERC./LEAKAGE THROUGH LAYER 4	0.026845	97.448	0.06
AVG. HEAD ON TOP OF LAYER 4	2.8267		
PERC./LEAKAGE THROUGH LAYER 8	0.026845	97.448	0.06
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	1.517	5507.743	3.28
SOIL WATER AT START OF YEAR	184.193	668621.625	
SOIL WATER AT END OF YEAR	187.100	679171.312	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.033	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.258	48125.223	41.38
EVAPOTRANSPIRATION	16.919	61416.555	52.81
DRAINAGE COLLECTED FROM LAYER 3	2.6713	9696.999	8.34
PERC./LEAKAGE THROUGH LAYER 4	0.034476	125.147	0.11
AVG. HEAD ON TOP OF LAYER 4	3.7022		
PERC./LEAKAGE THROUGH LAYER 8	0.034476	125.147	0.11
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-0.843	-3058.714	-2.63
SOIL WATER AT START OF YEAR	187.100	679171.312	
SOIL WATER AT END OF YEAR	184.617	670157.937	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.019	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.192	0.598	3.923	2.787	0.503	1.038
	1.326	1.087	2.364	1.754	0.482	0.928
STD. DEVIATIONS	1.394	0.771	1.284	3.155	0.252	0.614
	1.548	0.169	2.196	1.451	0.606	1.216

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.424	1.119	2.822	3.447
	4.224	2.144	2.284	1.434	0.869	0.436
STD. DEVIATIONS	0.060	0.051	0.119	0.548	0.644	0.627
	0.703	0.876	0.390	0.097	0.079	0.095

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1765	0.1369	0.1283	0.1132	0.1469	0.1611
	0.1758	0.1945	0.1948	0.2065	0.1966	0.2070
STD. DEVIATIONS	0.0584	0.0450	0.0425	0.0315	0.0466	0.0576
	0.0572	0.0533	0.0362	0.0332	0.0387	0.0647

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0023	0.0018	0.0017	0.0015	0.0020	0.0021
	0.0023	0.0025	0.0025	0.0027	0.0026	0.0027
STD. DEVIATIONS	0.0007	0.0005	0.0005	0.0004	0.0006	0.0007
	0.0007	0.0006	0.0004	0.0004	0.0005	0.0008

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0311	0.0174	0.0168	0.0160	0.0168	0.0164
	0.0169	0.0170	0.0163	0.0168	0.0162	0.0166
STD. DEVIATIONS	0.0391	0.0295	0.0334	0.0322	0.0328	0.0313
	0.0321	0.0317	0.0304	0.0312	0.0300	0.0307

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.8801	2.4550	2.0935	1.9095	2.3977	2.7164
	2.8686	3.1733	3.2842	3.3691	3.3146	3.3775
STD. DEVIATIONS	0.9530	0.8129	0.6937	0.5307	0.7597	0.9720
	0.9329	0.8697	0.6098	0.5417	0.6532	1.0561

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.4309	0.4377	0.3995	0.3606	0.3219	0.2835
	0.2455	0.2072	0.1700	0.1331	0.0966	0.0602
STD. DEVIATIONS	0.8988	0.9775	0.8932	0.8062	0.7198	0.6340
	0.5488	0.4632	0.3800	0.2976	0.2158	0.1346

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.981	(4.3045)	65272.33	44.777
EVAPOTRANSPIRATION	20.101	(2.3273)	72968.05	50.056
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.03799	(0.46046)	7397.913	5.07493
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02678	(0.00561)	97.224	0.06670
AVERAGE HEAD ON TOP OF LAYER 4	2.820	(0.638)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.21423	(0.37186)	777.647	0.53346
AVERAGE HEAD ON TOP OF LAYER 8	0.262	(0.581)		
CHANGE IN WATER STORAGE	-0.177	(1.7471)	-642.42	-0.441

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.557	9281.8633
DRAINAGE COLLECTED FROM LAYER 3	0.01078	39.13927
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000136	0.49242
AVERAGE HEAD ON TOP OF LAYER 4	5.454	
MAXIMUM HEAD ON TOP OF LAYER 4	10.509	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	2.7 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.002508	9.10528
AVERAGE HEAD ON TOP OF LAYER 8	2.415	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2861
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0668	0.3445
2	1.7489	0.1457
3	1.5929	0.1327
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	38.5440	0.2920
8	11.3040	0.4710
SNOW WATER	1.906	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY      **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:    C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP305\DT26-30P.D10
OUTPUT DATA FILE:           C:\HELP305\CTP26-30.OUT

TIME:   9:29     DATE:   5/25/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LLDPE REDUCTION YEARS 26-30

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   0
          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   =      0.3445 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1457	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1327	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	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.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.081	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	181.208	INCHES
TOTAL INITIAL WATER	=	183.114	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA.

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK
WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.240	58951.934	43.87
EVAPOTRANSPIRATION	19.803	71885.055	53.49
DRAINAGE COLLECTED FROM LAYER 3	1.3096	4753.804	3.54
PERC./LEAKAGE THROUGH LAYER 4	0.017859	64.827	0.05
AVG. HEAD ON TOP OF LAYER 4	1.8140		
PERC./LEAKAGE THROUGH LAYER 8	0.017876	64.889	0.05
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-0.351	-1272.994	-0.95
SOIL WATER AT START OF YEAR	184.616	670155.187	
SOIL WATER AT END OF YEAR	186.171	675801.000	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.113	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.434	56026.449	37.66

EVAPOTRANSPIRATION	21.402	77690.258	52.23
DRAINAGE COLLECTED FROM LAYER 3	2.1589	7836.789	5.27
PERC./LEAKAGE THROUGH LAYER 4	0.028257	102.573	0.07
AVG. HEAD ON TOP OF LAYER 4	2.9844		
PERC./LEAKAGE THROUGH LAYER 8	0.028257	102.573	0.07
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	1.956	7101.326	4.77
SOIL WATER AT START OF YEAR	186.171	675801.000	
SOIL WATER AT END OF YEAR	185.805	674470.437	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.018	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.564	78278.000	48.51
EVAPOTRANSPIRATION	22.952	83317.078	51.64
DRAINAGE COLLECTED FROM LAYER 3	2.0900	7586.756	4.70
PERC./LEAKAGE THROUGH LAYER 4	0.027474	99.731	0.06
AVG. HEAD ON TOP OF LAYER 4	2.8881		
PERC./LEAKAGE THROUGH LAYER 8	0.027474	99.731	0.06
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-2.184	-7928.130	-4.91
SOIL WATER AT START OF YEAR	185.805	674470.437	
SOIL WATER AT END OF YEAR	184.289	668968.062	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.076	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.462	85165.773	50.67
EVAPOTRANSPIRATION	19.112	69375.031	41.28
DRAINAGE COLLECTED FROM LAYER 3	2.1909	7952.991	4.73
PERC./LEAKAGE THROUGH LAYER 4	0.028613	103.867	0.06
AVG. HEAD ON TOP OF LAYER 4	3.0287		
PERC./LEAKAGE THROUGH LAYER 8	0.028613	103.867	0.06
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	1.507	5471.297	3.26
SOIL WATER AT START OF YEAR	184.289	668968.062	
SOIL WATER AT END OF YEAR	187.185	679481.312	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.064	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.257	48122.902	41.38
EVAPOTRANSPIRATION	16.938	61483.172	52.86
DRAINAGE COLLECTED FROM LAYER 3	2.7312	9914.316	8.52
PERC./LEAKAGE THROUGH LAYER 4	0.035194	127.754	0.11
AVG. HEAD ON TOP OF LAYER 4	3.7857		
PERC./LEAKAGE THROUGH LAYER 8	0.035194	127.754	0.11
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-0.921	-3342.917	-2.87
SOIL WATER AT START OF YEAR	187.185	679481.312	
SOIL WATER AT END OF YEAR	184.624	670183.750	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.041	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.125	0.659	3.924	2.781	0.503	1.043
	1.326	1.081	2.370	1.756	0.490	0.933
STD. DEVIATIONS	1.298	0.736	1.281	3.159	0.252	0.629
	1.548	0.169	2.205	1.453	0.618	1.223

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.425	1.115	2.860	3.353
	4.200	2.239	2.262	1.404	0.849	0.434
STD. DEVIATIONS	0.060	0.051	0.118	0.544	0.636	0.687
	0.762	0.795	0.404	0.072	0.079	0.097

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1816	0.1409	0.1320	0.1160	0.1503	0.1645
	0.1826	0.2025	0.1988	0.2062	0.2029	0.2179
STD. DEVIATIONS	0.0657	0.0509	0.0478	0.0357	0.0477	0.0613
	0.0618	0.0570	0.0461	0.0388	0.0455	0.0698

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0024	0.0019	0.0018	0.0016	0.0020	0.0022
	0.0024	0.0026	0.0026	0.0027	0.0026	0.0028
STD. DEVIATIONS	0.0008	0.0006	0.0006	0.0004	0.0006	0.0008
	0.0008	0.0007	0.0006	0.0005	0.0006	0.0008

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0024	0.0019	0.0018	0.0016	0.0020	0.0022
	0.0024	0.0026	0.0026	0.0027	0.0026	0.0028
STD. DEVIATIONS	0.0008	0.0006	0.0006	0.0004	0.0006	0.0008
	0.0008	0.0007	0.0006	0.0005	0.0006	0.0008

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.9629	2.5256	2.1536	1.9563	2.4527	2.7734
	2.9800	3.3050	3.3523	3.3644	3.4205	3.5555
STD. DEVIATIONS	1.0728	0.9148	0.7804	0.6021	0.7783	1.0340
	1.0092	0.9301	0.7777	0.6323	0.7673	1.1388

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	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

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.991	(4.3217)	65309.01	44.802
EVAPOTRANSPIRATION	20.041	(2.2848)	72750.12	49.906
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.09612	(0.50866)	7608.931	5.21969
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02748	(0.00620)	99.750	0.06843
AVERAGE HEAD ON TOP OF LAYER 4	2.900	(0.705)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.02748	(0.00620)	99.763	0.06844
AVERAGE HEAD ON TOP OF LAYER 8	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.002	(1.7205)	5.72	0.004

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.558	9283.9648
DRAINAGE COLLECTED FROM LAYER 3	0.01133	41.11354
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000142	0.51573
AVERAGE HEAD ON TOP OF LAYER 4	5.729	
MAXIMUM HEAD ON TOP OF LAYER 4	11.024	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.4 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.000142	0.51573
AVERAGE HEAD ON TOP OF LAYER 8	0.000	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2857
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0668	0.3445
2	1.7404	0.1450
3	1.6084	0.1340
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	38.5440	0.2920
8	11.3040	0.4710
SNOW WATER	1.906	

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LEACHATE REGRESSION ANALYSIS
for
PVC GEOMEMBRANE

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY      **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\DATA1-5.D10
OUTPUT DATA FILE:            C:\HELP305\CORT1-5.OUT

TIME:  9: 8     DATE:   5/19/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LEACHATE REDUCTION YEARS 1-5

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER   0
          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   =      0.1310 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1310	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0450	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 37

THICKNESS	=	0.04	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.	=	0.199999999000E-10	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3525	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.6710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.448	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	230.370	INCHES
TOTAL INITIAL WATER	=	232.276	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	15.144	54972.926	40.91
EVAPOTRANSPIRATION	19.347	70228.227	52.26
DRAINAGE COLLECTED FROM LAYER 3	0.6270	2276.048	1.69
PERC./LEAKAGE THROUGH LAYER 4	0.013896	50.443	0.04
AVG. HEAD ON TOP OF LAYER 4	0.8624		
PERC./LEAKAGE THROUGH LAYER 8	5.237181	19010.967	14.15
AVG. HEAD ON TOP OF LAYER 8	127.1235		
CHANGE IN WATER STORAGE	-3.335	-12105.555	-9.01
SOIL WATER AT START OF YEAR	234.600	851597.937	
SOIL WATER AT END OF YEAR	233.171	846411.187	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.035	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.299	55535.797	37.33

EVAPOTRANSPIRATION	21.078	76512.562	51.43
DRAINAGE COLLECTED FROM LAYER 3	2.2268	8083.223	5.43
PERC./LEAKAGE THROUGH LAYER 4	0.047885	173.824	0.12
AVG. HEAD ON TOP OF LAYER 4	3.0816		
PERC./LEAKAGE THROUGH LAYER 8	4.840433	17570.770	11.81
AVG. HEAD ON TOP OF LAYER 8	115.6798		
CHANGE IN WATER STORAGE	-2.464	-8944.984	-6.01
SOIL WATER AT START OF YEAR	233.171	846411.187	
SOIL WATER AT END OF YEAR	228.384	829034.312	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.047	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.594	78384.672	48.58
EVAPOTRANSPIRATION	22.715	82454.227	51.10
DRAINAGE COLLECTED FROM LAYER 3	2.2664	8227.086	5.10
PERC./LEAKAGE THROUGH LAYER 4	0.048707	176.808	0.11
AVG. HEAD ON TOP OF LAYER 4	3.1313		
PERC./LEAKAGE THROUGH LAYER 8	4.448727	16148.878	10.01
AVG. HEAD ON TOP OF LAYER 8	104.0156		
CHANGE IN WATER STORAGE	-6.573	-23861.336	-14.79
SOIL WATER AT START OF YEAR	228.384	829034.312	
SOIL WATER AT END OF YEAR	222.479	807598.812	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	-0.012	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.487	85257.320	50.73
EVAPOTRANSPIRATION	19.150	69513.977	41.36
DRAINAGE COLLECTED FROM LAYER 3	2.2220	8066.028	4.80
PERC./LEAKAGE THROUGH LAYER 4	0.047739	173.294	0.10
AVG. HEAD ON TOP OF LAYER 4	3.0736		
PERC./LEAKAGE THROUGH LAYER 8	4.052836	14711.796	8.75
AVG. HEAD ON TOP OF LAYER 8	92.9540		
CHANGE IN WATER STORAGE	-2.612	-9480.076	-5.64
SOIL WATER AT START OF YEAR	222.479	807598.812	
SOIL WATER AT END OF YEAR	221.256	803160.625	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	-0.019	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.277	48196.172	41.44
EVAPOTRANSPIRATION	16.751	60806.164	52.28
DRAINAGE COLLECTED FROM LAYER 3	2.8002	10164.877	8.74
PERC./LEAKAGE THROUGH LAYER 4	0.059629	216.452	0.19
AVG. HEAD ON TOP OF LAYER 4	3.8807		
PERC./LEAKAGE THROUGH LAYER 8	3.703663	13444.297	11.56
AVG. HEAD ON TOP OF LAYER 8	82.8777		
CHANGE IN WATER STORAGE	-4.492	-16306.419	-14.02
SOIL WATER AT START OF YEAR	221.256	803160.625	
SOIL WATER AT END OF YEAR	215.124	780899.625	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	0.100	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.230	0.579	3.817	2.683	0.502	1.042
	1.317	1.082	2.365	1.755	0.482	0.905
STD. DEVIATIONS	1.453	0.788	1.283	3.228	0.250	0.618
	1.553	0.169	2.201	1.455	0.615	1.194

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.423	1.077	2.856	3.400
	4.061	2.198	2.206	1.397	0.858	0.432
STD. DEVIATIONS	0.060	0.051	0.116	0.530	0.567	0.641
	0.888	0.838	0.428	0.178	0.125	0.097

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1690	0.1311	0.1225	0.1092	0.1301	0.1456
	0.1684	0.1951	0.1997	0.2174	0.2090	0.2315
STD. DEVIATIONS	0.1054	0.0815	0.0765	0.0654	0.0782	0.0876
	0.0810	0.0769	0.0577	0.0533	0.0569	0.0597

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0036	0.0028	0.0027	0.0024	0.0028	0.0031
	0.0036	0.0042	0.0043	0.0046	0.0045	0.0049
STD. DEVIATIONS	0.0022	0.0017	0.0016	0.0014	0.0017	0.0019
	0.0017	0.0016	0.0012	0.0011	0.0012	0.0012

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.3927	0.3550	0.3877	0.3727	0.3825	0.3675
	0.3771	0.3744	0.3597	0.3690	0.3546	0.3637
STD. DEVIATIONS	0.0520	0.0474	0.0522	0.0506	0.0522	0.0504
	0.0520	0.0518	0.0499	0.0513	0.0495	0.0509

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.7583	2.3479	1.9994	1.8414	2.1234	2.4554
	2.7474	3.1831	3.3668	3.5470	3.5237	3.7771
STD. DEVIATIONS	1.7204	1.4648	1.2478	1.1033	1.2757	1.4769
	1.3214	1.2556	0.9735	0.8700	0.9596	0.9749

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	109.4082	108.5583	107.7099	106.8209	105.9206	105.0142
	104.1047	103.1795	102.2698	101.3622	100.4572	99.5559
STD. DEVIATIONS	17.6618	17.7004	17.7357	17.7456	17.7329	17.6996
	17.6510	17.5892	17.5198	17.4436	17.3618	17.2754

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.760	(4.4858)	64469.37	44.226
EVAPOTRANSPIRATION	19.808	(2.2390)	71903.03	49.325
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.02850	(0.82054)	7363.452	5.05130
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.04357	(0.01733)	158.164	0.10850
AVERAGE HEAD ON TOP OF LAYER 4	2.806	(1.139)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	4.45657	(0.60964)	16177.343	11.09758
AVERAGE HEAD ON TOP OF LAYER 8	104.530	(17.592)		
CHANGE IN WATER STORAGE	-3.895	(1.6984)	-14139.67	-9.700

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.560	9293.7227
DRAINAGE COLLECTED FROM LAYER 3	0.01133	41.11433
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000238	0.86239
AVERAGE HEAD ON TOP OF LAYER 4	5.729	
MAXIMUM HEAD ON TOP OF LAYER 4	11.025	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.4 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.014812	53.76845
AVERAGE HEAD ON TOP OF LAYER 8	131.986	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2856
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0669	0.3445
2	1.7639	0.1470
3	1.6561	0.1380
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	68.1510	0.5163
8	11.3040	0.4710
SNOW WATER	1.906	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)                  **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                     USAE WATERWAYS EXPERIMENT STATION                     **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                           **
**                                                                           **
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PRECIPITATION DATA FILE:    C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP305\DATA6-10.D10
OUTPUT DATA FILE:           C:\HELP305\CORT6-10.OUT

TIME:   9:13     DATE:   5/19/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LEACHATE REDUCTION YEARS 6-10

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   0
          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    =      0.3445 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-05 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1470	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1380	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 37

THICKNESS	=	0.04	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.	=	0.199999999000E-10	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.5163	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.107	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	210.895	INCHES
TOTAL INITIAL WATER	=	212.801	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.202	58814.477	43.77
EVAPOTRANSPIRATION	19.852	72064.539	53.63
DRAINAGE COLLECTED FROM LAYER 3	1.4300	5191.011	3.86
PERC./LEAKAGE THROUGH LAYER 4	0.031398	113.973	0.08
AVG. HEAD ON TOP OF LAYER 4	1.9795		
PERC./LEAKAGE THROUGH LAYER 8	3.380475	12271.123	9.13
AVG. HEAD ON TOP OF LAYER 8	73.5535		
CHANGE IN WATER STORAGE	-3.845	-13958.607	-10.39
SOIL WATER AT START OF YEAR	214.303	777918.375	
SOIL WATER AT END OF YEAR	212.363	770878.562	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.034	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.203	55188.586	37.10

EVAPOTRANSPIRATION	21.049	76408.266	51.36
DRAINAGE COLLECTED FROM LAYER 3	2.3828	8649.515	5.81
PERC./LEAKAGE THROUGH LAYER 4	0.051097	185.481	0.12
AVG. HEAD ON TOP OF LAYER 4	3.2985		
PERC./LEAKAGE THROUGH LAYER 8	3.092010	11223.997	7.55
AVG. HEAD ON TOP OF LAYER 8	65.2271		
CHANGE IN WATER STORAGE	-0.747	-2712.957	-1.82
SOIL WATER AT START OF YEAR	212.363	770878.562	
SOIL WATER AT END OF YEAR	209.293	759733.687	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.006	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.599	78405.570	48.59
EVAPOTRANSPIRATION	22.845	82926.617	51.39
DRAINAGE COLLECTED FROM LAYER 3	2.3629	8577.392	5.32
PERC./LEAKAGE THROUGH LAYER 4	0.050697	184.031	0.11
AVG. HEAD ON TOP OF LAYER 4	3.2648		
PERC./LEAKAGE THROUGH LAYER 8	2.833660	10286.187	6.37
AVG. HEAD ON TOP OF LAYER 8	57.5408		
CHANGE IN WATER STORAGE	-5.191	-18842.281	-11.68
SOIL WATER AT START OF YEAR	209.293	759733.687	
SOIL WATER AT END OF YEAR	204.771	743317.250	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.026	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.325	84668.492	50.38
EVAPOTRANSPIRATION	19.438	70560.117	41.98
DRAINAGE COLLECTED FROM LAYER 3	2.1080	7652.117	4.55
PERC./LEAKAGE THROUGH LAYER 4	0.045403	164.812	0.10
AVG. HEAD ON TOP OF LAYER 4	2.9161		
PERC./LEAKAGE THROUGH LAYER 8	2.582608	9374.868	5.58
AVG. HEAD ON TOP OF LAYER 8	50.5271		
CHANGE IN WATER STORAGE	-1.153	-4186.676	-2.49
SOIL WATER AT START OF YEAR	204.771	743317.250	
SOIL WATER AT END OF YEAR	205.006	744172.500	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.105	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.257	48123.875	41.38
EVAPOTRANSPIRATION	16.980	61637.012	53.00
DRAINAGE COLLECTED FROM LAYER 3	2.6799	9728.073	8.36
PERC./LEAKAGE THROUGH LAYER 4	0.057172	207.534	0.18
AVG. HEAD ON TOP OF LAYER 4	3.7137		
PERC./LEAKAGE THROUGH LAYER 8	2.361711	8573.010	7.37
AVG. HEAD ON TOP OF LAYER 8	44.1525		
CHANGE IN WATER STORAGE	-3.239	-11756.789	-10.11
SOIL WATER AT START OF YEAR	205.006	744172.500	
SOIL WATER AT END OF YEAR	200.127	726461.062	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.126	0.659	3.920	2.768	0.500	1.019
	1.315	1.081	2.357	1.755	0.486	0.932
STD. DEVIATIONS	1.298	0.734	1.256	3.170	0.250	0.655
	1.553	0.168	2.190	1.453	0.616	1.222

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.435	1.089	2.878	3.331
	4.288	2.168	2.264	1.362	0.881	0.437
STD. DEVIATIONS	0.060	0.051	0.109	0.534	0.599	0.551
	0.717	0.827	0.392	0.129	0.113	0.105

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.2049	0.1588	0.1485	0.1310	0.1519	0.1632
	0.1813	0.2022	0.1993	0.2175	0.2018	0.2325
STD. DEVIATIONS	0.0525	0.0410	0.0381	0.0351	0.0480	0.0612
	0.0603	0.0565	0.0435	0.0412	0.0426	0.0523

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0044	0.0034	0.0032	0.0029	0.0033	0.0035
	0.0039	0.0043	0.0043	0.0046	0.0043	0.0050
STD. DEVIATIONS	0.0011	0.0008	0.0008	0.0007	0.0010	0.0013
	0.0012	0.0012	0.0009	0.0008	0.0009	0.0011

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.2514	0.2276	0.2484	0.2386	0.2447	0.2350
	0.2411	0.2392	0.2298	0.2357	0.2264	0.2322
STD. DEVIATIONS	0.0346	0.0322	0.0353	0.0339	0.0348	0.0334
	0.0342	0.0339	0.0326	0.0334	0.0321	0.0329

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	3.3433	2.8460	2.4236	2.2088	2.4783	2.7512
	2.9580	3.2997	3.3601	3.5493	3.4021	3.7938
STD. DEVIATIONS	0.8570	0.7293	0.6209	0.5912	0.7840	1.0315
	0.9844	0.9217	0.7338	0.6719	0.7183	0.8532

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	61.3872	61.0158	60.3964	59.7618	59.1321	58.5083
	57.8898	57.2671	56.6597	56.0575	55.4597	54.8670
STD. DEVIATIONS	11.7643	12.0823	11.9919	11.8993	11.8079	11.7161
	11.6244	11.5320	11.4423	11.3537	11.2657	11.1788

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.16 (5.757)	145773.5	100.00
RUNOFF	17.917 (4.3249)	65040.20	44.617
EVAPOTRANSPIRATION	20.033 (2.1591)	72719.31	49.885
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.19273 (0.47205)	7959.622	5.46027
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.04715 (0.00974)	171.166	0.11742
AVERAGE HEAD ON TOP OF LAYER 4	3.035 (0.654)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	2.85009 (0.40317)	10345.836	7.09720
AVERAGE HEAD ON TOP OF LAYER 8	58.200 (11.638)		
CHANGE IN WATER STORAGE	-2.835 (1.8654)	-10291.46	-7.060

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.558	9283.8379
DRAINAGE COLLECTED FROM LAYER 3	0.01089	39.51450
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000229	0.83002
AVERAGE HEAD ON TOP OF LAYER 4	5.506	
MAXIMUM HEAD ON TOP OF LAYER 4	10.607	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	2.8 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.009685	35.15754
AVERAGE HEAD ON TOP OF LAYER 8	77.994	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2857
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0651	0.3442
2	1.7095	0.1425
3	1.5515	0.1293
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	54.1369	0.4101
8	11.3040	0.4710
SNOW WATER	1.906	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY      **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\DT11-15.D10
OUTPUT DATA FILE:            C:\HELP305\CT11-15.OUT

TIME:   9:17     DATE:   5/19/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LEACHATE REDUCTION YEARS 11-15

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER   0
          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   =      0.3442 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1425	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1293	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 37

THICKNESS	=	0.04	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.	=	0.199999999000E-10	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4101	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.034	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	196.716	INCHES
TOTAL INITIAL WATER	=	198.622	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.231	58916.891	43.84
EVAPOTRANSPIRATION	19.708	71538.250	53.23
DRAINAGE COLLECTED FROM LAYER 3	1.3510	4904.272	3.65
PERC./LEAKAGE THROUGH LAYER 4	0.029730	107.920	0.08
AVG. HEAD ON TOP OF LAYER 4	1.8699		
PERC./LEAKAGE THROUGH LAYER 8	2.149027	7800.968	5.81
AVG. HEAD ON TOP OF LAYER 8	38.0209		
CHANGE IN WATER STORAGE	-2.418	-8777.815	-6.53
SOIL WATER AT START OF YEAR	200.124	726450.062	
SOIL WATER AT END OF YEAR	199.612	724591.000	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.178	55097.535	37.04

EVAPOTRANSPIRATION	20.967	76109.734	51.16
DRAINAGE COLLECTED FROM LAYER 3	2.4632	8941.570	6.01
PERC./LEAKAGE THROUGH LAYER 4	0.052738	191.441	0.13
AVG. HEAD ON TOP OF LAYER 4	3.4098		
PERC./LEAKAGE THROUGH LAYER 8	1.974369	7166.959	4.82
AVG. HEAD ON TOP OF LAYER 8	32.9748		
CHANGE IN WATER STORAGE	0.397	1441.581	0.97
SOIL WATER AT START OF YEAR	199.612	724591.000	
SOIL WATER AT END OF YEAR	197.686	717600.687	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.033	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.612	78450.844	48.62
EVAPOTRANSPIRATION	23.055	83691.039	51.87
DRAINAGE COLLECTED FROM LAYER 3	2.2723	8248.434	5.11
PERC./LEAKAGE THROUGH LAYER 4	0.048846	177.313	0.11
AVG. HEAD ON TOP OF LAYER 4	3.1407		
PERC./LEAKAGE THROUGH LAYER 8	1.811139	6574.436	4.07
AVG. HEAD ON TOP OF LAYER 8	28.1169		
CHANGE IN WATER STORAGE	-4.301	-15611.251	-9.68
SOIL WATER AT START OF YEAR	197.686	717600.687	
SOIL WATER AT END OF YEAR	194.054	704415.250	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.010	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.133	83974.453	49.96
EVAPOTRANSPIRATION	20.026	72694.844	43.25
DRAINAGE COLLECTED FROM LAYER 3	1.7596	6387.256	3.80
PERC./LEAKAGE THROUGH LAYER 4	0.038176	138.581	0.08
AVG. HEAD ON TOP OF LAYER 4	2.4340		
PERC./LEAKAGE THROUGH LAYER 8	1.651629	5995.413	3.57
AVG. HEAD ON TOP OF LAYER 8	23.6615		
CHANGE IN WATER STORAGE	-0.271	-983.064	-0.58
SOIL WATER AT START OF YEAR	194.054	704415.250	
SOIL WATER AT END OF YEAR	195.172	708474.125	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.116	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.389	48601.164	41.79
EVAPOTRANSPIRATION	16.853	61174.848	52.60
DRAINAGE COLLECTED FROM LAYER 3	2.5328	9194.179	7.91
PERC./LEAKAGE THROUGH LAYER 4	0.054171	196.640	0.17
AVG. HEAD ON TOP OF LAYER 4	3.5102		
PERC./LEAKAGE THROUGH LAYER 8	1.511630	5487.218	4.72
AVG. HEAD ON TOP OF LAYER 8	19.6214		
CHANGE IN WATER STORAGE	-2.246	-8152.157	-7.01
SOIL WATER AT START OF YEAR	195.172	708474.125	
SOIL WATER AT END OF YEAR	191.286	694367.312	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.061	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.125	0.660	3.920	2.776	0.500	1.031
	1.314	1.086	2.347	1.748	0.476	0.926
STD. DEVIATIONS	1.297	0.736	1.252	3.169	0.250	0.616
	1.553	0.169	2.174	1.442	0.592	1.212

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.436	1.093	2.889	3.475
	4.248	2.093	2.288	1.389	0.877	0.434
STD. DEVIATIONS	0.060	0.051	0.109	0.537	0.533	0.426
	0.752	0.783	0.384	0.078	0.094	0.099

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1957	0.1517	0.1419	0.1251	0.1416	0.1476
	0.1636	0.1951	0.1948	0.1985	0.1944	0.2258
STD. DEVIATIONS	0.0573	0.0451	0.0414	0.0394	0.0573	0.0725
	0.0667	0.0583	0.0456	0.0388	0.0356	0.0504

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0042	0.0033	0.0031	0.0027	0.0031	0.0032
	0.0035	0.0042	0.0042	0.0043	0.0042	0.0048
STD. DEVIATIONS	0.0012	0.0009	0.0009	0.0008	0.0012	0.0015
	0.0014	0.0012	0.0009	0.0008	0.0007	0.0010

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.1589	0.1454	0.1587	0.1525	0.1564	0.1502
	0.1540	0.1529	0.1468	0.1506	0.1447	0.1484
STD. DEVIATIONS	0.0195	0.0204	0.0224	0.0215	0.0220	0.0211
	0.0217	0.0215	0.0207	0.0212	0.0203	0.0208

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	3.1938	2.7186	2.3150	2.1097	2.3106	2.4891
	2.6690	3.1835	3.2847	3.2393	3.2772	3.6844
STD. DEVIATIONS	0.9344	0.7947	0.6761	0.6636	0.9357	1.2219
	1.0880	0.9508	0.7695	0.6337	0.5994	0.8222

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	29.9946	30.3112	29.9183	29.5153	29.1155	28.7195
	28.3269	27.9322	27.5479	27.1667	26.7881	26.4132
STD. DEVIATIONS	6.6257	7.6564	7.5988	7.5398	7.4818	7.4235
	7.3649	7.3060	7.2491	7.1931	7.1373	7.0821

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.909	(4.2341)	65008.18	44.595
EVAPOTRANSPIRATION	20.122	(2.2466)	73041.74	50.106
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.07580	(0.50569)	7535.143	5.16907
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.04473	(0.01047)	162.379	0.11139
AVERAGE HEAD ON TOP OF LAYER 4	2.873	(0.701)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	1.81956	(0.25279)	6604.999	4.53100
AVERAGE HEAD ON TOP OF LAYER 8	28.479	(7.298)		
CHANGE IN WATER STORAGE	-1.768	(1.8705)	-6416.54	-4.402

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.558	9286.3779
DRAINAGE COLLECTED FROM LAYER 3	0.01024	37.16838
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000216	0.78251
AVERAGE HEAD ON TOP OF LAYER 4	5.180	
MAXIMUM HEAD ON TOP OF LAYER 4	9.995	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	1.9 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.006179	22.43102
AVERAGE HEAD ON TOP OF LAYER 8	41.074	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2842
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0665	0.3444
2	1.7195	0.1433
3	1.5767	0.1314
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	45.2591	0.3429
8	11.3040	0.4710
SNOW WATER	1.906	

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**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY    **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:    C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP305\DT16-20.D10
OUTPUT DATA FILE:           C:\HELP305\CT16-20.OUT

TIME:   9:22     DATE:   5/19/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LEACHATE REDUCTION YEARS 16-20

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER   0
          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    =      0.3444 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1433	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1314	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 37

THICKNESS	=	0.04	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.	=	0.199999999000E-10	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3429	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.049	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	187.882	INCHES
TOTAL INITIAL WATER	=	189.788	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130.	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.156	58647.680	43.64
EVAPOTRANSPIRATION	19.777	71791.406	53.42
DRAINAGE COLLECTED FROM LAYER 3	1.4188	5150.357	3.83
PERC./LEAKAGE THROUGH LAYER 4	0.031147	113.064	0.08
AVG. HEAD ON TOP OF LAYER 4	1.9636		
PERC./LEAKAGE THROUGH LAYER 8	1.366975	4962.121	3.69
AVG. HEAD ON TOP OF LAYER 8	15.4570		
CHANGE IN WATER STORAGE	-1.699	-6169.084	-4.59
SOIL WATER AT START OF YEAR	191.290	694381.250	
SOIL WATER AT END OF YEAR	191.496	695130.937	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.097	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.260	55394.363	37.24

EVAPOTRANSPIRATION	21.430	77789.781	52.29
DRAINAGE COLLECTED FROM LAYER 3	2.1846	7930.042	5.33
PERC./LEAKAGE THROUGH LAYER 4	0.047033	170.730	0.11
AVG. HEAD ON TOP OF LAYER 4	3.0258		
PERC./LEAKAGE THROUGH LAYER 8	1.267411	4600.702	3.09
AVG. HEAD ON TOP OF LAYER 8	12.5739		
CHANGE IN WATER STORAGE	0.838	3042.501	2.05
SOIL WATER AT START OF YEAR	191.496	695130.937	
SOIL WATER AT END OF YEAR	190.011	689741.562	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.023	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.590	78371.289	48.57
EVAPOTRANSPIRATION	22.808	82794.523	51.31
DRAINAGE COLLECTED FROM LAYER 3	2.2087	8017.574	4.97
PERC./LEAKAGE THROUGH LAYER 4	0.047521	172.502	0.11
AVG. HEAD ON TOP OF LAYER 4	3.0511		
PERC./LEAKAGE THROUGH LAYER 8	1.163746	4224.398	2.62
AVG. HEAD ON TOP OF LAYER 8	9.4876		
CHANGE IN WATER STORAGE	-3.321	-12054.309	-7.47
SOIL WATER AT START OF YEAR	190.011	689741.562	
SOIL WATER AT END OF YEAR	187.359	680113.062	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.038	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.149	84029.562	50.00
EVAPOTRANSPIRATION	20.003	72611.172	43.20
DRAINAGE COLLECTED FROM LAYER 3	1.8306	6645.135	3.95
PERC./LEAKAGE THROUGH LAYER 4	0.039677	144.029	0.09
AVG. HEAD ON TOP OF LAYER 4	2.5336		
PERC./LEAKAGE THROUGH LAYER 8	1.062737	3857.734	2.30
AVG. HEAD ON TOP OF LAYER 8	6.6676		
CHANGE IN WATER STORAGE	0.255	925.378	0.55
SOIL WATER AT START OF YEAR	187.359	680113.062	
SOIL WATER AT END OF YEAR	189.003	686080.375	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.042	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.355	48477.477	41.68
EVAPOTRANSPIRATION	17.080	62001.785	53.31
DRAINAGE COLLECTED FROM LAYER 3	2.5142	9126.450	7.85
PERC./LEAKAGE THROUGH LAYER 4	0.053786	195.245	0.17
AVG. HEAD ON TOP OF LAYER 4	3.4840		
PERC./LEAKAGE THROUGH LAYER 8	0.974205	3536.364	3.04
AVG. HEAD ON TOP OF LAYER 8	4.1127		
CHANGE IN WATER STORAGE	-1.883	-6836.880	-5.88
SOIL WATER AT START OF YEAR	189.003	686080.375	
SOIL WATER AT END OF YEAR	185.479	673288.812	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.125	0.659	3.925	2.779	0.503	1.033
	1.316	1.079	2.352	1.750	0.468	0.914
STD. DEVIATIONS	1.297	0.734	1.266	3.166	0.251	0.624
	1.552	0.171	2.179	1.446	0.588	1.199

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.425	1.102	2.916	3.528
	4.218	2.093	2.249	1.429	0.919	0.440
STD. DEVIATIONS	0.060	0.051	0.115	0.542	0.535	0.500
	0.753	0.753	0.410	0.079	0.154	0.109

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1910	0.1479	0.1385	0.1167	0.1363	0.1453
	0.1581	0.1894	0.1926	0.2049	0.1929	0.2178
STD. DEVIATIONS	0.0480	0.0369	0.0348	0.0284	0.0438	0.0658
	0.0618	0.0485	0.0363	0.0365	0.0314	0.0462

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0041	0.0032	0.0030	0.0026	0.0030	0.0032
	0.0034	0.0041	0.0041	0.0044	0.0041	0.0047
STD. DEVIATIONS	0.0010	0.0008	0.0007	0.0006	0.0009	0.0014
	0.0013	0.0010	0.0007	0.0007	0.0006	0.0009

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0998	0.0934	0.1020	0.0979	0.1005	0.0965
	0.0990	0.0982	0.0944	0.0968	0.0930	0.0954
STD. DEVIATIONS	0.0100	0.0130	0.0142	0.0136	0.0140	0.0134
	0.0137	0.0136	0.0131	0.0134	0.0129	0.0132

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	3.1172	2.6536	2.2599	1.9674	2.2237	2.4509
	2.5795	3.0905	3.2467	3.3435	3.2527	3.5542
STD. DEVIATIONS	0.7825	0.6667	0.5683	0.4784	0.7150	1.1094
	1.0080	0.7906	0.6123	0.5963	0.5295	0.7541

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	9.9161	10.8875	10.6379	10.3815	10.1269	9.8752
	9.6259	9.3756	9.1323	8.8914	8.6521	8.4151
STD. DEVIATIONS	3.4106	4.8576	4.8205	4.7826	4.7452	4.7073
	4.6693	4.6312	4.5945	4.5586	4.5230	4.4878

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.16 (5.757)	145773.5	100.00
RUNOFF	17.902 (4.2377)	64984.08	44.579
EVAPOTRANSPIRATION	20.220 (2.1368)	73397.74	50.351
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.03138 (0.41938)	7373.911	5.05847
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.04383 (0.00868)	159.114	0.10915
AVERAGE HEAD ON TOP OF LAYER 4	2.812 (0.581)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	1.16701 (0.15662)	4236.264	2.90606
AVERAGE HEAD ON TOP OF LAYER 8	9.660 (4.524)		
CHANGE IN WATER STORAGE	-1.162 (1.6939)	-4218.48	-2.894

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.558	9286.2686
DRAINAGE COLLECTED FROM LAYER 3	0.01012	36.74211
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000213	0.77387
AVERAGE HEAD ON TOP OF LAYER 4	5.120	
MAXIMUM HEAD ON TOP OF LAYER 4	9.883	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	1.8 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.003949	14.33541
AVERAGE HEAD ON TOP OF LAYER 8	17.588	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2858
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0638	0.3440
2	1.6092	0.1341
3	1.4952	0.1246
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	39.6469	0.3004
8	11.3040	0.4710
SNOW WATER	1.906	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)                  **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                     USAE WATERWAYS EXPERIMENT STATION                     **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                           **
**                                                                           **
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PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\DT21-25.D10
OUTPUT DATA FILE:            C:\HELP305\CT21-25.OUT


TIME:   9:26     DATE:   5/19/2000


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     TITLE:  OLD CORTLAND CO LF CLOSURE: LEACHATE REDUCTION YEARS 21-25

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.


                                LAYER  1
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   0
          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   =     0.3440 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    = 0.999999975000E-05 CM/SEC
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1341	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1246	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 37

THICKNESS	=	0.04	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.	=	0.199999999000E-10	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3004	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.922	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	182.077	INCHES
TOTAL INITIAL WATER	=	183.983	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.167	58688.008	43.67
EVAPOTRANSPIRATION	19.744	71672.445	53.33
DRAINAGE COLLECTED FROM LAYER 3	1.2583	4567.652	3.40
PERC./LEAKAGE THROUGH LAYER 4	0.027820	100.987	0.08
AVG. HEAD ON TOP OF LAYER 4	1.7431		
PERC./LEAKAGE THROUGH LAYER 8	0.891766	3237.110	2.41
AVG. HEAD ON TOP OF LAYER 8	1.7346		
CHANGE IN WATER STORAGE	-1.042	-3782.577	-2.81
SOIL WATER AT START OF YEAR	185.485	673311.125	
SOIL WATER AT END OF YEAR	186.349	676447.312	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.069	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.462	56128.387	37.73

EVAPOTRANSPIRATION	21.859	79346.656	53.34
DRAINAGE COLLECTED FROM LAYER 3	2.1217	7701.730	5.18
PERC./LEAKAGE THROUGH LAYER 4	0.045681	165.821	0.11
AVG. HEAD ON TOP OF LAYER 4	2.9328		
PERC./LEAKAGE THROUGH LAYER 8	0.290521	1054.591	0.71
AVG. HEAD ON TOP OF LAYER 8	0.0984		
CHANGE IN WATER STORAGE	1.247	4526.051	3.04
SOIL WATER AT START OF YEAR	186.349	676447.312	
SOIL WATER AT END OF YEAR	185.273	672541.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	-0.004	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.469	77933.227	48.30
EVAPOTRANSPIRATION	22.899	83122.578	51.52
DRAINAGE COLLECTED FROM LAYER 3	1.7829	6471.792	4.01
PERC./LEAKAGE THROUGH LAYER 4	0.038742	140.635	0.09
AVG. HEAD ON TOP OF LAYER 4	2.4632		
PERC./LEAKAGE THROUGH LAYER 8	0.038745	140.643	0.09
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-1.740	-6314.803	-3.91
SOIL WATER AT START OF YEAR	185.273	672541.500	
SOIL WATER AT END OF YEAR	184.202	668652.500	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.087	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.392	84911.898	50.52
EVAPOTRANSPIRATION	19.292	70028.961	41.67
DRAINAGE COLLECTED FROM LAYER 3	2.0245	7349.079	4.37
PERC./LEAKAGE THROUGH LAYER 4	0.043658	158.478	0.09
AVG. HEAD ON TOP OF LAYER 4	2.7997		
PERC./LEAKAGE THROUGH LAYER 8	0.043634	158.391	0.09
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	1.548	5620.682	3.34
SOIL WATER AT START OF YEAR	184.202	668652.500	
SOIL WATER AT END OF YEAR	187.139	679315.125	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.258	48125.566	41.38
EVAPOTRANSPIRATION	16.959	61562.074	52.93
DRAINAGE COLLECTED FROM LAYER 3	2.6695	9690.214	8.33
PERC./LEAKAGE THROUGH LAYER 4	0.056962	206.771	0.18
AVG. HEAD ON TOP OF LAYER 4	3.7000		
PERC./LEAKAGE THROUGH LAYER 8	0.056984	206.851	0.18
AVG. HEAD ON TOP OF LAYER 8	0.0001		
CHANGE IN WATER STORAGE	-0.903	-3279.552	-2.82
SOIL WATER AT START OF YEAR	187.139	679315.125	
SOIL WATER AT END OF YEAR	184.595	670080.937	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	0.036	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.192	0.597	3.914	2.789	0.503	1.040
	1.328	1.082	2.366	1.753	0.475	0.911
STD. DEVIATIONS	1.394	0.773	1.317	3.155	0.251	0.624
	1.547	0.169	2.199	1.451	0.601	1.197

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.416	1.091	2.886	3.453
	4.180	2.103	2.280	1.465	0.933	0.444
STD. DEVIATIONS	0.060	0.051	0.123	0.538	0.578	0.675
	0.754	0.813	0.390	0.232	0.108	0.093

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1681	0.1301	0.1219	0.1072	0.1330	0.1495
	0.1652	0.1907	0.1919	0.2109	0.2001	0.2027
STD. DEVIATIONS	0.0665	0.0511	0.0483	0.0362	0.0534	0.0630
	0.0633	0.0632	0.0455	0.0368	0.0404	0.0716

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0036	0.0028	0.0027	0.0024	0.0029	0.0032
	0.0036	0.0041	0.0041	0.0045	0.0043	0.0043
STD. DEVIATIONS	0.0014	0.0011	0.0010	0.0008	0.0011	0.0013
	0.0013	0.0013	0.0009	0.0008	0.0008	0.0015

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0325	0.0291	0.0317	0.0257	0.0179	0.0176
	0.0183	0.0186	0.0180	0.0186	0.0179	0.0183
STD. DEVIATIONS	0.0388	0.0354	0.0392	0.0332	0.0329	0.0313
	0.0320	0.0315	0.0302	0.0309	0.0297	0.0305

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.7433	2.3353	1.9888	1.8072	2.1697	2.5211
	2.6965	3.1117	3.2350	3.4418	3.3747	3.3079
STD. DEVIATIONS	1.0845	0.9240	0.7876	0.6111	0.8715	1.0615
	1.0323	1.0319	0.7673	0.5999	0.6813	1.1681

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.5846	0.6037	0.5308	0.4577	0.4110	0.3722
	0.3338	0.2951	0.2577	0.2208	0.1843	0.1478
STD. DEVIATIONS	1.0253	1.1490	1.0750	1.0023	0.9190	0.8323
	0.7463	0.6599	0.5762	0.4937	0.4119	0.3304

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.950	(4.2831)	65157.41	44.698
EVAPOTRANSPIRATION	20.151	(2.3215)	73146.54	50.178
LATERAL DRAINAGE COLLECTED FROM LAYER 3	1.97138	(0.51400)	7156.094	4.90905
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.04257	(0.01061)	154.538	0.10601
AVERAGE HEAD ON TOP OF LAYER 4	2.728	(0.713)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.26433	(0.36638)	959.517	0.65822
AVERAGE HEAD ON TOP OF LAYER 8	0.367	(0.766)		
CHANGE IN WATER STORAGE	-0.178	(1.4767)	-646.04	-0.443

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.558	9284.9512
DRAINAGE COLLECTED FROM LAYER 3	0.01103	40.05633
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000232	0.84099
AVERAGE HEAD ON TOP OF LAYER 4	5.582	
MAXIMUM HEAD ON TOP OF LAYER 4	10.750	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.0 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.002550	9.25746
AVERAGE HEAD ON TOP OF LAYER 8	2.856	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2860
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0665	0.3444
2	1.7477	0.1456
3	1.5730	0.1311
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	38.5440	0.2920
8	11.3040	0.4710
SNOW WATER	1.906	

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**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY       **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:    C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP305\DT26-30.D10
OUTPUT DATA FILE:           C:\HELP305\CT26-30.OUT

TIME:   9:31     DATE:   5/19/2000

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     TITLE:  OLD CORTLAND CO LF CLOSURE: LEACHATE REDUCTION YEARS 26-30

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.

                                LAYER  1
                                --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER   0
          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   =      0.3444 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1456	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1311	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC
SLOPE	=	18.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 37

THICKNESS	=	0.04	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.	=	0.199999999000E-10	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999998974000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	408.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	132.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.670000020000E-07	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 18.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	65.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.076	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	1.906	INCHES
INITIAL WATER IN LAYER MATERIALS	=	181.187	INCHES
TOTAL INITIAL WATER	=	183.093	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK
AND STATION LATITUDE = 42.40 DEGREES

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	16.163	58671.363	43.66
EVAPOTRANSPIRATION	19.967	72479.867	53.94
DRAINAGE COLLECTED FROM LAYER 3	1.2751	4628.465	3.44
PERC./LEAKAGE THROUGH LAYER 4	0.028178	102.285	0.08
AVG. HEAD ON TOP OF LAYER 4	1.7664		
PERC./LEAKAGE THROUGH LAYER 8	0.028195	102.346	0.08
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-0.413	-1499.370	-1.12
SOIL WATER AT START OF YEAR	184.595	670078.937	
SOIL WATER AT END OF YEAR	186.088	675498.375	
SNOW WATER AT START OF YEAR	1.906	6918.780	5.15
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.100	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.459	56117.855	37.72

EVAPOTRANSPIRATION	21.412	77724.805	52.25
DRAINAGE COLLECTED FROM LAYER 3	2.2310	8098.589	5.44
PERC./LEAKAGE THROUGH LAYER 4	0.047905	173.895	0.12
AVG. HEAD ON TOP OF LAYER 4	3.0828		
PERC./LEAKAGE THROUGH LAYER 8	0.047905	173.895	0.12
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	1.830	6642.258	4.47
SOIL WATER AT START OF YEAR	186.088	675498.375	
SOIL WATER AT END OF YEAR	185.595	673708.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.613	78456.539	48.62
EVAPOTRANSPIRATION	22.656	82241.492	50.97
DRAINAGE COLLECTED FROM LAYER 3	2.0508	7444.352	4.61
PERC./LEAKAGE THROUGH LAYER 4	0.044286	160.757	0.10
AVG. HEAD ON TOP OF LAYER 4	2.8342		
PERC./LEAKAGE THROUGH LAYER 8	0.044286	160.757	0.10
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	-1.915	-6949.677	-4.31
SOIL WATER AT START OF YEAR	185.595	673708.750	
SOIL WATER AT END OF YEAR	184.348	669184.875	

SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.053	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.287	84530.320	50.30
EVAPOTRANSPIRATION	19.682	71446.422	42.51
DRAINAGE COLLECTED FROM LAYER 3	1.9522	7086.448	4.22
PERC./LEAKAGE THROUGH LAYER 4	0.042179	153.110	0.09
AVG. HEAD ON TOP OF LAYER 4	2.6994		
PERC./LEAKAGE THROUGH LAYER 8	0.042179	153.110	0.09
AVG. HEAD ON TOP OF LAYER 8	0.0000		
CHANGE IN WATER STORAGE	1.337	4852.653	2.89
SOIL WATER AT START OF YEAR	184.348	669184.875	
SOIL WATER AT END OF YEAR	187.074	679079.500	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.072	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00

RUNOFF	13.258	48125.437	41.38
EVAPOTRANSPIRATION	16.814	61033.586	52.48
DRAINAGE COLLECTED FROM LAYER 3	2.7001	9801.451	8.43
PERC./LEAKAGE THROUGH LAYER 4	0.057586	209.037	0.18
AVG. HEAD ON TOP OF LAYER 4	3.7414		
PERC./LEAKAGE THROUGH LAYER 8	0.057586	209.037	0.18
AVG. HEAD ON TOP OF LAYER 8	0.0001		
CHANGE IN WATER STORAGE	-0.789	-2864.297	-2.46
SOIL WATER AT START OF YEAR	187.074	679079.500	
SOIL WATER AT END OF YEAR	184.645	670260.562	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83
SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.023	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	1.125	0.659	3.923	2.801	0.503	1.003
	1.329	1.095	2.365	1.755	0.478	0.919
STD. DEVIATIONS	1.298	0.740	1.307	3.193	0.255	0.648
	1.554	0.169	2.197	1.454	0.609	1.207

EVAPOTRANSPIRATION

TOTALS	0.425	0.476	0.416	1.065	2.913	3.586
	4.155	2.155	2.220	1.401	0.860	0.434
STD. DEVIATIONS	0.060	0.051	0.122	0.517	0.669	0.549
	0.860	0.671	0.421	0.177	0.123	0.094

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.1772	0.1373	0.1284	0.1123	0.1413	0.1491
	0.1660	0.1984	0.1930	0.2163	0.2084	0.2141
STD. DEVIATIONS	0.0634	0.0495	0.0459	0.0327	0.0456	0.0631
	0.0654	0.0590	0.0471	0.0519	0.0510	0.0678

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0038	0.0030	0.0028	0.0025	0.0031	0.0032
	0.0036	0.0043	0.0041	0.0046	0.0045	0.0046
STD. DEVIATIONS	0.0013	0.0010	0.0010	0.0007	0.0009	0.0013
	0.0014	0.0012	0.0010	0.0011	0.0010	0.0014

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0038	0.0030	0.0028	0.0025	0.0031	0.0032
	0.0036	0.0043	0.0041	0.0046	0.0045	0.0046
STD. DEVIATIONS	0.0013	0.0010	0.0010	0.0007	0.0009	0.0013
	0.0014	0.0012	0.0010	0.0011	0.0010	0.0014

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.8908	2.4607	2.0953	1.8944	2.3053	2.5141
	2.7092	3.2371	3.2539	3.5298	3.5142	3.4937
STD. DEVIATIONS	1.0345	0.8804	0.7495	0.5508	0.7438	1.0632
	1.0679	0.9632	0.7946	0.8473	0.8602	1.1061

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	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

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.956	(4.2812)	65180.30	44.713
EVAPOTRANSPIRATION	20.106	(2.1935)	72985.24	50.068
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.04184	(0.51604)	7411.861	5.08450
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.04403	(0.01065)	159.817	0.10963
AVERAGE HEAD ON TOP OF LAYER 4	2.825	(0.715)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.04403	(0.01064)	159.829	0.10964
AVERAGE HEAD ON TOP OF LAYER 8	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.010	(1.5487)	36.31	0.025

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.569	9324.8877
DRAINAGE COLLECTED FROM LAYER 3	0.01068	38.77431
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000225	0.81504
AVERAGE HEAD ON TOP OF LAYER 4	5.403	
MAXIMUM HEAD ON TOP OF LAYER 4	10.414	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	2.6 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.000225	0.81504
AVERAGE HEAD ON TOP OF LAYER 8	0.000	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2857
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0668	0.3445
2	1.7195	0.1433
3	1.6506	0.1375
4	0.0000	0.0000
5	6.8160	0.2840
6	119.1360	0.2920
7	38.5440	0.2920
8	11.3040	0.4710
SNOW WATER	1.906	

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APPENDIX B

SLOPE STABILITY ANALYSIS

- **Waste-Mass Stability Analysis**
  - ***Construction Loading Case***
  - ***Post Closure Conditions***
- **Capping System Veneer Stability Analysis**
  - ***LLDPE Geomembrane***
  - ***PVC Geomembrane***

SLOPE STABILITY ANALYSES

1.0 Introduction

This section presents the stability analyses used in the design of the closure system for the Old Cortland County Landfill. These analyses were performed on the most critical components of the most critical cross-sections for the landfill. The following cases were analyzed:

- **WASTE MASS STABILITY ANALYSIS**
  - CONSTRUCTION LOADING CASE
  - POST CLOSURE CONDITIONS

- **CAPPING SYSTEM VENEER STABILITY ANALYSIS**
  - LLDPE GEOMEMBRANE
  - PVC GEOMEMBRANE

2.0 Stability Cross-Sections

Sheet S-1 (attached) shows a plan view of the landfill footprint and the location of the cross-section analyzed for Post Closure and Construction stability. The sub-surface soil and groundwater cross-sections were plotted from existing bedrock and groundwater mapping presented by Barton & Loguidice, P.C. in the Remedial Investigation (B&L, March 1998).

Worst case post closure conditions were determined to be along the south slope of the landfill within the limits of the relocated refuse. The stability of the south slope was determined by allowing potential failures through the landfill capping system, relocated refuse, existing waste mass and subgrade soils. To model worst case conditions, the PVC to drainage sand interface was used in the analysis.

The most critical construction case occurs with the construction loading applied to the completed PVC capping system. To model this condition, the same landfill cross-section used to analyze global stability of the south slope was utilized. Worst case construction loading was determined to be a fully loaded articulated hauler. Overall construction stability was determined by allowing potential failures through the landfill capping system, relocated refuse, existing waste mass and subgrade soils.

The landfill capping system cross-section is shown on Sheet G-4 of the Construction Drawings. The grading plan of the final capping system will typically follow the existing grades at the site. Waste which is relocated to within the limits of waste of the Old Cortland County Landfill will have a maximum grade of 3.5H:1V or 15.95 degrees (28.57% slope) and a maximum slope height of 157 feet occurring on the south west slope of the landfill. A HELP Model analysis was performed to determine the maximum head build up within capping system on the 3.5H:1V slope. Maximum head build-up

within the capping system was determined to be 3.5 inches. This peak head was used in modeling the stability of the side slope capping system.

3. 0 Soil/Geosynthetic Properties

Capping system soil properties were based on knowledge of the on-site soils as well as typical valves of sands, glacial tills and cohesive soils as published in NAVFAC (1983). The soil properties used in the stability analyses are summarized in the attached calculations.

The stability of the landfill capping system is governed by both the internal shear strength characteristics of the soil layers, as well as the shear strength characteristics of the soil/geosynthetic interfaces. Since both compacted cohesive soils and granular soils generally have higher shear strengths than soil/geosynthetic interfaces, the probable failure plane in the landfill capping system will occur along the interface with the lowest shear strength. Internal shear strength is represented by a combination of cohesion (c) and internal friction angle (ϕ). Similarly, interface shear strength is represented by a combination of adhesion (a) and interface friction angle (δ). Since the long-term contribution of adhesion is uncertain, the analyses were conservatively performed assuming the adhesion of all interfaces to be zero. The interface shear strengths analyzed as part of the capping system stability analyses include:

- Barrier Protection Soil / Geotextile: a=0 psf; $\delta = 32^\circ$
- Geotextile / Soil Drainage Layer: a=0 psf; $\delta = 30^\circ$
- Drainage Layer / PVC: a=0 psf; $\delta = 25^\circ$ (Critical)
- Drainage Layer / Textured LLDPE: a=0 psf, $\delta = 28^\circ$

Municipal Solid Waste (MSW) shear strength data is relatively limited and is summarized in the USEPA seismic design guidance manual (USEPA, 1995). The data shows that both laboratory and field tests consistently result in MSW shear strengths in excess of a cohesion (c) of 300 psf and an internal friction angle of 25 degrees. Therefore, these values were conservatively chosen to be used in the stability analyses. The unit weight of the waste mass is a combination of MSW and cover soil. Assuming that the waste mass consists of three parts waste to one part soil, the resulting combined MSW unit weight would be approximately 65 pcf.

The relocated refuse was estimated to have lower strength values than the existing waste mass of the Old Cortland County Landfill. A cohesion (c) of 200 and an internal friction angle of 15 degrees were chosen to be used in the stability analyses.

4.0 Seismic Design Considerations

Seismic stability is not required for the landfill capping system since the site is not located within a seismic impact zone. A seismic impact zone is defined as any area with a ten percent or greater probability of exceeding a maximum horizontal bedrock acceleration of 0.10g in 250 years.

5.0 Methods of Analysis

Post Closure stability and construction conditions were analyzed using the two-dimensional limit equilibrium slope stability computer program PCSTABL6 (Winstabl Version 1.2) developed as a Joint Highway Research Project (JHRP-88/19) between the Indiana Department of Transportation and Purdue University and modified by the University of Wisconsin-Madison. Circular failures through the waste and in-situ soils using the simplified Janbu method of slices were analyzed.

Landfill capping system veneer stability was analyzed using a two-dimensional, two part wedge method presented by Giroud and Beech (1990). The method models the slope as two blocks: a sliding block along the slope above the critical interface and a toe buttress block at the base of the sliding block. The equation is summarized in the attached calculation sheets.

6.0 Results and Conclusions

Failure planes associated with the global stability analysis of the south slope of the landfill, under both construction loading and post closure conditions, occurred within the relocated refuse. The minimum factors of safety for these cases were determined to be 1.62 and 1.72 respectfully. These factors of safety were determined to be satisfactory and indicate that the landfill capping system will remain stable during construction as well as during post closure.

The output of the veneer stability analysis for the landfill capping system indicated a minimum factor of safety of 1.56 when a PVC geomembrane was utilized and 1.78 when a textured LLDPE geomembrane was used. These factors of safety were determined to be satisfactory and indicate that the landfill capping system will remain stable with either geomembrane material.

SOIL PROPERTIES

SLOPE STABILITY ANALYSES

OLD CORTLAND COUNTY LANDFILL CLOSURE

Soil No.	Soil / Interface Description	γ_m (pcf)	γ_{sat} (pcf)	Cohesion / Adhesion (psf)	ϕ / δ (degrees)
1	Municipal Solid Waste	65	65	c=300	25
2	Relocated Waste	100	100	c=200	15
3	Existing Till	135	135	c=300	30
4	Bedrock	140	140	c=800	50
5	Barrier Protection Soil	130	130	c=0	30
6	PVC / Drainage Sand	0.1	0.1	a=0	25
7	LLDPE / Drainage Sand	0.1	0.1	a=0	28

Barton & Loguidice, P.C.
Consulting Engineers

Barton & Loguidice, P.C.
Consulting Engineers
290 Elwood Davis Road / Box 3107, Syracuse, New York 13220
Phone 315-457-5200 Fax 315-451-0052

JOB OLD CORTLAND CO. LF CLOSURE (332.032)
SHEET NO. 1 OF 1
CALCULATED BY JFB DATE 5/23/00
CHECKED BY DATE
SCALE

STABILITY CALCULATIONS

CALCULATION OF WORST CASE EQUIPMENT LOADING

ASSUMPTIONS: FROM CATERPILLAR PERFORMANCE HANDBOOK, EDITION 20, A D300B ARTICULATED DUMP HAS AN OPERATING WEIGHT OF 43,520 lbs. IT WILL BE ASSUMED THAT THE TRUCK WILL CARRY APPROXIMATELY 20 TONS (40,000 lbs) WHEN FULLY LOADED TO YIELD AN APPROXIMATE WEIGHT OF 83,520 lbs.

WHEN FULLY LOADED, THIS WEIGHT IS DISTRIBUTED AS FOLLOWS: FRONT (31%), CENTER (34.5%), AND REAR (34.5%). THEREFORE, THE REAR AND CENTER TIRES WILL EACH CARRY A LOAD OF APPROXIMATELY (83,520 lbs)(0.345) / 2 = 14,407 lbs (1.5) = **21,611 lbs**.

NOTE: LIVE LOAD MULTIPLIED BY 1.5 (COMMON PRACTICE).

ASSUME THAT THE CONTACT AREA FOR THE SINGLE TRUCK TIRE IS **3 sf**.

THEREFORE, THE WORST CASE LOADING FOR THE EQUIPMENT USE FOR THE PROJECT IS:

(21,611 lbs) / (3 sf) = 7,204 psf

N

LEGEND
- EXISTING DITCH
- EXISTING CONTOUR
- EXISTING TREE/BRUSH LINE
- EXISTING FENCE LINE
- PROPOSED TYPE "B" GAS VENT
- PROPOSED TYPE "A" GAS VENT
- PROPOSED DITCH, ITEM TYPE
- APPROXIMATE LIMIT OF EXISTING OLD COUNTY LANDFILL REFUSE
- GRID COORDINATE
- AREA FOR REFUSE REMOVAL/RELOCATION GRADE TO FREE DRAIN
- AREA FOR REFUSE REMOVAL/RELOCATION AND/BACKFILL WITH COMMON FILL TO EXISTING GRADE
- AREA FOR OLD CITY L.F. CAPING SYSTEM
- FILL AREA FOR EXCAVATED MATERIAL
- AREA FOR OLD COUNTY L.F. CAPING SYSTEM

SETTLING POND
SETTLING POND
SETTLING POND
OLD COUNTY LAND FILL
SEE ROAD REPLACEMENT DETAIL SHEET G-4
E638000
E638500
E639000
E639500
N956000
N956500
N957000
N957500

In charge of	PFD	Date	APRIL, 2000
Designed by	JPS	Scale	NOT TO SCALE
Drawn by	AES		
Checked by			

NO ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

REVISIONS	COMPLETED CONSTRUCTION
	Significant Construction Changes Are Shown
	By ____ Date ____
	Ck'd ____ Date ____

Barton & Loguidice, P.C.
Consulting Engineers
290 Elwood Davis Road / Box 3107, Syracuse, New York 13220

OLD CORTLAND COUNTY LANDFILL
BASIS OF DESIGN REPORT

SITE PLAN

TOWN OF SOLON — CORTLAND COUNTY, NEW YORK

Figure S-1

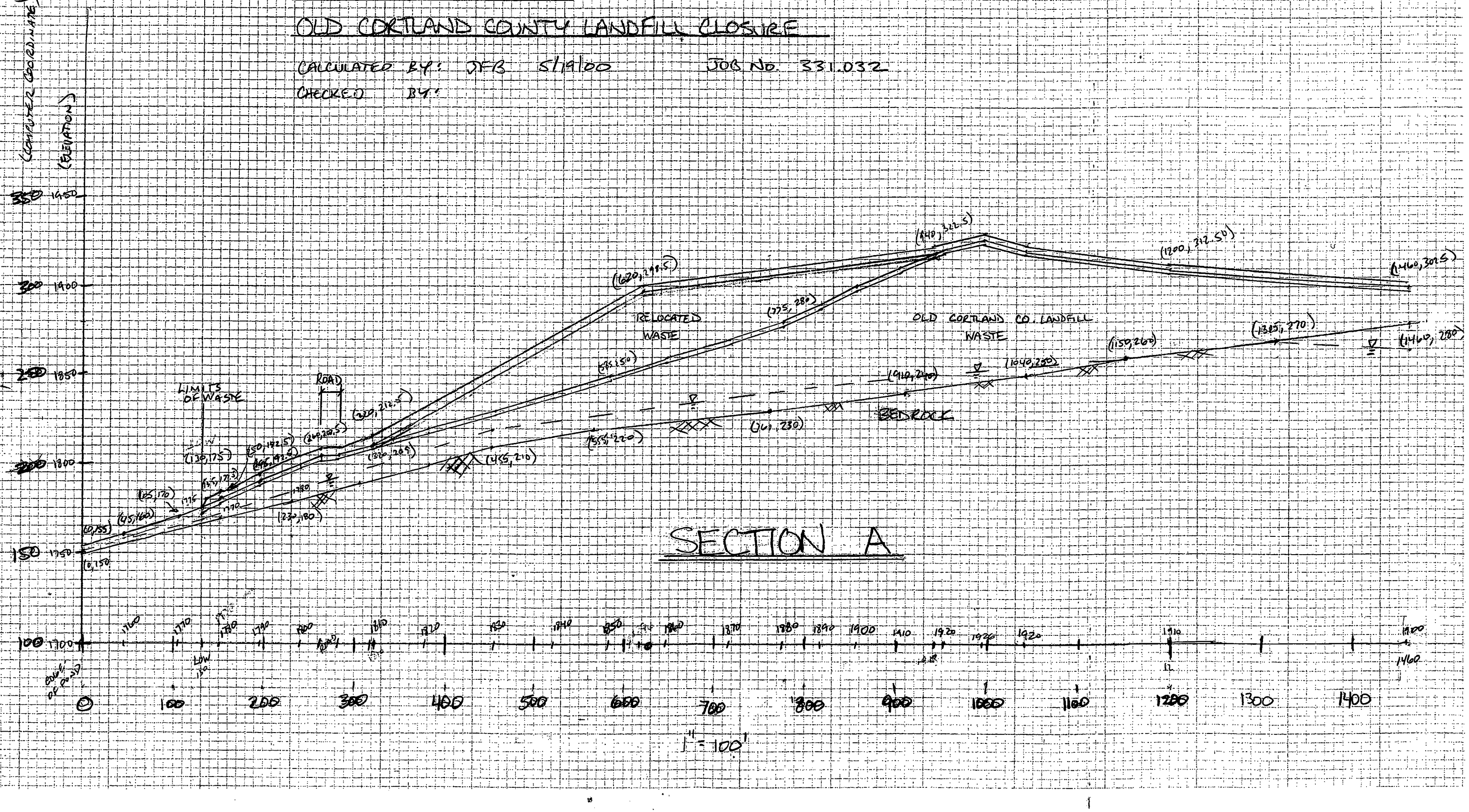
File Number 331.032

STABILITY ANALYSES

OLD CORTLAND COUNTY LANDFILL CLOSURE

CALCULATED BY: JFB 5/19/00 JOB NO. 331.032

CHECKED BY:



SECTION A

WASTE-MASS STABILITY ANALYSIS
for
CONSTRUCTION LOADING CASE

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION South Slope Global Stability - Construction Loading

JFB - 5/24/00

BOUNDARY COORDINATES

15 Top Boundaries
61 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Below Bnd	Type
1	0.00	155.00	45.00	160.00	3	
2	45.00	160.00	105.00	170.00	3	
3	105.00	170.00	130.00	175.00	3	
4	130.00	175.00	135.00	177.50	3	
5	135.00	177.50	150.00	182.50	5	
6	150.00	182.50	195.00	192.50	5	
7	195.00	192.50	260.00	207.50	5	
8	260.00	207.50	280.00	207.50	5	
9	280.00	207.50	320.00	212.50	5	
10	320.00	212.50	620.00	298.50	5	

11	620.00	298.50	940.00	322.50	5
12	940.00	322.50	995.00	328.50	5
13	995.00	328.50	1045.00	322.50	5
14	1045.00	322.50	1200.00	312.50	5
15	1200.00	312.50	1460.00	302.50	5
16	135.00	175.00	150.00	180.00	6
17	150.00	180.00	195.00	190.00	6
18	195.00	190.00	260.00	205.00	6
19	260.00	205.00	280.00	205.00	6
20	280.00	205.00	320.00	210.00	6
21	320.00	210.00	620.00	296.00	6
22	620.00	296.00	940.00	320.00	6
23	940.00	320.00	995.00	326.00	6
24	995.00	326.00	1045.00	320.00	6
25	1045.00	320.00	1200.00	310.00	6
26	1200.00	310.00	1460.00	300.00	6
27	135.00	174.90	150.00	179.90	3
28	150.00	179.90	195.00	189.90	3
29	195.00	189.90	260.00	204.90	3
30	260.00	204.90	280.00	204.90	3
31	280.00	204.90	320.00	209.90	2
32	320.00	209.90	620.00	295.90	2
33	620.00	295.90	940.00	319.90	2
34	940.00	319.90	995.00	325.90	3
35	995.00	325.90	1045.00	319.90	3
36	1045.00	319.90	1200.00	309.90	3
37	1200.00	309.90	1460.00	299.90	3
38	135.00	174.00	150.00	179.00	1
39	150.00	179.00	195.00	189.00	1
40	195.00	189.00	260.00	204.00	1
41	260.00	204.00	280.00	204.00	1
42	280.00	204.00	320.00	209.00	1
43	320.00	209.00	585.00	250.00	3
44	585.00	250.00	775.00	280.00	3
45	775.00	280.00	940.00	319.00	3
46	940.00	319.00	995.00	325.00	3
47	995.00	325.00	1045.00	319.00	1
48	1045.00	319.00	1200.00	309.00	1
49	1200.00	309.00	1460.00	299.00	1
50	320.00	209.00	585.00	249.00	3
51	585.00	249.00	775.00	279.00	3
52	775.00	279.00	940.00	318.00	3
53	0.00	150.00	230.00	180.00	4
54	230.00	180.00	455.00	210.00	4
55	455.00	210.00	555.00	220.00	4
56	555.00	220.00	760.00	230.00	4
57	760.00	230.00	910.00	240.00	4
58	910.00	240.00	1040.00	250.00	4
59	1040.00	250.00	1150.00	260.00	4
60	1150.00	260.00	1315.00	270.00	4
61	1315.00	270.00	1460.00	280.00	4

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant S (psf)	Piez. urface No.
1	65.0	65.0	300.0	25.0	0.00	0.0	1
2	100.0	100.0	200.0	15.0	0.00	0.0	0
3	135.0	135.0	300.0	30.0	0.00	0.0	0
4	140.0	140.0	800.0	50.0	0.00	0.0	1
5	130.0	130.0	0.0	30.0	0.00	0.0	0
6	0.1	0.1	0.0	25.0	0.00	0.0	0
7	0.1	0.1	0.0	28.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 8 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	152.00
2	130.00	168.00
3	455.00	220.00
4	760.00	240.00
5	910.00	250.00
6	1150.00	260.00
7	1315.00	270.00

8	1460.00	265.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	610.00	615.00	7204.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

100 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 100.00 ft.
and X = 300.00 ft.

Each Surface Terminates Between X = 500.00 ft.
and X = 800.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Metho
d * *

Failure Surface Specified By 45 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.31	202.00
3	253.29	202.73
4	263.25	203.54
5	273.21	204.43
6	283.17	205.40
7	293.11	206.44
8	303.05	207.56
9	312.98	208.76
10	322.90	210.03
11	332.80	211.39
12	342.70	212.82
13	352.59	214.32
14	362.46	215.91
15	372.32	217.57
16	382.17	219.31
17	392.00	221.12
18	401.82	223.02
19	411.63	224.99
20	421.41	227.03
21	431.19	229.15
22	440.94	231.35
23	450.68	233.62
24	460.40	235.97
25	470.10	238.40
26	479.78	240.90
27	489.45	243.48
28	499.09	246.13
29	508.71	248.86
30	518.31	251.66
31	527.89	254.54
32	537.44	257.49
33	546.97	260.51
34	556.48	263.62
35	565.96	266.79
36	575.42	270.04
37	584.85	273.36
38	594.26	276.76
39	603.63	280.23
40	612.99	283.77
41	622.31	287.38

42	631.61	291.07
43	640.87	294.83
44	650.11	298.67
45	656.10	301.21

*** 1.620 ***

Failure Surface Specified By 48 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.28	202.41
3	253.22	203.52
4	263.15	204.68
5	273.07	205.90
6	282.99	207.16
7	292.91	208.48
8	302.81	209.84
9	312.71	211.26
10	322.60	212.73
11	332.49	214.25
12	342.36	215.82
13	352.23	217.45
14	362.09	219.12
15	371.94	220.84
16	381.78	222.62
17	391.61	224.44
18	401.43	226.32
19	411.25	228.25
20	421.05	230.22
21	430.84	232.25
22	440.62	234.33
23	450.40	236.46
24	460.15	238.64
25	469.90	240.86
26	479.64	243.14
27	489.36	245.47
28	499.08	247.85
29	508.78	250.28
30	518.47	252.76
31	528.14	255.29
32	537.80	257.87
33	547.45	260.50
34	557.09	263.18
35	566.71	265.91
36	576.31	268.68

37	585.90	271.51
38	595.48	274.39
39	605.04	277.31
40	614.59	280.29
41	624.12	283.31
42	633.64	286.39
43	643.14	289.51
44	652.62	292.68
45	662.09	295.90
46	671.54	299.17
47	680.97	302.49
48	683.05	303.23

*** 1.649 ***

Failure Surface Specified By 59 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.29	202.27
3	253.24	203.24
4	263.19	204.23
5	273.14	205.27
6	283.08	206.34
7	293.02	207.45
8	302.96	208.59
9	312.89	209.77
10	322.81	210.98
11	332.73	212.23
12	342.65	213.52
13	352.56	214.84
14	362.47	216.20
15	372.37	217.60
16	382.27	219.03
17	392.16	220.49
18	402.05	222.00
19	411.93	223.53
20	421.80	225.11
21	431.67	226.72
22	441.54	228.36
23	451.40	230.04
24	461.25	231.76
25	471.09	233.51
26	480.93	235.30
27	490.76	237.13
28	500.59	238.99

29	510.41	240.88
30	520.22	242.81
31	530.02	244.78
32	539.82	246.78
33	549.61	248.82
34	559.39	250.89
35	569.17	253.00
36	578.94	255.14
37	588.70	257.32
38	598.45	259.53
39	608.19	261.78
40	617.93	264.07
41	627.66	266.39
42	637.37	268.75
43	647.08	271.14
44	656.79	273.56
45	666.48	276.02
46	676.16	278.52
47	685.84	281.05
48	695.50	283.62
49	705.16	286.22
50	714.80	288.85
51	724.44	291.53
52	734.07	294.23
53	743.68	296.97
54	753.29	299.75
55	762.89	302.56
56	772.47	305.41
57	782.05	308.29
58	791.62	311.20
59	792.34	311.43

*** 1.744 ***

Failure Surface Specified By 45 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	255.56	206.47
2	265.55	206.81
3	275.54	207.24
4	285.53	207.76
5	295.51	208.37
6	305.49	209.06
7	315.45	209.85
8	325.42	210.72
9	335.37	211.68

10	345.31	212.73
11	355.25	213.87
12	365.17	215.10
13	375.09	216.41
14	384.99	217.81
15	394.88	219.30
16	404.75	220.88
17	414.61	222.55
18	424.46	224.30
19	434.29	226.14
20	444.10	228.07
21	453.89	230.09
22	463.67	232.19
23	473.43	234.38
24	483.16	236.65
25	492.88	239.02
26	502.58	241.47
27	512.25	244.00
28	521.90	246.62
29	531.53	249.33
30	541.13	252.12
31	550.71	255.00
32	560.26	257.96
33	569.78	261.01
34	579.28	264.14
35	588.75	267.36
36	598.19	270.66
37	607.60	274.04
38	616.98	277.51
39	626.33	281.06
40	635.64	284.69
41	644.93	288.41
42	654.18	292.21
43	663.39	296.09
44	672.57	300.05
45	679.09	302.93

*** 1.758 ***

Failure Surface Specified By 58 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.27	202.45
3	253.21	203.58
4	263.14	204.75

5	273.07	205.94
6	282.99	207.17
7	292.91	208.42
8	302.83	209.71
9	312.74	211.02
10	322.65	212.37
11	332.56	213.75
12	342.46	215.15
13	352.36	216.59
14	362.25	218.05
15	372.13	219.55
16	382.02	221.08
17	391.90	222.64
18	401.77	224.22
19	411.64	225.84
20	421.50	227.49
21	431.36	229.17
22	441.21	230.87
23	451.06	232.61
24	460.90	234.38
25	470.74	236.18
26	480.57	238.01
27	490.40	239.86
28	500.22	241.75
29	510.03	243.67
30	519.84	245.62
31	529.64	247.60
32	539.44	249.60
33	549.23	251.64
34	559.01	253.71
35	568.79	255.81
36	578.56	257.93
37	588.33	260.09
38	598.08	262.28
39	607.83	264.50
40	617.58	266.74
41	627.32	269.02
42	637.05	271.32
43	646.77	273.66
44	656.49	276.02
45	666.20	278.42
46	675.90	280.84
47	685.59	283.30
48	695.28	285.78
49	704.96	288.29
50	714.63	290.84
51	724.29	293.41
52	733.95	296.01
53	743.59	298.64
54	753.23	301.30
55	762.87	303.99
56	772.49	306.71

57	782.10	309.46
58	787.69	311.08

*** 1.768 ***

Failure Surface Specified By 50 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	196.22
2	221.06	197.27
3	231.00	198.37
4	240.93	199.52
5	250.86	200.72
6	260.78	201.97
7	270.69	203.27
8	280.60	204.62
9	290.50	206.01
10	300.40	207.46
11	310.29	208.96
12	320.17	210.50
13	330.04	212.09
14	339.90	213.74
15	349.76	215.43
16	359.61	217.17
17	369.45	218.96
18	379.27	220.80
19	389.09	222.68
20	398.91	224.62
21	408.71	226.60
22	418.50	228.64
23	428.28	230.72
24	438.05	232.85
25	447.81	235.03
26	457.56	237.26
27	467.29	239.53
28	477.02	241.86
29	486.74	244.23
30	496.44	246.65
31	506.13	249.12
32	515.81	251.64
33	525.47	254.21
34	535.12	256.82
35	544.76	259.48
36	554.39	262.19
37	564.00	264.95
38	573.60	267.75

39	583.18	270.60
40	592.75	273.50
41	602.31	276.45
42	611.85	279.45
43	621.38	282.49
44	630.89	285.58
45	640.38	288.72
46	649.86	291.90
47	659.33	295.13
48	668.77	298.41
49	678.20	301.74
50	682.19	303.16

*** 1.770 ***

Failure Surface Specified By 58 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.27	202.44
3	253.21	203.57
4	263.14	204.73
5	273.07	205.92
6	283.00	207.13
7	292.92	208.38
8	302.84	209.66
9	312.75	210.97
10	322.66	212.31
11	332.57	213.67
12	342.47	215.07
13	352.37	216.50
14	362.26	217.96
15	372.15	219.45
16	382.03	220.97
17	391.91	222.51
18	401.79	224.09
19	411.66	225.70
20	421.52	227.34
21	431.38	229.01
22	441.24	230.70
23	451.09	232.43
24	460.93	234.19
25	470.77	235.98
26	480.60	237.80
27	490.43	239.64
28	500.25	241.52

29	510.07	243.43
30	519.88	245.36
31	529.68	247.33
32	539.48	249.32
33	549.28	251.35
34	559.06	253.41
35	568.84	255.49
36	578.62	257.61
37	588.38	259.75
38	598.14	261.92
39	607.90	264.13
40	617.65	266.36
41	627.39	268.62
42	637.12	270.92
43	646.85	273.24
44	656.57	275.59
45	666.28	277.97
46	675.98	280.38
47	685.68	282.82
48	695.37	285.29
49	705.06	287.79
50	714.73	290.31
51	724.40	292.87
52	734.06	295.46
53	743.71	298.07
54	753.35	300.72
55	762.99	303.39
56	772.62	306.09
57	782.24	308.83
58	790.91	311.32

*** 1.771 ***

Failure Surface Specified By 59 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.28	202.42
3	253.21	203.53
4	263.15	204.67
5	273.08	205.84
6	283.01	207.04
7	292.93	208.27
8	302.85	209.53
9	312.77	210.82
10	322.68	212.14

11	332.59	213.49
12	342.49	214.87
13	352.39	216.28
14	362.29	217.72
15	372.18	219.20
16	382.07	220.70
17	391.95	222.23
18	401.83	223.79
19	411.70	225.38
20	421.57	227.00
21	431.43	228.65
22	441.29	230.33
23	451.14	232.04
24	460.99	233.78
25	470.83	235.56
26	480.67	237.36
27	490.50	239.19
28	500.32	241.05
29	510.14	242.94
30	519.96	244.86
31	529.76	246.81
32	539.57	248.79
33	549.36	250.80
34	559.15	252.84
35	568.93	254.91
36	578.71	257.01
37	588.48	259.14
38	598.25	261.30
39	608.00	263.49
40	617.76	265.70
41	627.50	267.95
42	637.24	270.23
43	646.97	272.54
44	656.69	274.87
45	666.41	277.24
46	676.12	279.63
47	685.82	282.06
48	695.51	284.51
49	705.20	287.00
50	714.88	289.51
51	724.55	292.05
52	734.21	294.63
53	743.87	297.23
54	753.51	299.86
55	763.15	302.52
56	772.78	305.21
57	782.41	307.93
58	792.02	310.68
59	795.40	311.65

*** 1.775 ***

Failure Surface Specified By 56 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	196.22
2	221.03	197.48
3	230.95	198.77
4	240.86	200.08
5	250.77	201.43
6	260.67	202.81
7	270.58	204.22
8	280.47	205.65
9	290.36	207.12
10	300.25	208.62
11	310.13	210.14
12	320.01	211.70
13	329.89	213.28
14	339.75	214.90
15	349.62	216.54
16	359.48	218.22
17	369.33	219.92
18	379.18	221.65
19	389.02	223.42
20	398.86	225.21
21	408.69	227.03
22	418.52	228.88
23	428.34	230.76
24	438.16	232.67
25	447.97	234.61
26	457.77	236.58
27	467.57	238.57
28	477.36	240.60
29	487.15	242.66
30	496.93	244.74
31	506.70	246.86
32	516.47	249.00
33	526.23	251.18
34	535.99	253.38
35	545.73	255.61
36	555.48	257.87
37	565.21	260.16
38	574.94	262.48
39	584.66	264.83
40	594.37	267.21
41	604.08	269.62
42	613.78	272.05
43	623.47	274.52

44	633.15	277.01
45	642.83	279.54
46	652.50	282.09
47	662.16	284.67
48	671.81	287.28
49	681.46	289.92
50	691.09	292.58
51	700.72	295.28
52	710.34	298.01
53	719.96	300.76
54	729.56	303.54
55	739.16	306.36
56	744.04	307.80

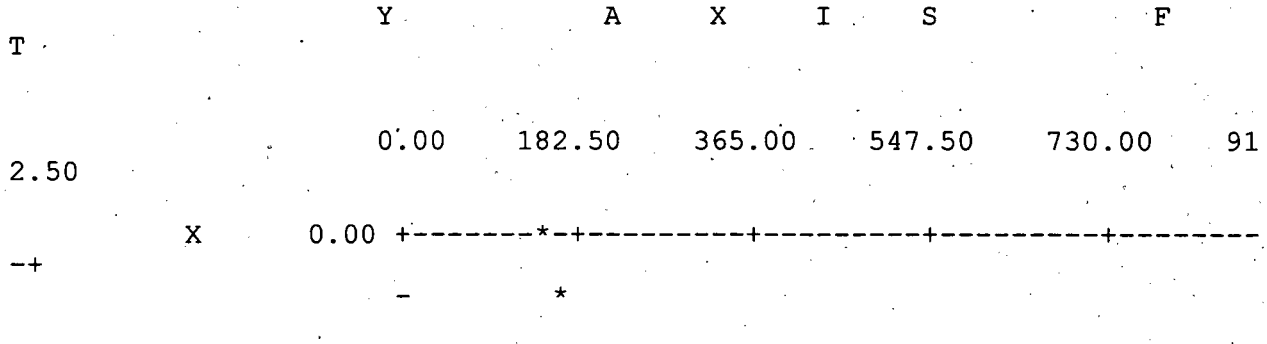
*** 1.819 ***

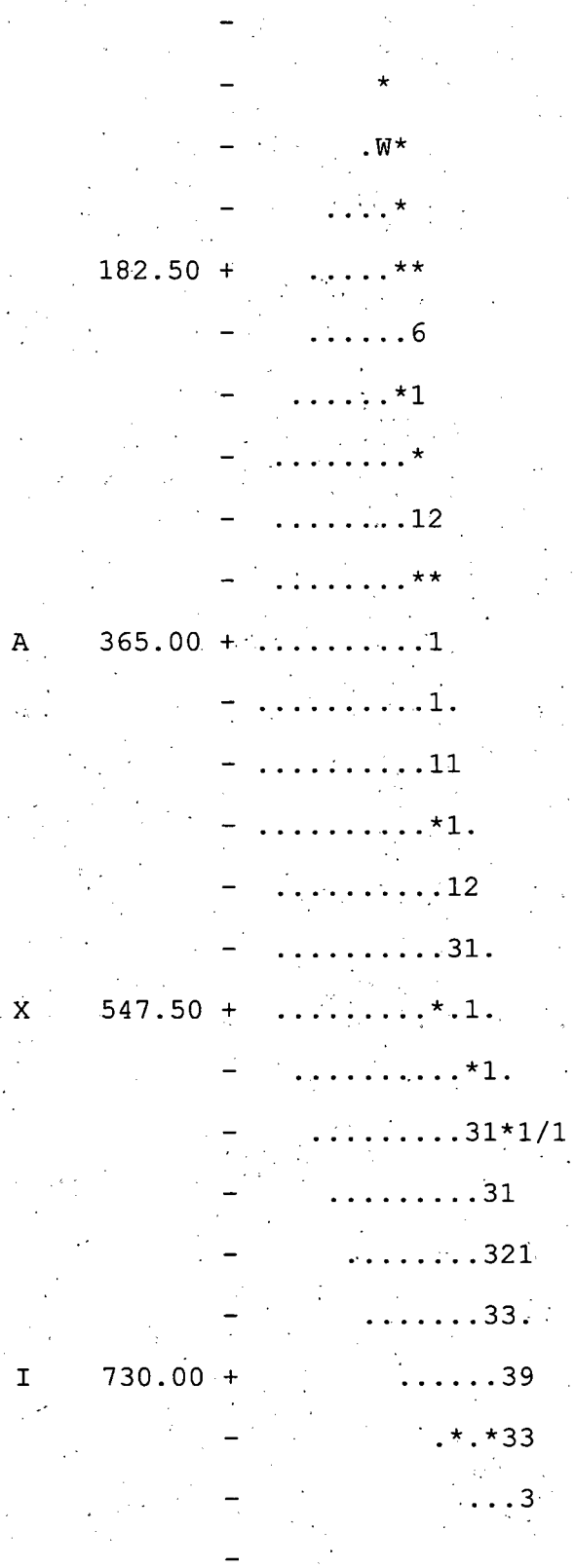
Failure Surface Specified By 60 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	196.22
2	221.05	197.28
3	230.99	198.38
4	240.93	199.51
5	250.86	200.67
6	260.79	201.86
7	270.72	203.09
8	280.64	204.35
9	290.55	205.63
10	300.47	206.95
11	310.37	208.30
12	320.28	209.69
13	330.18	211.10
14	340.07	212.55
15	349.96	214.03
16	359.85	215.53
17	369.73	217.08
18	379.60	218.65
19	389.47	220.25
20	399.34	221.89
21	409.20	223.55
22	419.05	225.25
23	428.90	226.98
24	438.75	228.74
25	448.59	230.54
26	458.42	232.36
27	468.24	234.22

28	478.06	236.10
29	487.88	238.02
30	497.69	239.97
31	507.49	241.95
32	517.28	243.97
33	527.07	246.01
34	536.86	248.09
35	546.63	250.19
36	556.40	252.33
37	566.16	254.50
38	575.92	256.70
39	585.66	258.93
40	595.41	261.19
41	605.14	263.49
42	614.87	265.81
43	624.58	268.16
44	634.29	270.55
45	644.00	272.97
46	653.69	275.42
47	663.38	277.90
48	673.06	280.41
49	682.73	282.95
50	692.40	285.52
51	702.05	288.12
52	711.70	290.76
53	721.34	293.42
54	730.97	296.12
55	740.59	298.84
56	750.20	301.60
57	759.80	304.39
58	769.40	307.21
59	778.98	310.06
60	780.61	310.55

*** 1.821 ***




182.50
365.00
547.50
730.00

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                    -
                    -
S       912.50      +          *W
                    -              **
                    -
                    -               *
                    -            *  **
                    -
        1095.00     +
                    -
                    -            *
                    -               *
                    -
                    -
F       1277.50     +
                    -            *
                    -
                    -
                    -
                    -
T       1460.00     +            ***
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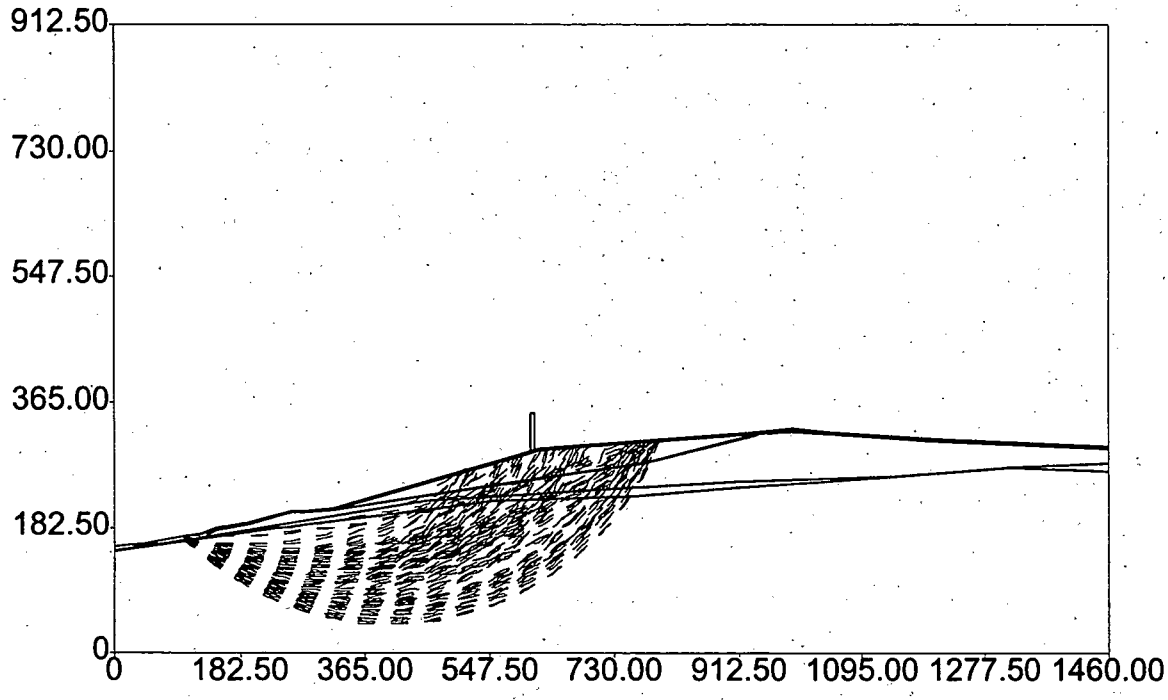
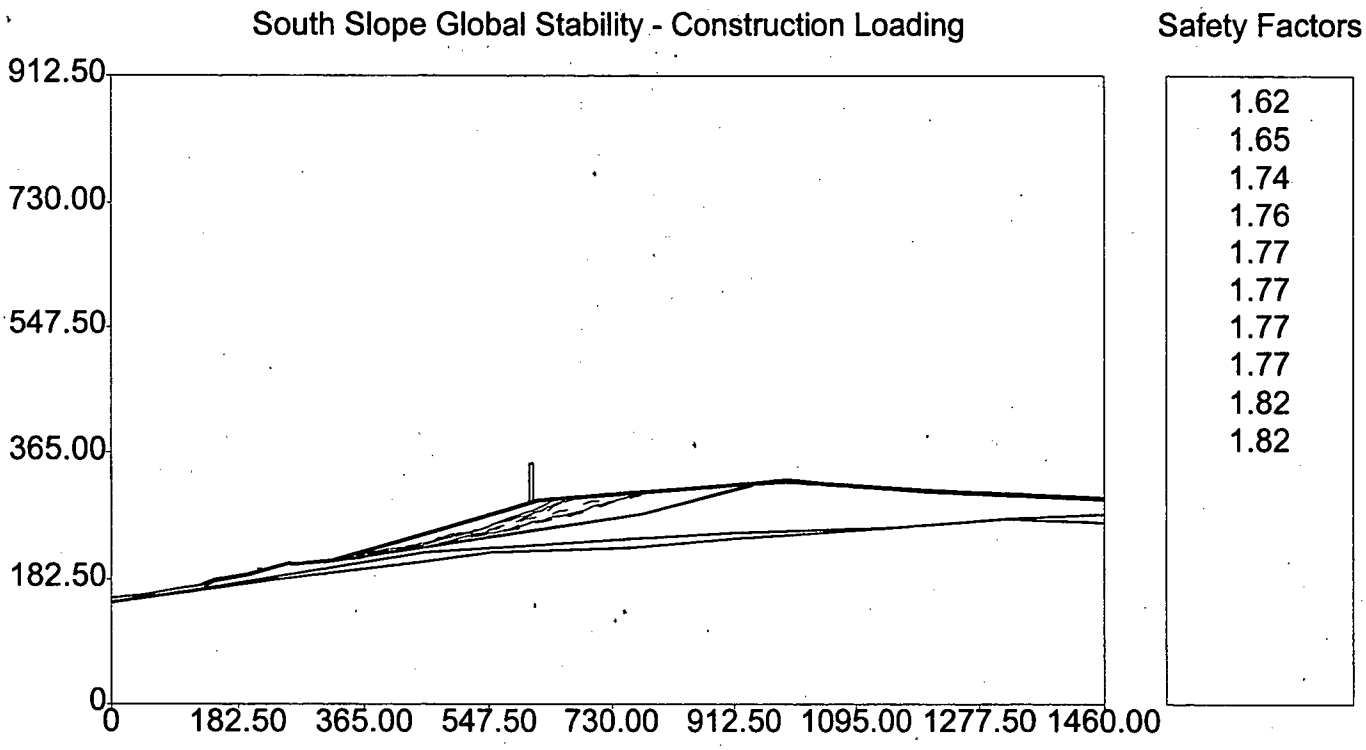
South Slope Global Stability - Construction Loading




South Slope Global Stability - Construction Loading
Safety Factors
1.62
1.65
1.74
1.76
1.77
1.77
1.77
1.77
1.82
1.82
912.50
730.00
547.50
365.00
182.50
0
0
182.50
365.00
547.50
730.00
912.50
1095.00
1277.50
1460.00

WASTE-MASS STABILITY ANALYSIS
for
POST-CLOSURE CONDITIONS

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION South Slope Global Stability

JFB 5/24/00

BOUNDARY COORDINATES

15 Top Boundaries
61 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Below Bnd	Type
1	0.00	155.00	45.00	160.00	3	
2	45.00	160.00	105.00	170.00	3	
3	105.00	170.00	130.00	175.00	3	
4	130.00	175.00	135.00	177.50	3	
5	135.00	177.50	150.00	182.50	5	
6	150.00	182.50	195.00	192.50	5	
7	195.00	192.50	260.00	207.50	5	
8	260.00	207.50	280.00	207.50	5	
9	280.00	207.50	320.00	212.50	5	
10	320.00	212.50	620.00	298.50	5	

11	620.00	298.50	940.00	322.50	5
12	940.00	322.50	995.00	328.50	5
13	995.00	328.50	1045.00	322.50	5
14	1045.00	322.50	1200.00	312.50	5
15	1200.00	312.50	1460.00	302.50	5
16	135.00	175.00	150.00	180.00	6
17	150.00	180.00	195.00	190.00	6
18	195.00	190.00	260.00	205.00	6
19	260.00	205.00	280.00	205.00	6
20	280.00	205.00	320.00	210.00	6
21	320.00	210.00	620.00	296.00	6
22	620.00	296.00	940.00	320.00	6
23	940.00	320.00	995.00	326.00	6
24	995.00	326.00	1045.00	320.00	6
25	1045.00	320.00	1200.00	310.00	6
26	1200.00	310.00	1460.00	300.00	6
27	135.00	174.90	150.00	179.90	3
28	150.00	179.90	195.00	189.90	3
29	195.00	189.90	260.00	204.90	3
30	260.00	204.90	280.00	204.90	3
31	280.00	204.90	320.00	209.90	2
32	320.00	209.90	620.00	295.90	2
33	620.00	295.90	940.00	319.90	2
34	940.00	319.90	995.00	325.90	3
35	995.00	325.90	1045.00	319.90	3
36	1045.00	319.90	1200.00	309.90	3
37	1200.00	309.90	1460.00	299.90	3
38	135.00	174.00	150.00	179.00	1
39	150.00	179.00	195.00	189.00	1
40	195.00	189.00	260.00	204.00	1
41	260.00	204.00	280.00	204.00	1
42	280.00	204.00	320.00	209.00	1
43	320.00	209.00	585.00	250.00	3
44	585.00	250.00	775.00	280.00	3
45	775.00	280.00	940.00	319.00	3
46	940.00	319.00	995.00	325.00	3
47	995.00	325.00	1045.00	319.00	1
48	1045.00	319.00	1200.00	309.00	1
49	1200.00	309.00	1460.00	299.00	1
50	320.00	209.00	585.00	249.00	3
51	585.00	249.00	775.00	279.00	3
52	775.00	279.00	940.00	318.00	3
53	0.00	150.00	230.00	180.00	4
54	230.00	180.00	455.00	210.00	4
55	455.00	210.00	555.00	220.00	4
56	555.00	220.00	760.00	230.00	4
57	760.00	230.00	910.00	240.00	4
58	910.00	240.00	1040.00	250.00	4
59	1040.00	250.00	1150.00	260.00	4
60	1150.00	260.00	1315.00	270.00	4
61	1315.00	270.00	1460.00	280.00	4

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Piez. urface No.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant S (psf)
1 0 0 1 0 0 0	1	65.0	65.0	300.0	25.0	0.00	0.0
	2	100.0	100.0	200.0	15.0	0.00	0.0
	3	135.0	135.0	300.0	30.0	0.00	0.0
	4	140.0	140.0	800.0	50.0	0.00	0.0
	5	130.0	130.0	0.0	30.0	0.00	0.0
	6	0.1	0.1	0.0	25.0	0.00	0.0
	7	0.1	0.1	0.0	28.0	0.00	0.0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 8 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	152.00
2	130.00	168.00
3	455.00	220.00
4	760.00	240.00
5	910.00	250.00
6	1150.00	260.00
7	1315.00	270.00

8 1460.00 265.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

100 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 100.00 ft.
and X = 300.00 ft.

Each Surface Terminates Between X = 500.00 ft.
and X = 800.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 45 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.31	202.00
3	253.29	202.73
4	263.25	203.54
5	273.21	204.43
6	283.17	205.40

7	293.11	206.44
8	303.05	207.56
9	312.98	208.76
10	322.90	210.03
11	332.80	211.39
12	342.70	212.82
13	352.59	214.32
14	362.46	215.91
15	372.32	217.57
16	382.17	219.31
17	392.00	221.12
18	401.82	223.02
19	411.63	224.99
20	421.41	227.03
21	431.19	229.15
22	440.94	231.35
23	450.68	233.62
24	460.40	235.97
25	470.10	238.40
26	479.78	240.90
27	489.45	243.48
28	499.09	246.13
29	508.71	248.86
30	518.31	251.66
31	527.89	254.54
32	537.44	257.49
33	546.97	260.51
34	556.48	263.62
35	565.96	266.79
36	575.42	270.04
37	584.85	273.36
38	594.26	276.76
39	603.63	280.23
40	612.99	283.77
41	622.31	287.38
42	631.61	291.07
43	640.87	294.83
44	650.11	298.67
45	656.10	301.21

*** 1.715 ***

Failure Surface Specified By 48 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35

2	243.28	202.41
3	253.22	203.52
4	263.15	204.68
5	273.07	205.90
6	282.99	207.16
7	292.91	208.48
8	302.81	209.84
9	312.71	211.26
10	322.60	212.73
11	332.49	214.25
12	342.36	215.82
13	352.23	217.45
14	362.09	219.12
15	371.94	220.84
16	381.78	222.62
17	391.61	224.44
18	401.43	226.32
19	411.25	228.25
20	421.05	230.22
21	430.84	232.25
22	440.62	234.33
23	450.40	236.46
24	460.15	238.64
25	469.90	240.86
26	479.64	243.14
27	489.36	245.47
28	499.08	247.85
29	508.78	250.28
30	518.47	252.76
31	528.14	255.29
32	537.80	257.87
33	547.45	260.50
34	557.09	263.18
35	566.71	265.91
36	576.31	268.68
37	585.90	271.51
38	595.48	274.39
39	605.04	277.31
40	614.59	280.29
41	624.12	283.31
42	633.64	286.39
43	643.14	289.51
44	652.62	292.68
45	662.09	295.90
46	671.54	299.17
47	680.97	302.49
48	683.05	303.23

*** 1.723 ***

Failure Surface Specified By 59 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.29	202.27
3	253.24	203.24
4	263.19	204.23
5	273.14	205.27
6	283.08	206.34
7	293.02	207.45
8	302.96	208.59
9	312.89	209.77
10	322.81	210.98
11	332.73	212.23
12	342.65	213.52
13	352.56	214.84
14	362.47	216.20
15	372.37	217.60
16	382.27	219.03
17	392.16	220.49
18	402.05	222.00
19	411.93	223.53
20	421.80	225.11
21	431.67	226.72
22	441.54	228.36
23	451.40	230.04
24	461.25	231.76
25	471.09	233.51
26	480.93	235.30
27	490.76	237.13
28	500.59	238.99
29	510.41	240.88
30	520.22	242.81
31	530.02	244.78
32	539.82	246.78
33	549.61	248.82
34	559.39	250.89
35	569.17	253.00
36	578.94	255.14
37	588.70	257.32
38	598.45	259.53
39	608.19	261.78
40	617.93	264.07
41	627.66	266.39
42	637.37	268.75
43	647.08	271.14
44	656.79	273.56
45	666.48	276.02

46	676.16	278.52
47	685.84	281.05
48	695.50	283.62
49	705.16	286.22
50	714.80	288.85
51	724.44	291.53
52	734.07	294.23
53	743.68	296.97
54	753.29	299.75
55	762.89	302.56
56	772.47	305.41
57	782.05	308.29
58	791.62	311.20
59	792.34	311.43

*** 1.769 ***

Failure Surface Specified By 58 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.27	202.45
3	253.21	203.58
4	263.14	204.75
5	273.07	205.94
6	282.99	207.17
7	292.91	208.42
8	302.83	209.71
9	312.74	211.02
10	322.65	212.37
11	332.56	213.75
12	342.46	215.15
13	352.36	216.59
14	362.25	218.05
15	372.13	219.55
16	382.02	221.08
17	391.90	222.64
18	401.77	224.22
19	411.64	225.84
20	421.50	227.49
21	431.36	229.17
22	441.21	230.87
23	451.06	232.61
24	460.90	234.38
25	470.74	236.18
26	480.57	238.01

27	490.40	239.86
28	500.22	241.75
29	510.03	243.67
30	519.84	245.62
31	529.64	247.60
32	539.44	249.60
33	549.23	251.64
34	559.01	253.71
35	568.79	255.81
36	578.56	257.93
37	588.33	260.09
38	598.08	262.28
39	607.83	264.50
40	617.58	266.74
41	627.32	269.02
42	637.05	271.32
43	646.77	273.66
44	656.49	276.02
45	666.20	278.42
46	675.90	280.84
47	685.59	283.30
48	695.28	285.78
49	704.96	288.29
50	714.63	290.84
51	724.29	293.41
52	733.95	296.01
53	743.59	298.64
54	753.23	301.30
55	762.87	303.99
56	772.49	306.71
57	782.10	309.46
58	787.69	311.08

*** 1.795 ***

Failure Surface Specified By 58 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.27	202.44
3	253.21	203.57
4	263.14	204.73
5	273.07	205.92
6	283.00	207.13
7	292.92	208.38
8	302.84	209.66

9	312.75	210.97
10	322.66	212.31
11	332.57	213.67
12	342.47	215.07
13	352.37	216.50
14	362.26	217.96
15	372.15	219.45
16	382.03	220.97
17	391.91	222.51
18	401.79	224.09
19	411.66	225.70
20	421.52	227.34
21	431.38	229.01
22	441.24	230.70
23	451.09	232.43
24	460.93	234.19
25	470.77	235.98
26	480.60	237.80
27	490.43	239.64
28	500.25	241.52
29	510.07	243.43
30	519.88	245.36
31	529.68	247.33
32	539.48	249.32
33	549.28	251.35
34	559.06	253.41
35	568.84	255.49
36	578.62	257.61
37	588.38	259.75
38	598.14	261.92
39	607.90	264.13
40	617.65	266.36
41	627.39	268.62
42	637.12	270.92
43	646.85	273.24
44	656.57	275.59
45	666.28	277.97
46	675.98	280.38
47	685.68	282.82
48	695.37	285.29
49	705.06	287.79
50	714.73	290.31
51	724.40	292.87
52	734.06	295.46
53	743.71	298.07
54	753.35	300.72
55	762.99	303.39
56	772.62	306.09
57	782.24	308.83
58	790.91	311.32

*** 1.798 ***

Failure Surface Specified By 59 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.33	201.35
2	243.28	202.42
3	253.21	203.53
4	263.15	204.67
5	273.08	205.84
6	283.01	207.04
7	292.93	208.27
8	302.85	209.53
9	312.77	210.82
10	322.68	212.14
11	332.59	213.49
12	342.49	214.87
13	352.39	216.28
14	362.29	217.72
15	372.18	219.20
16	382.07	220.70
17	391.95	222.23
18	401.83	223.79
19	411.70	225.38
20	421.57	227.00
21	431.43	228.65
22	441.29	230.33
23	451.14	232.04
24	460.99	233.78
25	470.83	235.56
26	480.67	237.36
27	490.50	239.19
28	500.32	241.05
29	510.14	242.94
30	519.96	244.86
31	529.76	246.81
32	539.57	248.79
33	549.36	250.80
34	559.15	252.84
35	568.93	254.91
36	578.71	257.01
37	588.48	259.14
38	598.25	261.30
39	608.00	263.49
40	617.76	265.70
41	627.50	267.95
42	637.24	270.23

43	646.97	272.54
44	656.69	274.87
45	666.41	277.24
46	676.12	279.63
47	685.82	282.06
48	695.51	284.51
49	705.20	287.00
50	714.88	289.51
51	724.55	292.05
52	734.21	294.63
53	743.87	297.23
54	753.51	299.86
55	763.15	302.52
56	772.78	305.21
57	782.41	307.93
58	792.02	310.68
59	795.40	311.65

*** 1.800 ***

Failure Surface Specified By 45 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	255.56	206.47
2	265.55	206.81
3	275.54	207.24
4	285.53	207.76
5	295.51	208.37
6	305.49	209.06
7	315.45	209.85
8	325.42	210.72
9	335.37	211.68
10	345.31	212.73
11	355.25	213.87
12	365.17	215.10
13	375.09	216.41
14	384.99	217.81
15	394.88	219.30
16	404.75	220.88
17	414.61	222.55
18	424.46	224.30
19	434.29	226.14
20	444.10	228.07
21	453.89	230.09
22	463.67	232.19
23	473.43	234.38

24	483.16	236.65
25	492.88	239.02
26	502.58	241.47
27	512.25	244.00
28	521.90	246.62
29	531.53	249.33
30	541.13	252.12
31	550.71	255.00
32	560.26	257.96
33	569.78	261.01
34	579.28	264.14
35	588.75	267.36
36	598.19	270.66
37	607.60	274.04
38	616.98	277.51
39	626.33	281.06
40	635.64	284.69
41	644.93	288.41
42	654.18	292.21
43	663.39	296.09
44	672.57	300.05
45	679.09	302.93

*** 1.838 ***

Failure Surface Specified By 60 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	196.22
2	221.05	197.28
3	230.99	198.38
4	240.93	199.51
5	250.86	200.67
6	260.79	201.86
7	270.72	203.09
8	280.64	204.35
9	290.55	205.63
10	300.47	206.95
11	310.37	208.30
12	320.28	209.69
13	330.18	211.10
14	340.07	212.55
15	349.96	214.03
16	359.85	215.53
17	369.73	217.08
18	379.60	218.65

19	389.47	220.25
20	399.34	221.89
21	409.20	223.55
22	419.05	225.25
23	428.90	226.98
24	438.75	228.74
25	448.59	230.54
26	458.42	232.36
27	468.24	234.22
28	478.06	236.10
29	487.88	238.02
30	497.69	239.97
31	507.49	241.95
32	517.28	243.97
33	527.07	246.01
34	536.86	248.09
35	546.63	250.19
36	556.40	252.33
37	566.16	254.50
38	575.92	256.70
39	585.66	258.93
40	595.41	261.19
41	605.14	263.49
42	614.87	265.81
43	624.58	268.16
44	634.29	270.55
45	644.00	272.97
46	653.69	275.42
47	663.38	277.90
48	673.06	280.41
49	682.73	282.95
50	692.40	285.52
51	702.05	288.12
52	711.70	290.76
53	721.34	293.42
54	730.97	296.12
55	740.59	298.84
56	750.20	301.60
57	759.80	304.39
58	769.40	307.21
59	778.98	310.06
60	780.61	310.55

*** 1.851 ***

Failure Surface Specified By 50 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	211.11	196.22
2	221.06	197.27
3	231.00	198.37
4	240.93	199.52
5	250.86	200.72
6	260.78	201.97
7	270.69	203.27
8	280.60	204.62
9	290.50	206.01
10	300.40	207.46
11	310.29	208.96
12	320.17	210.50
13	330.04	212.09
14	339.90	213.74
15	349.76	215.43
16	359.61	217.17
17	369.45	218.96
18	379.27	220.80
19	389.09	222.68
20	398.91	224.62
21	408.71	226.60
22	418.50	228.64
23	428.28	230.72
24	438.05	232.85
25	447.81	235.03
26	457.56	237.26
27	467.29	239.53
28	477.02	241.86
29	486.74	244.23
30	496.44	246.65
31	506.13	249.12
32	515.81	251.64
33	525.47	254.21
34	535.12	256.82
35	544.76	259.48
36	554.39	262.19
37	564.00	264.95
38	573.60	267.75
39	583.18	270.60
40	592.75	273.50
41	602.31	276.45
42	611.85	279.45
43	621.38	282.49
44	630.89	285.58
45	640.38	288.72
46	649.86	291.90
47	659.33	295.13
48	668.77	298.41
49	678.20	301.74
50	682.19	303.16

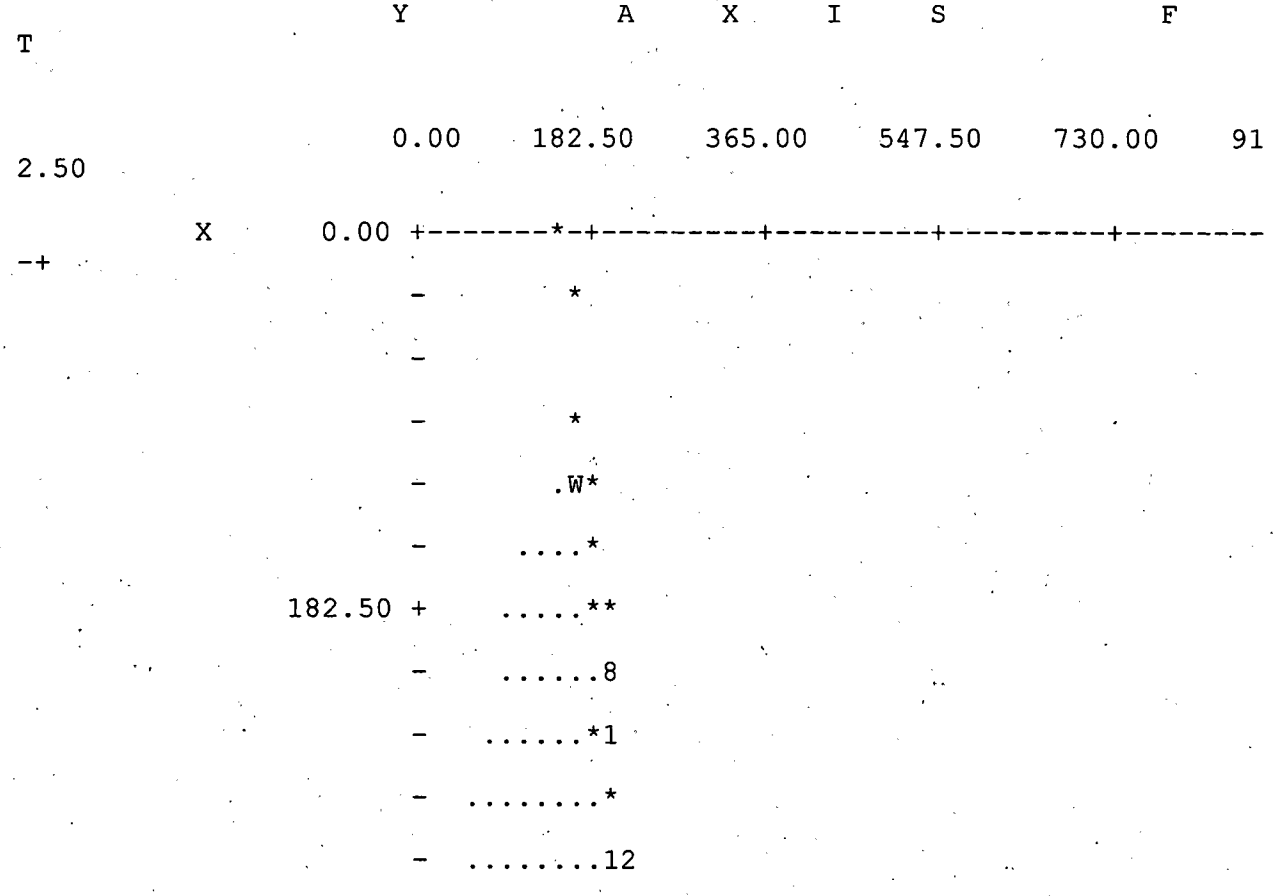
*** 1.851 ***

Failure Surface Specified By 56 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	196.22
2	221.03	197.48
3	230.95	198.77
4	240.86	200.08
5	250.77	201.43
6	260.67	202.81
7	270.58	204.22
8	280.47	205.65
9	290.36	207.12
10	300.25	208.62
11	310.13	210.14
12	320.01	211.70
13	329.89	213.28
14	339.75	214.90
15	349.62	216.54
16	359.48	218.22
17	369.33	219.92
18	379.18	221.65
19	389.02	223.42
20	398.86	225.21
21	408.69	227.03
22	418.52	228.88
23	428.34	230.76
24	438.16	232.67
25	447.97	234.61
26	457.77	236.58
27	467.57	238.57
28	477.36	240.60
29	487.15	242.66
30	496.93	244.74
31	506.70	246.86
32	516.47	249.00
33	526.23	251.18
34	535.99	253.38
35	545.73	255.61
36	555.48	257.87
37	565.21	260.16
38	574.94	262.48
39	584.66	264.83
40	594.37	267.21

41	604.08	269.62
42	613.78	272.05
43	623.47	274.52
44	633.15	277.01
45	642.83	279.54
46	652.50	282.09
47	662.16	284.67
48	671.81	287.28
49	681.46	289.92
50	691.09	292.58
51	700.72	295.28
52	710.34	298.01
53	719.96	300.76
54	729.56	303.54
55	739.16	306.36
56	744.04	307.80

*** 1.863 ***



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                -  ..........1.
                -  ..........11
                -  ..........*1.
                -  ..........12
                -  ..........31.
X     547.50 +  .........*.1.
                -   ..........*1.
                -    .........31*
                -     .........31
                -      ........321
                -       .......33.
I     730.00 +         ......30
                -          .*.*33
                -            ...3
                -
                -
                -
S     912.50 +            *W
                -              **
                -
                -               *
                -            *  **
                -
    1095.00 +
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                -
                -              *
                -                  *
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F     1277.50   +
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T     1460.00   +                ***
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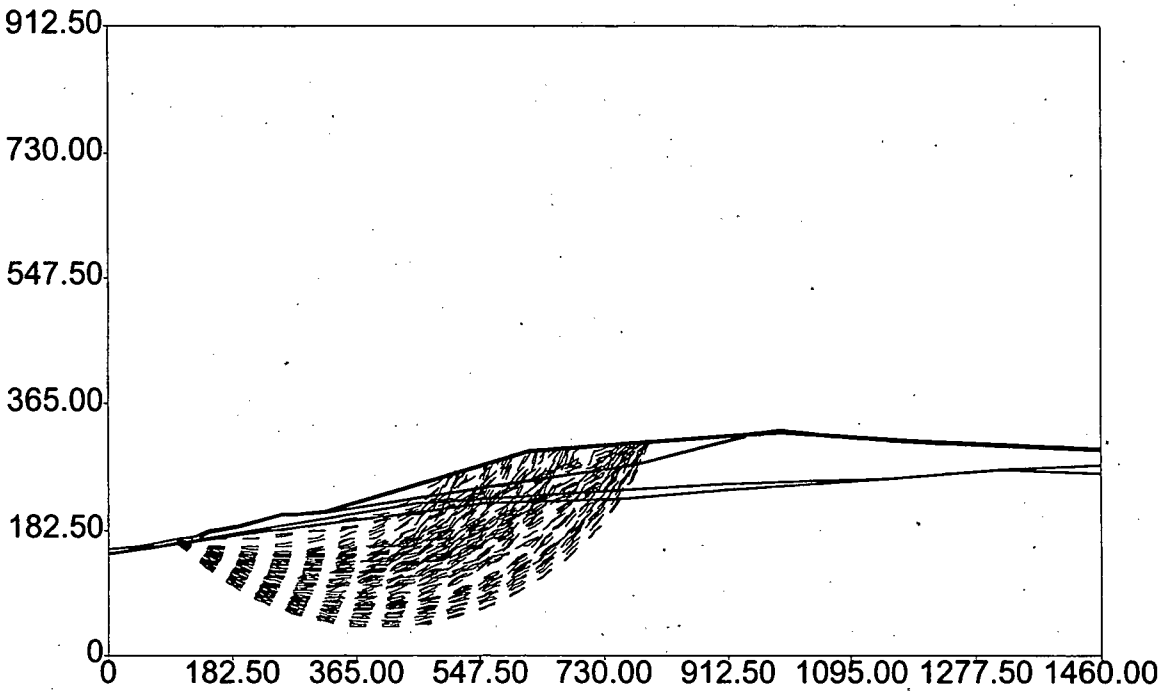
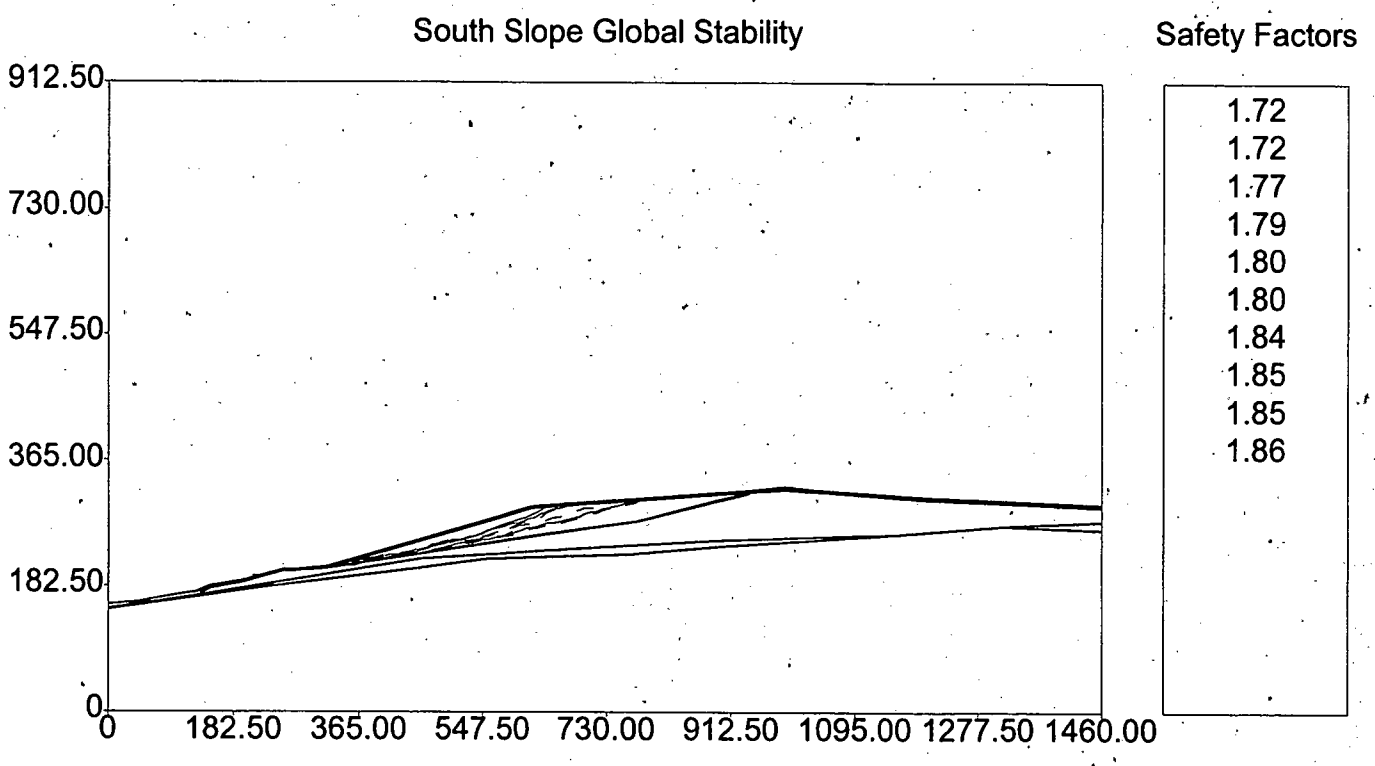
South Slope Global Stability




South Slope Global Stability
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365.00
182.50
0
0
182.50
365.00
547.50
730.00
912.50
1095.00
1277.50
1460.00
1.72
1.72
1.77
1.79
1.80
1.80
1.84
1.85
1.85
1.86

CAPPING SYSTEM VENEER STABILITY ANALYSIS
for
LLDPE & PVC GEOMEMBRANES

Barton & Loguidice, P.C.
Consulting Engineers
290 Elwood Davis Road / Box 3107, Syracuse, New York 13220
Phone 315-457-5200 Fax 315-451-0052

JOB OLD CORTLAND CO LF CLOSURE 331.032
SHEET NO. 1 OF 1
CALCULATED BY JFB DATE 5/23/00
CHECKED BY DATE
SCALE

CAPPING SYSTEM VENEER SLOPE STABILITY ANALYSIS

METHOD OF ANALYSIS: 2-PART WEDGE GIROUD & BEECH

CRITICAL INTERFACE: DRAINAGE LAYER / GEOMEMBRANE = 25 deg (PVC) or 28 deg (LLDPE)

SLOPE HEIGHT: 157.14 FEET OCCURING ON SOUTH WEST SLOPE

SLOPE RUN FACTOR: 3.5 TO 1

HEAD ABOVE INTERFACE: 3.513 INCHES CALCULATED FROM THE ATTACHED HELP MODEL

DRAINAGE LENGTH = 550 FT

SLOPE = 28.6 %

SOIL PARAMETERS ABOVE INTERFACE:

18-INCHES OF PROTECTIVE COVER: C=0 psf, phi = 30 deg, Unit Weight = 130 pcf (Includes 6-inches of topsoil)

12-INCHES OF DRAINAGE SAND: C=0 psf, phi = 34 deg, Unit Weight = 115 pcf

AVERAGE SOIL PARAMETERS: C=0 psf, phi = 32 deg, Unit Weight = 125 pcf

SEISMIC STABILITY NOT REQUIRED SINCE SITE <0.10 g (6NYCRR PART 360 2.7(b)(7)(i))

CALCULATION: SEE SPREADSHEET ON NEXT PAGE

PVC RESULT: FS(static) = 1.56

LLDPE RESULT: FS(static) = 1.78

VENEER STABILITY ANALYSES
Giroud & Beech (1990)

Factor of Safety (FS) = (Sum of Resistive Forces)/(Sum of Driving Forces) = [{Fr(a) + Fr(Sc)} + {Fb(c) + Fb(Ø) - EQf}]/[{Fd(soil) + Fd(water)}]

$$FS = \frac{[\{(aH/\sin B)+(EQi*G'T^2\tan Sc/(2\sin B)*(2Hcos B/T-1))\}+\{(cT\cos Ø/(\sin B*\cos(Ø+B)))+(G'T^2\sin Ø/(\sin 2B*\cos(Ø+B)))-EQf\}]}{[\{(EQd*G'T(H-T/(2\cos B))\}+(GwsinBhLh)\}]}$$

where:
- Fr(a) = Resistive force due to interface adhesion
- Fr(Sc) = Resistive force due to interface friction
- Fb(c) = Buttress force due to soil cohesion
- Fb(Ø) = Buttress force due to soil internal friction
- Fd(soil) = Driving force due to soil weight
- Fd(water) = Driving force due to water above interface
- EQf = Reduction in buttress force due to earthquake loading = (ksG'T²)/(sin2B*(cosB-sinB*tanØ))
- EQd = additional driving force due to earthquake loading = 1+ks/tanB
- EQi = interface reduction factor due to earthquake loading = 1-ks*tanB
- G' = soil unit weight accounting for buoyancy = G-Gw(h/T)

CASE: CAPPING SYSTEM — **CRITICAL INTERFACE: DRAINAGE LAYER / PVC**

SOIL PARAMETERS		
G = moist unit weight =	125	pcf
c = internal cohesion =	0	psf
Ø = internal friction angle =	32	°
T = cover thickness =	2.5	ft
DESIGN PARAMETERS		
H = height of slope =	157.14	ft
B = slope angle =	15.95	°
Slope run factor (H:V)	3.50	H:1V
Lh = Horizontal slope length =	550.0	ft

INTERFACE PARAMETERS		
Sc = interface friction angle =	25	°
a = interface adhesion =	0	psf
EFFECTS OF WATER		
h = head of water above interface =	0.2928	ft
Gw = unit weight of water =	62.4	pcf
G' = buoyant soil unit weight =	117.7	pcf
EARTHQUAKE PARAMETERS		
ks = pseudostatic seismic coefficient =	0	g

RESISTIVE FORCES

	STATIC (lbs/ft)	SEISMIC (lbs/ft)
Fr(a) =	0	0
Fr(Sc) =	74,812	74,812
Fb(c) =	0	0
Fb(Ø) =	1,101	1,101
EQf =	0	0
TOTAL =	75,914	75,914

DRIVING FORCES

	STATIC (lbs/ft)	SEISMIC (lbs/ft)
Fd(soil) =	45,853	45,853
Fd(water)=	2,761	2,761
TOTAL =	48,614	48,614

Calculated By:
JFB, 5/18/00

Checked By:

Barton & Loguidice, P.C.
Consulting Engineers

FS(static) =	**1.56**	—>	Tensile reinforcement req'd for (FS=1.25)=	0 lbs/ft
FS(seismic) =	**1.56**	—>	Tensile reinforcement req'd for (FS=1.0) =	0 lbs/ft

VENEER STABILITY ANALYSES
Giroud & Beech (1990)

Factor of Safety (FS) = (Sum of Resistive Forces)/(Sum of Driving Forces) = [(Fr(a) + Fr(Sc)) + (Fb(c) + Fb(Ø) - EQf)]/[(Fd(soil) + Fd(water))]

$$FS = \frac{[\{(aH/\sin B)+(EQi*G'T^2\tan Sc/(2\sin B)*(2Hcos B/T-1))\}+\{(cT\cos Ø/(\sin B*\cos(Ø+B)))+(G'T^2\sin Ø/(\sin 2B*\cos(Ø+B)))-EQf\}]}{[\{(EQd*G'T(H-T/(2\cos B)))+(Gw\sin BhLh)\}]}$$

where:
- Fr(a) = Resistive force due to interface adhesion
- Fr(Sc) = Resistive force due to interface friction
- Fb(c) = Buttress force due to soil cohesion
- Fb(Ø) = Buttress force due to soil internal friction
- Fd(soil) = Driving force due to soil weight
- Fd(water) = Driving force due to water above interface
- EQf = Reduction in buttress force due to earthquake loading = (ksG'T²)/(sin2B*(cosB-sinB*tanØ))
- EQd = additional driving force due to earthquake loading = 1+ks/tanB
- EQi = interface reduction factor due to earthquake loading = 1-ks*tanB
- G' = soil unit weight accounting for buoyancy = G-Gw(h/T)

CASE: CAPPING SYSTEM — **CRITICAL INTERFACE: DRAINAGE LAYER / LLDPE**

SOIL PARAMETERS		
G = moist unit weight =	125	pcf
c = internal cohesion =	0	psf
Ø = internal friction angle =	32	°
T = cover thickness =	2.5	ft
DESIGN PARAMETERS		
H = height of slope =	157.14	ft
B = slope angle =	15.95	°
Slope run factor (H:V)	3.50	H:1V
Lh = Horizontal slope length =	550.0	ft

INTERFACE PARAMETERS		
Sc = interface friction angle =	28	°
a = interface adhesion =	0	psf
EFFECTS OF WATER		
h = head of water above interface =	0.2928	ft
Gw = unit weight of water =	62.4	pcf
G' = buoyant soil unit weight =	117.7	pcf
EARTHQUAKE PARAMETERS		
ks = pseudostatic seismic coefficient =	0	g

RESISTIVE FORCES	STATIC (lbs/ft)	SEISMIC (lbs/ft)
Fr(a) =	0	0
Fr(Sc) =	85,305	85,305
Fb(c) =	0	0
Fb(Ø) =	1,101	1,101
EQf =	0	0
TOTAL =	86,406	86,406

DRIVING FORCES	STATIC (lbs/ft)	SEISMIC (lbs/ft)
Fd(soil) =	45,853	45,853
Fd(water)=	2,761	2,761
TOTAL =	48,614	48,614

Calculated By:
JFB, 5/18/00

Checked By:

Barton & Loguidice, P.C.
Consulting Engineers

FS(static) =	**1.78**	—>	Tensile reinforcement req'd for (FS=1.25)=	0 lbs/ft
FS(seismic) =	**1.78**	—>	Tensile reinforcement req'd for (FS=1.0) =	0 lbs/ft

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY    **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP305\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP305\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP305\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP305\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP305\CORT10.D10
OUTPUT DATA FILE:            C:\HELP305\CORT1.OUT

TIME:  11:33     DATE:   5/24/2000

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

     TITLE:  Old Cortland Co LF Closure Veneer Stability Head Build Up

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

     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   0
          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    =      0.4570 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.999999975000E-05 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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	=	0.1781	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0492	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999989000E-02	CM/SEC
SLOPE	=	28.60	PERCENT
DRAINAGE LENGTH	=	550.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	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.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 -- GOOD	

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT

SOIL DATA BASE USING SOIL TEXTURE # 5 WITH A
FAIR STAND OF GRASS, A SURFACE SLOPE OF 29.%
AND A SLOPE LENGTH OF 550. FEET.

SCS RUNOFF CURVE NUMBER	=	65.80	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.505	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.060	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.080	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	5.469	INCHES
TOTAL INITIAL WATER	=	5.469	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ITHACA NEW YORK

STATION LATITUDE	=	42.40	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	279	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	69.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA FOR ITHACA NEW YORK
WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.20	22.70	32.20	44.50	54.80	64.30
68.80	67.10	60.20	49.60	39.30	27.60

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ITHACA NEW YORK

AND STATION LATITUDE = 42.40 DEGREES

ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	134382.578	100.00
RUNOFF	15.309	55573.297	41.35
EVAPOTRANSPIRATION	20.323	73772.195	54.90
DRAINAGE COLLECTED FROM LAYER 3	1.2573	4563.963	3.40
PERC./LEAKAGE THROUGH LAYER 4	0.116745	423.784	0.32
AVG. HEAD ON TOP OF LAYER 4	0.2511		
CHANGE IN WATER STORAGE	0.014	49.387	0.04
SOIL WATER AT START OF YEAR	6.545	23759.533	
SOIL WATER AT END OF YEAR	6.559	23808.920	
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	-0.049	0.00

ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.98	148757.406	100.00
RUNOFF	15.463	56130.555	37.73
EVAPOTRANSPIRATION	22.803	82774.109	55.64
DRAINAGE COLLECTED FROM LAYER 3	1.3523	4908.823	3.30
PERC./LEAKAGE THROUGH LAYER 4	0.126115	457.796	0.31
AVG. HEAD ON TOP OF LAYER 4	0.2708		

CHANGE IN WATER STORAGE	1.236	4486.112	3.02
SOIL WATER AT START OF YEAR	6.559	23808.920	
SOIL WATER AT END OF YEAR	5.472	19863.141	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.323	8431.890	5.67
ANNUAL WATER BUDGET BALANCE	0.0000	0.013	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.45	161353.516	100.00
RUNOFF	21.445	77843.852	48.24
EVAPOTRANSPIRATION	24.037	87255.727	54.08
DRAINAGE COLLECTED FROM LAYER 3	0.6727	2441.927	1.51
PERC./LEAKAGE THROUGH LAYER 4	0.069970	253.990	0.16
AVG. HEAD ON TOP OF LAYER 4	0.1346		
CHANGE IN WATER STORAGE	-1.775	-6442.043	-3.99
SOIL WATER AT START OF YEAR	5.472	19863.141	
SOIL WATER AT END OF YEAR	4.366	15846.900	
SNOW WATER AT START OF YEAR	2.323	8431.890	5.23
SNOW WATER AT END OF YEAR	1.655	6006.088	3.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.064	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	46.30	168069.031	100.00
RUNOFF	23.233	84334.344	50.18
EVAPOTRANSPIRATION	20.855	75704.734	45.04
DRAINAGE COLLECTED FROM LAYER 3	1.1737	4260.553	2.54
PERC./LEAKAGE THROUGH LAYER 4	0.095143	345.370	0.21
AVG. HEAD ON TOP OF LAYER 4	0.2346		
CHANGE IN WATER STORAGE	0.943	3424.000	2.04
SOIL WATER AT START OF YEAR	4.366	15846.900	
SOIL WATER AT END OF YEAR	6.698	24312.846	
SNOW WATER AT START OF YEAR	1.655	6006.088	3.57
SNOW WATER AT END OF YEAR	0.266	964.143	0.57
ANNUAL WATER BUDGET BALANCE	0.0000	0.024	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.04	116305.187	100.00
RUNOFF	13.373	48543.289	41.74
EVAPOTRANSPIRATION	17.797	64603.918	55.55
DRAINAGE COLLECTED FROM LAYER 3	1.2124	4401.060	3.78
PERC./LEAKAGE THROUGH LAYER 4	0.113127	410.652	0.35
AVG. HEAD ON TOP OF LAYER 4	0.2432		
CHANGE IN WATER STORAGE	-0.456	-1653.718	-1.42
SOIL WATER AT START OF YEAR	6.698	24312.846	
SOIL WATER AT END OF YEAR	4.602	16704.488	
SNOW WATER AT START OF YEAR	0.266	964.143	0.83

SNOW WATER AT END OF YEAR	1.906	6918.781	5.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.008	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.80	2.09	2.65	2.37	3.03	4.00
	4.17	4.03	5.43	4.15	2.36	3.07
STD. DEVIATIONS	2.10	0.80	0.63	0.94	0.94	1.09
	2.81	0.59	2.99	1.70	1.22	0.78
RUNOFF						
TOTALS	0.886	0.685	3.931	2.828	0.508	1.066
	1.328	1.083	2.346	1.743	0.456	0.903
STD. DEVIATIONS	1.058	0.724	1.324	3.122	0.252	0.592
	1.546	0.157	2.168	1.439	0.565	1.186
EVAPOTRANSPIRATION						
TOTALS	0.436	0.476	0.415	1.099	2.914	3.483
	4.325	2.412	2.479	1.622	1.045	0.457
STD. DEVIATIONS	0.055	0.051	0.123	0.548	0.577	0.596
	0.810	0.806	0.405	0.168	0.079	0.113
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0793	0.0211	0.0068	0.0648	0.2458	0.1955
	0.1006	0.0679	0.0465	0.0423	0.1092	0.1538
STD. DEVIATIONS	0.0804	0.0217	0.0071	0.0844	0.1650	0.1235
	0.0446	0.0176	0.0135	0.0206	0.1693	0.2474
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0078	0.0028	0.0012	0.0057	0.0196	0.0166
	0.0103	0.0077	0.0057	0.0052	0.0095	0.0120
STD. DEVIATIONS	0.0071	0.0025	0.0011	0.0070	0.0120	0.0091
	0.0036	0.0016	0.0012	0.0020	0.0119	0.0167

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.1878	0.0553	0.0160	0.1586	0.5820	0.4783
	0.2381	0.1608	0.1138	0.1001	0.2672	0.3641
STD. DEVIATIONS	0.1903	0.0569	0.0168	0.2064	0.3906	0.3021
	0.1056	0.0417	0.0329	0.0489	0.4141	0.5857

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	40.16	(5.757)	145773.5	100.00
RUNOFF	17.764	(4.3028)	64485.07	44.236
EVAPOTRANSPIRATION	21.163	(2.4021)	76822.13	52.700
LATERAL DRAINAGE COLLECTED FROM LAYER 3	1.13368	(0.26616)	4115.265	2.82305
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.10422	(0.02220)	378.319	0.25952
AVERAGE HEAD ON TOP OF LAYER 4	0.227	(0.053)		
CHANGE IN WATER STORAGE	-0.008	(1.2014)	-27.25	-0.019

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	3.13	11361.900
RUNOFF	2.554	9271.8887
DRAINAGE COLLECTED FROM LAYER 3	0.02414	87.61858
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.001597	5.79659
AVERAGE HEAD ON TOP OF LAYER 4	1.771	
MAXIMUM HEAD ON TOP OF LAYER 4	3.513	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	7.10	25775.8906

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2806
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0540

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	2.0629	0.3438
2	1.5665	0.1305
3	0.5224	0.0435
4	0.0000	0.0000
SNOW WATER	1.906	

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PUNCTURE RESISTANCE ANALYSIS
for
LLDPE GEOMEMBRANE

LLDPE PUNCTURE RESISTANCE
(From Koerner, Designing with Geosynthetics, third edition, 1994, pg. 165-167)

INTRODUCTION

The analysis performed below will determine if the 2.5 foot thick gravel protective cover layer is thick enough to protect the underlying LLDPE geomembrane from puncturing under the loads which will be induced by landfill operating equipment in the area surrounding the Maintenance building.

The analysis consists of first calculating the landfill equipment loads which may occur in this area of the site; these loads are then used to calculate the increase in stress on the LLDPE geomembrane. The force required for the LLDPE to resist puncture is then calculated using the calculated stress acting through a stone of specified dimension and other factors which related the ASTM puncture method to the actual field conditions. The factor of safety is then calculated by dividing the required force by the puncture strength of the LLDPE as tested by ASTM test method D4833.

The calculations analyze two scenarios; a typical scenario whereby the load of a landfill compactor is evenly distributed through each wheel as individual point loads; and a worst case scenario whereby the load of a full articulated dump truck is distributed through one point load.

CALCULATE TOTAL LOAD (Q) APPLIED TO GROUND SURFACE

CASE 1: typical load of a CAT 826C landfill compactor
operating weight = 69,733 lbs. (Caterpillar performance handbook, edition 20, 1989)
assume weight evenly distributed through each wheel as individual point loads
include factor of safety(F.S)=1.5

Q_1= 69733(1.5)/4= 26150 [lbs.]

CASE 2: worst case load of a fully loaded CAT D300B articulated dump truck
operating weight=43,520 lbs. (Caterpillar performance handbook, edition 20, 1989)
fully loaded weight (+40,000 lbs.)=83,520 lbs.
assume weight distributed through one tire as a point load

Q_2= 83,520*1.5= 125280 [lbs.]

CALCULATE LOAD INDUCED ON LLDPE GEOMEMBRANE
using Boussinesq method (Bowles, Foundation Analysis and Design, Fourth Edition, pg. 243)

$$q = \frac{3Q}{2\pi r^2} \cdot \frac{1}{(1+(r/z)^2)^{5/2}}$$

where:
q= pressure acting on the stone to cause puncture of the LLDPE geomembrane [psf]
Q=total load applied to ground surface [lbs.]
z=soil thickness = 2.5 [ft]
r=horizontal distance from source load to point to be analyzed [ft],assume a worst case scenario whereby the point to be analyzed is directly below the applied load (I.e. r=0)

$$q = \frac{3Q}{2\pi z^2}$$

CASE 1: q= 1998 [psf]

CASE 2: q= 9571 [psf]

CALCULATE FORCE REQUIRED TO RESIST LLDPE PUNCTURE

$F_{req'd} = qd^2 s_1 s_2 s_3$

where:

q (defined above) [psi]

d=average diameter of puncturing aggregate, assume= 1 [in]

s_1=protusion factor (h/d), where h=protrusion height
assume worst case= 1

s_2=scale factor to adjust ASTM D4833 test value using .31 inch diameter puncture probe to actual puncturing object (.31/d) = 0.31

s_3=shape factor to adjust flat puncture probe of ASTM D4833 to actual shape of puncturing object $(1-A_p/A_c)$
where A_p/A_c ranges from 0.8 for Ottawa sand to 0.3 for shot rock
assume worst case= 0.7

CASE 1: $F_{req'd}$= 3.0 [lbs.]

CASE 2: $F_{req'd}$= 14.4 [lbs.]

CALCULATE FACTOR OF SAFETY AGAINST LLDPE PUNCTURE

$$F.S. = \frac{F_{allow}}{F_{req'd}}$$

where: $F_{allow} = \frac{F_{ault}}{F.S._p}$

F_{ault}= ultimate puncture strength as determined by test method ASTM 4833
LLDPE minimum value= 68 [lbs.]

$F.S._p$= cumulative factor of safety. Assume= 2

CASE 1: F.S. = 11.3

CASE 2: F.S. = 2.4

CONCLUSIONS AND RECOMMENDATIONS

The analysis performed above, indicates that the 2.5 feet of stone to be placed above the LLDPE will offer adequate protection against the LLDPE puncturing from typical and extreme worst case loading conditions. However, during the winter months this area is plowed and it is likely that some of the gravel will be scraped off. If the gravel is scraped off such that only 0.85 feet of material remains, then typical compactor loading will most likely result in a puncture. If enough gravel is scraped off such that 1.9 feet of gravel remains, then the worst case loading scenario will most likely result in a puncture. Therefor, the thickness of the gravel protection layer should be monitored closely to ensure that the LLDPE is not punctured. In addition to the 2.5 feet of protective cover, a 12 oz/yd geotextile will be placed on top of the LLDPE geomembrane to protect the geomembrane from puncture during the installation of the stone layer.

PUNCTURE RESISTANCE ANALYSIS
for
PVC GEOMEMBRANE

job: Old Cortland County Landfill FS
calculated by: SCG date: 4/24/98
checked by: JTB date: 4/28/98
job# 331.22 page: 1/3

PVC PUNCTURE RESISTANCE
(From Koerner, Designing with Geosynthetics, third edition, 1994, pg. 165-167)

INTRODUCTION

The analysis performed below will determine if the 2.5 foot thick gravel protective cover layer is thick enough to protect the underlying PVC geomembrane from puncturing under the loads which will be induced by landfill operating equipment in the area surrounding the Maintenance building.

The analysis consists of first calculating the landfill equipment loads which may occur in this area of the site; these loads are then used to calculate the increase in stress on the PVC geomembrane. The force required for the PVC to resist puncture is then calculated using the calculated stress acting through a stone of specified dimension and other factors which related the ASTM puncture method to the actual field conditions. The factor of safety is then calculated by dividing the required force by the puncture strength of the PVC as tested by ASTM test method D4833.

The calculations analyze two scenarios; a typical scenario whereby the load of a landfill compactor is evenly distributed through each wheel as individual point loads; and a worst case scenario whereby the load of a full articulated dump truck is distributed through one point load.

CALCULATE TOTAL LOAD (Q) APPLIED TO GROUND SURFACE

CASE 1: typical load of a CAT 826C landfill compactor
operating weight = 69,733 lbs. (Caterpillar performance handbook, edition 20, 1989)
assume weight evenly distributed through each wheel as individual point loads
include factor of safety(F.S)=1.5

Q_1= 69733(1.5)/4= 26150 [lbs.]

CASE 2: worst case load of a fully loaded CAT D300B articulated dump truck
operating weight=43,520 lbs. (Caterpillar performance handbook, edition 20, 1989)
fully loaded weight (+20,000 lbs.)=83,520 lbs.
assume weight distributed through one tire as a point load

Q_2= 83,520*1.5= 125280 [lbs.]

CALCULATE LOAD INDUCED ON PVC GEOMEMBRANE
using Boussinesq method (Bowles, Foundation Analysis and Design, Fourth Edition, pg. 243)

$$q = \frac{3Q}{2\pi r^2} \cdot \frac{1}{(1+(r/z)^2)^{5/2}}$$

where:
q= pressure acting on the stone to cause puncture of the PVC geomembrane [psf]
Q=total load applied to ground surface [lbs.]
z=soil thickness = 2.5 [ft]
r=horizontal distance from source load to point to be analyzed [ft],assume a worst case scenario whereby the point to be analyzed is directly below the applied load (I.e. r=0)

$$q = \frac{3Q}{2\pi z^2}$$

CASE 1: q= 1998 [psf]

CASE 2: q= 9571 [psf]

CALCULATE FORCE REQUIRED TO RESIST PVC PUNCTURE

$$F_{req'd} = qd^2 s_1 s_2 s_3$$

where:

q (defined above) [psi]

d=average diameter of puncturing aggregate, assume= 1 [in]

s_1=protusion factor (h/d), where h=protrusion height
assume worst case= 1

s_2=scale factor to adjust ASTM D4833 test value using .31 inch diameter puncture probe to actual puncturing object (.31/d) = 0.31

s_3=shape factor to adjust flat puncture probe of ASTM D4833 to actual shape of puncturing object $(1-A_p/A_c)$
where A_p/A_c ranges from 0.8 for Ottawa sand to 0.3 for shot rock
assume worst case= 0.7

CASE 1: $F_{req'd}$= 3.0 [lbs.]

CASE 2: $F_{req'd}$= 14.4 [lbs.]

CALCULATE FACTOR OF SAFETY AGAINST PVC PUNCTURE

$$F.S. = \frac{F_{allow}}{F_{req'd}}$$

where: $F_{allow} = \frac{F_{ault}}{F.S._p}$

F_{ault}= ultimate puncture strength as determined by test method ASTM 4833
PVC ranges from 10 to 100 lbs. Assume= 50 [lbs.]

$F.S._p$= cumulative factor of safety. Assume= 2

CASE 1: F.S. = 8.3

CASE 2: F.S. = 1.7

CONCLUSIONS AND RECOMMENDATIONS

The analysis performed above, indicates that the 2.5 feet of stone to be placed above the PVC will offer adequate protection against the PVC puncturing from typical and extreme worst case loading conditions. However, during the winter months this area is plowed and it is likely that some of the gravel will be scraped off. If the gravel is scraped off such that only 0.85 feet of material remains, then typical compactor loading will most likely result in a puncture. If enough gravel is scraped off such that 1.9 feet of gravel remains, then the worst case loading scenario will most likely result in a puncture. Therefor, the thickness of the gravel protection layer should be monitored closely to ensure that the PVC is not punctured. In addition to the 2.5 feet of protective cover, a 12 oz/yd geotextile will be placed on top of the PVC geomembrane to protect the geomembrane from puncture during the installation of the stone layer.

APPENDIX C

STORM WATER RUNOFF CALCULATIONS

Barton & Loguidice, P.C.
Consulting Engineers
290 Elwood Davis Road / Box 3107, Syracuse, New York 13220
Phone 315-457-5200 Fax 315-451-0052

JOB Old Cortland Landfill Closure - 331.032
SHEET NO. 1 OF 2
CALCULATED BY CWH DATE 4/14/00
CHECKED BY MQC DATE 4/14/00
SCALE

Surface Water Drainage Calculations:

{REF: 6 NYCRR PART 360, Solid Waste Management Facilities}

{REF: Phillips Driscopipe System Design Manual}

This analysis is intended to satisfy the requirement that are set forth in following regulation.

6 NYCRR Part 360 - 2.15 (k) 2 states that *"Drainage control structures must be designed, graded, and maintained to prevent ponding and erosion to the cover. The surface drainage system must be designed and constructed to protect the cover from, at a minimum, the peak discharge from a 24-hour, 25-year frequency storm."*.

A. Storm Event: 25yr/24hr storm event for Cortland County = 4.6 in

B. Drainage Area: (Type II Ditch)

31.8 in^2 @ 1in = 100ft

Therefore, the area is equal to 318,000 ft^2 or 7.3 ac.

C. Type II Ditch calculations:

see attached sheet

D. Drainage Area: (Type III Ditch)

9.67in^2 @ 1in = 100 ft

Therefore, the area is equal to 96,700 ft^2 or 2.2 ac

E. Type III Ditch calculations:

see attached sheet

F. Drainage Area: Road Ditch

6.70 in2 @ 1in = 100ft

Therefore, the area is equal to 67,000 ft^2 or 1.54 ac

Barton & Loguidice, P.C.
Consulting Engineers
290 Elwood Davis Road / Box 3107, Syracuse, New York 13220
Phone 315-457-5200 Fax 315-451-0052

JOB Old Cortland Landfill Closure - 331.032
SHEET NO. 2 OF 2
CALCULATED BY CWH DATE 4/14/00
CHECKED BY MQC DATE 4/14/00
SCALE

G. Road Ditch calculation:

see attached sheet

H. Culvert Calculations: (eastern culvert)

Q = 33.58 cfs (see attached)

Q = 15072 gpm

$Q_{all} = 98.3\ A\ R_h^{2/3}\ S^{1/2}$ (Manning Equation)

Diameter = 24 in

where: Q_{all} = allowable flow (gpm)

A = Area (in^2)

R_h = Hydraulic Radius

S = Slope (ft /ft)

$Q_{all} = 98.3\ (12^2\pi)\ (6)^{2/3}\ (.02)^{1/2}$

Q_{all} = 21176 gpm

Conclusion: Since Q_{all} is greater than Q, a 24 inch diameter CMP will be adequate.

I. Culvert Calculations: (western culvert)

Q = 7.1 cfs (see attached)

Q = 3186.90 gpm

$Q_{all} = 98.3\ A\ R_h^{2/3}\ S^{1/2}$ (Manning Equation)

Diameter = 18 in

where: Q_{all} = allowable flow (gpm)

A = Area (in^2)

R_h = Hydraulic Radius

S = Slope (ft /ft)

$Q_{all} = 98.3\ (9^2\pi)\ (4.5)^{2/3}\ (.02)^{1/2}$

Q_{all} = 9642 gpm

Conclusion: Since Q_{all} is greater than Q, a 18 inch diameter CMP will be adequate.

Barton & Loguidice, P.C.
Consulting Engineers

SURFACE WATER DRAINAGE CALCULATIONS

Old Cortland Landfill Closure

CALCULATED BY: CWH DATE: 4/14/00

CHECKED BY: MQC DATE: 4/14/00

TYPE II DITCH:

The Rational Method: **Q = CIA**

Q = Max Flow Rate

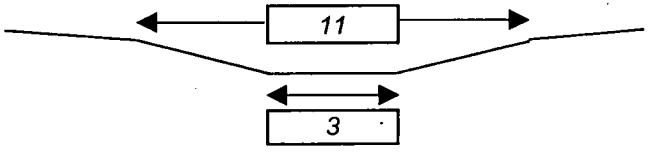
C = Runoff Coeeficient: *1* (Frozen Ground Conditions)

I = Rainfall Intensity (in/hr): *4.6* (10 Minute Duration for Cortland County County, 25yr/24hr Storm)

A = Area (acres) *7.3*

Q_{max} = ***33.6 cfs***

SWALE DESIGN:



Depth = 2.5 feet

Manning's Equation: $Q = (1.486/n) A R^{2/3} S^{1/2}$

Q = Flow Capacity

n = Roughness Coefficient: *0.03* (Stone Lined Swale)

A = Area (sf) 17.5

P = Wetted Perimeter 12.4

R = Hydraulic Radius = A/P 1.407

S = Slope: *0.01*

$Q_{allowed}$ = **108.9 cfs**

F.S. = **3.24**

Barton & Loguidice, P.C.
Consulting Engineers

SURFACE WATER DRAINAGE CALCULATIONS

Old Cortland Landfill Closure

CALCULATED BY: CWH DATE: 4/14/00

CHECKED BY: MQC DATE: 4/14/00

TYPE III DITCH:

The Rational Method: **Q = CIA**

Q = Max Flow Rate

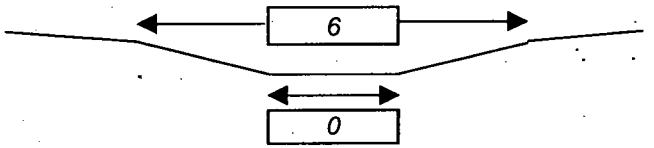
C = Runoff Coeeficient: *1* (Frozen Ground Conditions)

I = Rainfall Intensity (in/hr): *4.6* (10 Minute Duration for Cortland County County, 25yr/24hr Storm)

A = Area (acres) *2.2*

Q_{max} = ***10.1 cfs***

SWALE DESIGN:



Depth = *1.5* feet

Manning's Equation: $Q = (1.486/n) A R^{2/3} S^{1/2}$

Q = Flow Capacity

n = Roughness Coefficient: *0.03* (Stone Lined Swale)

A = Area (sf) 4.5

P = Wetted Perimeter 6.7

R = Hydraulic Radius = A/P 0.671

S = Slope: *0.01*

$Q_{allowed}$ = **17.1 cfs**

***F.S.* = 1.69**

Barton & Loguidice, P.C.
Consulting Engineers

SURFACE WATER DRAINAGE CALCULATIONS

Old Cortland Landfill Closure

CALCULATED BY: CWH DATE: 4/14/00

CHECKED BY: MQC DATE: 4/14/00

ROAD DITCH:

The Rational Method: **Q = CIA**

Q = Max Flow Rate

C = Runoff Coeeficient: *1* (Frozen Ground Conditions)

I = Rainfall Intensity (in/hr): *4.6* (10 Minute Duration for Cortland County County, 25yr/24hr Storm)

A = Area (acres) *1.54*

Q_{max} = ***7.1 cfs***

Manning's Equation: $Q = (1.486/n) A R^{2/3} S^{1/2}$

Q = Flow Capacity

n = Roughness Coefficient: *0.03* (Stone Lined Swale)

A = Area (sf) 4.5

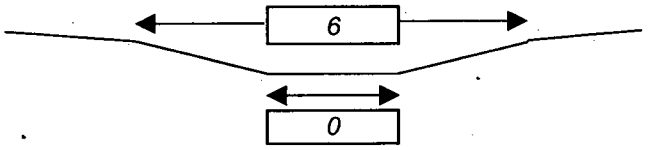
P = Wetted Perimeter 6.7

R = Hydraulic Radius = A/P 0.671

S = Slope: *0.01*

$Q_{allowed}$ = **17.1 cfs**

SWALE DESIGN:



Depth = *1.5* feet

***F.S.* = 2.41**