US EPA ARCHIVE DOCUMENT

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: JWP Date: 1/6/09
Checked By: MNF Date: 1/8/09

TITLE: ESTIMATION OF LEACHATE HEAD ACCUMULATION

Problem Statement:

Estimate the leachate generation rates and head accumulation on the bottom liner for the proposed landfill design using Hydrogeologic Evaluation of Landfill Performance (HELP) modeling based on the following landfill scenarios:

1. Daily Cover Operations (1 Year-Simulation)
2. Intermediate Cover (One initial 10 foot lift, six 20 foot lifts and one 10' lift of chemical waste/excavated soil plus one 11 foot lft of MSW; each lift run at a 1 Year-Simulation)
3. Post Closure, Final Cover (30 Year-Simulation) with Leachate Collection and Removal
4. Post Closure, Final Cover (100 Year-Simulation) with No Leachate Collection and Removal

Given:

1. Landfill layers as shown in Exhibit 1.
2. HELP Model Version 3.07.
3. Soil Types Presented in Exhibit 2.

Assumptions:

1. Temperature and precipitation data synthetically generated by HELP using the monthly average values obtained from a nearby National Weather Station (Lincoln, Illinois) as reported by the National Oceanographic and Atmospheric Administration (NOAA). (Please refer to Exhibit 3).
2. Solar Radiation Data synthetically generated by HELP using the data for Chicago, Illinois and adjusted for the site latitude (please refer to Exhibit 3).
3. Length of growing season data was obtained from a nearby National Weather Station (Lincoln, Illinois) as reported by NOAA (please refer to Exhibit 3).
4. Wind speed data was obtained from a nearby National Weather Station (Lincoln, Illinois) as reported by NOAA (please refer to Exhibit 3).
5. Relative humidity was obtained from from a nearby National Weather Station (Lincoln,

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Illinois) as reported by NOAA (please refer to Exhibit 3).

6. The 'HELP' modeling results are independent of the landfill area. One (1) acre area was considered for the analysis.

7. The HELP Model default Texture No. 35 was used to represent the High Density Polyethylene (HDPE) liners in the bottom liner system and the for the liner used in the final cover system (please refer to Exhibit 2).

8. HDPE Geomembrane characteristics:

Bottom and Final Cover Liners
Pinhole density = 1 hole per acre;
Installation defects = 10 holes per acre;
Placement Quality = 4 (Poor).

Note: A Construction Quality Assurance (CQA) program has been developed for the facility which addresses proper installation of the geomembrane liner and cover. The assumed placement quality for the final cover geomembrane is unlikely with the proper implementation of the facility's CQA plan, and represents a conservative condition.

10. The hydraulic conductivity (k) of the Final Cover Soil Barrier layer was conservatively assumed to be 1×10^{-5} cm/sec in order to account for possible dessication cracks and settlement that may occur over the long term period. Note however, the Design Report (Section 3) and the Construction Quality Assurance Plan (Section 5) require that the Final Cover Soil Barrier layer be constructed to have a maximum hydraulic conductivity of 1×10^{-7} cm/sec.

11. Compacted Earth Liner layer assumed to be saturated.

12. The HELP Model default Texture No. 18 was used to represent the Municipal Solid Waste, and default Texture No. 9 was used to represent the chemical waste/excavated soil (please refer to Exhibit 2).

13. The HELP Model defines field capacity as the soil water storage/volumetric content after a prolonged period of gravity drainage from saturation corresponding to the soil water storage when a soil exerts a soil suction of 1/3 bar.

14. The initial water content of the chemical waste/excavated soil for Scenario 1 - Daily Cover, was assumed equal to an average value of 26%. This material was assumed to comprise of 50% dewatered sediments with the remaining composition exhibiting typical characteristics of excavated soil. The dewatered sediment has a field capacity of approximately 32% and the typical water content of excavated soil is approximately 20%.

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15. The following equations are used to calculate the initial water content for a waste layer which has increased in thickness between the previous and current simulation.

Change in Water Content (inches) = Waste Thickness (in) * (Final Water Content - Initial Water Content)

Waste Water Content (vol/vol) = Initial Water Content + (Change in Water Content/Waste Thickness)

16. Groundwater seepage was assumed through the bottom compacted earth liner (Layer 9 or the last layer in the Operational Period Scenarios - 1 and 2, respectively, and Layer 16 in the Post Closure Period - Scenarios 3 and 4). The groundwater seepage rate was calculated to be 0.0548 inches/year (please refer to Exhibit 4).

17. The HELP Model gives results in inches/time period but all results were converted to gal/acre/day using conversion factors listed below:

$$\frac{\#\text{ inches}}{\text{time period}} \times \frac{1\text{ foot}}{12\text{ inches}} \times \frac{43{,}560\text{ ft}^2}{\text{acre}} \times \frac{7.48\text{ gallons}}{1\text{ ft}^3} \times \frac{\text{time period}}{\#\text{ days}}$$

HELP Model Scenarios:

Scenario 1 - Daily Cover Operations

The daily cover operations were modeled as a 10- foot thick layer of waste covered by 6 inches of daily cover material, as shown in Exhibit 1. This scenario was modeled for one year which is overly conservative, because an intermediate cover must be placed down on all surfaces of the landfill where no additional waste will be deposited within 60 days. Other assumptions used in running the 'HELP' model are listed below.

1. Bare ground condition was used for the operation runs with daily cover. The corresponding Maximum Leaf Index is 0.0 (refer to Exhibit 3).

2. The 'HELP' default (Chicago, Illinois) Evaporative Zone Depth is 6 inches corresponding to bare ground condition.

3. No runoff was allowed during the operational period with daily cover. The SCS curve number input for the operational simulations with daily cover was interpolated to be 93.1 as shown in Exhibit 5.

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4. The initial water content of the leachate collection system and daily cover material were set at the field capacity of the respective materials.

Scenario 1 - Daily Cover Results

Exhibit 7 includes the Scenario 1 Daily Cover 'HELP' simulations, the table below summarizes the results.

Scenario 1 - Daily Cover Initial & Final Water Contents			
Layer No.	**Layer**	**Initial Water Content (%)**	**Final Water Content (%)**
2	Chemical Waste/Excavated Soil	26.00	31.38
3	Leachate Drainage Layer	4.50	6.57
9	Compacted Earth Liner	42.70	42.70

Scenario 1 - Daily Cover Leachate Generation Results			
Peak Daily Leachate Generation (gal/acre/day)	**Average High Monthly Leachate Generation (gal/acre/day)**	**Average Annual Leachate Generation (gal/acre/day)**	**Peak Daily Leachate Head (inches)**
880.28	758.39	167.69	2.772

Scenario 2 - Intermediate Cover

Exhibit 1 shows the cross section of the landfill during the intermediate cover period. The maximum thickness of the chemical waste/excavated soil was estimated to be 140 feet with an overlying 12-inch layer of intermediate cover. This maximum thickness was modeled in 8 lifts with six 20 foot lifts and one 10 foot lift of chemical waste/excavated soil (130 feet + 10 feet from scenario 1 = 140 total feet) and one 11 foot lift of MSW. By running the HELP Model for a full year more water is allowed to enter the waste. The intermediate cover simulation was run for a period of 1 year for each of the 8 total lifts. Other assumptions used in running the 'HELP' Model are listed below.

1. Poor vegetation conditions were assumed for the intermediate cover simulation. The Maximum Leaf Area Index corresponding to poor vegetation condition is 1.0 (please refer to Exhibit 3).

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2. The 'HELP' default (Chicago, Illinois) Evaporative Zone Depth is 14 inches corresponding to poor vegetation condition.

3. 75% of the runoff was allowed during the intermediate period. This is a conservative approach. A more likely scenario would be to use 100% for intermediate cover scenario. The SCS number input for the operational simulation with intermediate cover was interpolated to be 89.1 as shown in Exhibit 5.

4. The initial water contents for the chemical waste\excavated soil, leachate drainage layer, and compacted earth liner were set equal to the final water contents (Water Content = %) of the respective layers from the daily cover scenario.

Water Balance

The following calculation was performed to determine the water content of the each consecutive upper lift of chemical waste/excavated soil (240 in) based on the results from the daily cover scenario.

$$(120 \text{ in})*(0.3138 - 0.2600) = 6.456 \text{ in}$$

$$(0.2600) + (6.456 \text{ in} / 240 \text{ in}) = 0.2869$$

Since the final lift of waste was 120 inches, it was assumed to be at 0.26 which was the water content of the 10 foot lift of chemical waste/excavated soil during daily cover scenario. The final lift of MSW was assumed to have an initial water content of 20% based on previous experience.

Scenario 2 - Intermediate Cover Results

Exhibit 8 includes the Scenario 2 Intermediate Cover 'HELP' simulations, the following tables summarizes the results.

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Intermediate Cover, Lift 1 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	Chemical Waste/Excavated	28.69	28.86
3	Chemical Waste/Excavated	31.38	28.40
4	Leachate Collection System	6.57	5.11
10	Compacted Earth Liner	42.70	42.70

Max leachate

Intermediate Cover, Lift 2 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	Chemical Waste/Excavated	28.69	28.86
3	Chemical Waste/Excavated	28.86	28.40
4	Chemical Waste/Excavated	28.40	29.26
5	Leachate Collection System	5.11	5.72
11	Compacted Earth Liner	42.70	42.70

Intermediate Cover, Lift 3 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	Chemical Waste/Excavated	28.69	28.86
3	Chemical Waste/Excavated	28.86	28.40
4	Chemical Waste/Excavated	28.40	28.93
5	Chemical Waste/Excavated	29.26	28.46
6	Leachate Collection System	5.72	5.61
12	Compacted Earth Liner	42.70	42.70

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Intermediate Cover, Lift 4 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	Chemical Waste/Excavated	28.69	28.86
3	Chemical Waste/Excavated	28.86	28.40
4	Chemical Waste/Excavated	28.40	28.93
5	Chemical Waste/Excavated	28.93	28.43
6	Chemical Waste/Excavated	28.46	28.92
7	Leachate Collection System	5.61	5.14
13	Compacted Earth Liner	42.70	42.70

Intermediate Cover, Lift 5 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	Chemical Waste/Excavated	28.69	28.86
3	Chemical Waste/Excavated	28.86	28.40
4	Chemical Waste/Excavated	28.40	28.93
5	Chemical Waste/Excavated	28.93	28.43
6	Chemical Waste/Excavated	28.43	28.79
7	Chemical Waste/Excavated	28.92	29.01
8	Leachate Collection System	5.14	5.36
14	Compacted Earth Liner	42.70	42.70

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Intermediate Cover, Lift 6 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	Chemical Waste/Excavated	28.69	28.86
3	Chemical Waste/Excavated	28.86	28.40
4	Chemical Waste/Excavated	28.40	28.93
5	Chemical Waste/Excavated	28.93	28.43
6	Chemical Waste/Excavated	28.43	28.79
7	Chemical Waste/Excavated	28.79	28.74
8	Chemical Waste/Excavated	29.01	28.41
9	Leachate Collection System	5.36	5.31
15	Compacted Earth Liner	42.70	42.70

Intermediate Cover, Lift 7 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	Chemical Waste/Excavated	26.00	28.09
3	Chemical Waste/Excavated	28.86	28.40
4	Chemical Waste/Excavated	28.40	28.40
5	Chemical Waste/Excavated	28.93	28.40
6	Chemical Waste/Excavated	28.43	28.40
7	Chemical Waste/Excavated	28.79	28.84
8	Chemical Waste/Excavated	28.74	28.51
9	Chemical Waste/Excavated	28.41	29.03
10	Leachate Collection System	5.31	6.29
16	Compacted Earth Liner	42.70	42.70

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Intermediate Cover, Lift 8 - Water Content Results			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
2	MSW	20.00	21.95
4	Chemical Waste/Excavated	28.09	28.40
5	Chemical Waste/Excavated	28.40	28.40
6	Chemical Waste/Excavated	28.40	28.40
7	Chemical Waste/Excavated	28.40	28.40
8	Chemical Waste/Excavated	28.40	28.40
9	Chemical Waste/Excavated	28.84	28.40
10	Chemical Waste/Excavated	28.51	28.40
11	Chemical Waste/Excavated	29.03	28.40
12	Leachate Collection System	6.29	4.68
18	Compacted Earth Liner	42.70	42.70

Intermediate cover, Lift 1 had the highest peak daily leachate generation rate; the results are summarized below in the following table. The peak daily leachate generation rate will be used to size the leachate collection pipes and storage tanks.

Scenario 2 - Intermediate Cover, Lift 1 Leachate Generation Results			
Peak Daily Leachate Generation (gal/acre/day)	Average High Monthly Leachate Generation (gal/acre/day)	Average Annual Leachate Generation (gal/acre/day)	Peak Daily Leachate Head (inches)
754.02	675.51	435.63	2.409

Scenario 3 - Post Closure Period: Yrs. 1- 30 (with Leachate Collection & Removal)

This simulation was run for post closure period years 1 through 30 with leachate collection and removal. Leachate collection and removal for years 1-30 was simulated by modeling the sand layer underneath the waste as a lateral drainage layer. Other assumptions used in running the 'HELP' model are listed below.

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1. Good vegetation condition was assumed for the post closure period. The Maximum Leaf Area Index corresponding to good vegetation condition is 4.0 (refer to Exhibit 3).

2. The HELP default (Chicago, Illinois) Evaporative Zone Depth is 20 inches corresponding to good vegetation condition.

3. The initial water contents for the chemical waste/excavated soil, leachate drainage layer, and compacted earth liner were set equal to the final water contents (Water Content = %) of the respective layers from the intermediate cover scenario.

4. The chemical waste/excavated soil layers were modeled as one layer consisting of the entire thickness at 140 feet in order to remain under the maximum 20 layers of soil and design data that HELP will accept as inputs. The layers can be combined because the final water content from the last lift of the intermediate cover scenario all had the exact same value for the final water content.

5. The Final Cover Soil Barrier layer was modeled with a hydraulic conductivity (k) of 1 x 10^{-5} cm/sec in order to be conservative and to account for possible dessication cracks and settlement that may occur over the long term period. Note however, the Design and the Construction Quality Assurance Plan require that the Final Cover Soil Barrier layer be constructed to have a hydraulic conductivity of 1 x 10^{-7} cm/sec.

6. The final land form simulation utilized a maximum thickness of 140 feet for the chemical waste/excavated soil, with an overlying 12-inch separation layer, and an 11.1-foot layer of municipal solid waste above (please refer to Exhibit 1). These thicknesses correspond to the location within the Chemical Waste Unit at which the chemical waste/excavated soil is at a peak or maximum thickness (140 feet).

7. 100% of the runoff was allowed during the post closure operations.

8. The SCS number was computed by 'HELP' based on surface slope, slope length, soil texture, and quantity of vegetative cover (assumed good stand of grass and simulation value of 4 for vegetative cover).

Scenario 3 - Post Closure Period: Yrs. 1- 30 Results

Exhibit 9 includes the post closure period 'HELP' simulations. The following table summarizes the results.

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Scenario 3 - Post Closure Period: Years 1-30 Initial & Final Water Contents			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
7	MSW	21.95	22.22
9	Chemical Waste/Excavated Soil	28.40	28.40
10	Leachate Drainage Layer	4.68	4.50
16	Compacted Earth Liner	42.70	42.70

Scenario 3 - Post Closure Period: Years 1 - 30 Leachate Generation Results				
Peak Daily Leachate Generation (gal/acre/day)	Average High Monthly Leachate Generation (gal/acre/day)	Average Annual Leachate Generation (gal/acre/day)	Peak Daily Leachate Head on Primary Liner System (inches)	Peak Daily Leachate Head on Secondary Liner System (inches)
30.95	0.536	0.054	0.112	0.001

The leachate collection system has been designed to maintain a maximum leachate head of less than 12 inches under final cover conditions.

Scenario 4 - Post Closure Period: Yrs. 31-131 (with No Leachate Collection & Removal)

This simulation was run for post closure period years 31 through 131 with no leachate collection and removal. No leachate collection and removal was simulated for years 31-131 by modeling the sand layer underneath the waste as a vertical percolation layer. Other assumptions used in running the 'HELP' model are listed below.

1. Good vegetation condition was assumed for the post closure period. The Maximum Leaf Area Index corresponding to good vegetation condition is 4.0 (refer to Exhibit 3).

2. The HELP default (Chicago, Illinois) Evaporative Zone Depth is 20 inches corresponding to good vegetation condition.

3. The initial water contents for the waste and soil layers, as presented in the table below, were set equal to the final water contents (Water Content = %) of the respective layers

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from the post closure period, years 1-30 scenario.

4. The Final Cover Soil Barrier layer was modeled with a hydraulic conductivity (k) of 1 x 10^{-5} cm/sec in order to be conservative and to account for possible dessication cracks and settlement that may occur over the long term period. Note however, the Design and the Construction Quality Assurance Plan require that the Final Cover Soil Barrier layer be constructed to have a hydraulic conductivity of 1 x 10^{-7} cm/sec.

5. The final land form simulation utilized a maximum thickness of 140 feet for the chemical waste\excavated soil, with an overlying 12-inch intermediate cover layer, and an 11.1-foot layer of municipal solid waste above (please refer to Exhibit 1). These thicknesses correspond to the location within the Chemical Waste Unit at which the chemical waste/excavated soil is at a peak or maximum thickness (140 feet).

6. 100% of the runoff was allowed during the post closure operations.

7. The SCS number was computed by 'HELP' based on surface slope, slope length, soil texture, and quantity of vegetative cover (assumed good stand of grass and simulation value of 4 for vegetative cover).

Scenario 4 - Post Closure Period Yrs. 31-131 (No Leachate Collection & Removal) Results

Exhibit 10 includes the post closure period 'HELP' simulations. The table below summarizes the results.

Scenario 4 - Post Closure Period: Years 31-131
Initial & Final Water Contents

Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
1	Vegetative Layer	15.20	42.12
2	Protective Layer	23.93	29.25
5	Compacted Cohesive Soil Liner	42.70	42.70
6	Foundation Layer	28.18	28.20
7	MSW	22.22	22.27
8	Separation Layer	31.00	31.00
9	Chemical Waste/Excavated Soil	28.40	28.40

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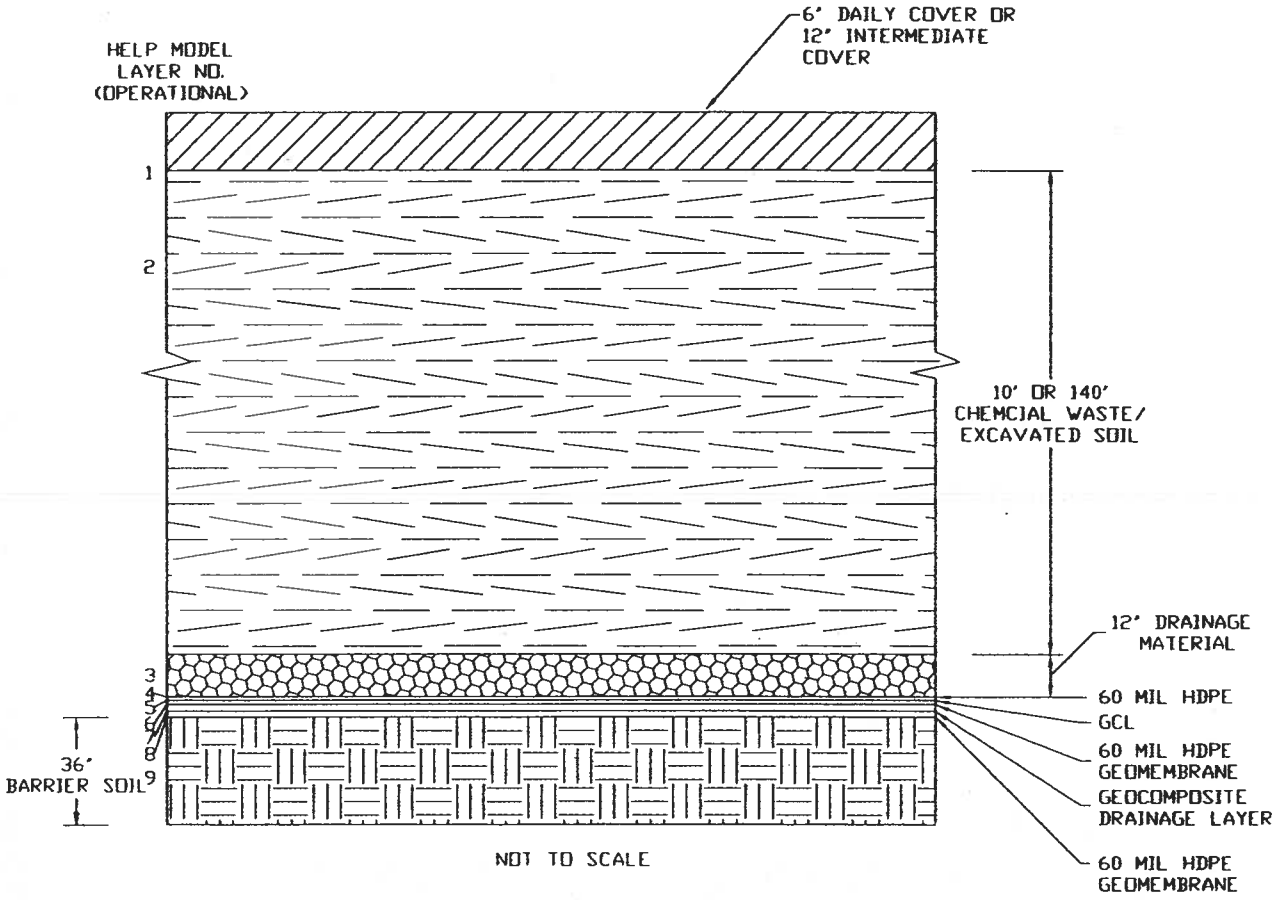
Scenario 4 - Post Closure Period: Years 31-131 Initial & Final Water Contents			
Layer No.	Layer	Initial Water Content (%)	Final Water Content (%)
10	Leachate Drainage Layer	4.50	4.50
16	Compacted Earth Liner	42.70	42.70

Scenario 4 - Post Closure Period: Years 31 - 131 Leachate Generation Results	
Peak Daily Average Head on Primary Liner System (inches)	Peak Daily Average Head on Secondary Liner System (inches)
0.000	0.200

The leachate collection system has been designed to maintain a maximum leachate head of less than 12 inches under final cover conditions. In addition, 130 years after closure, the primary geomembrane will have less than 1 inch of leachate head.

EXHIBIT 1
LANDFILL CROSS SECTION SCHEMATICS



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CLINTON LF. NO. 3 CHEMICAL WASTE UNIT
DEWITT COUNTY, ILLINOIS

LANDFILL CROSS SECTION - SCHEMATIC
OPERATIONAL PERIODS
DAILY & INTERMEDIATE COVER

APPROVED BY: DAM	PROJ. NO. 128017	DATE: JAN. 2007

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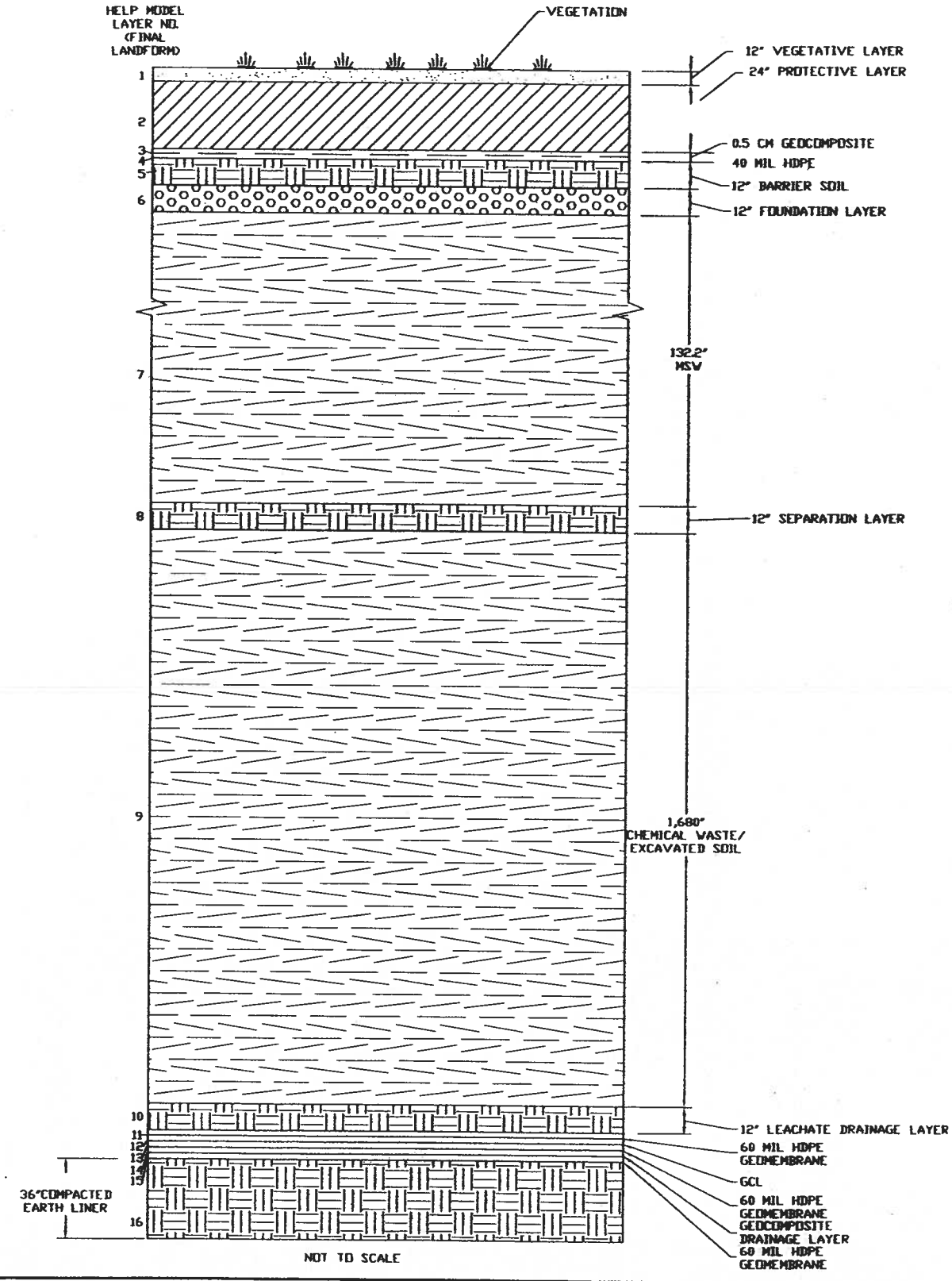

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CLINTON LF. NO. 3 CHEMICAL WASTE UNIT
DEWITT COUNTY, ILLINOIS

LANDFILL CROSS SECTION - SCHEMATIC
POST-CLOSURE PERIODS

APPROVED BY: DAM	PROJ. NO.: 128017	DATE: JAN. 2007

EXHIBIT 2
SOIL TYPES - 'HELP' MODELING

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

Purpose:

Select the appropriate HELP model default textures / soil properties for model input.

Operational Period Layers:

1. The previous Exhibit (Exhibit 1) in this Appendix shows the landfill layers for the operational simulation.

2. This Exhibit shows the HELP default classification characteristics. The following table summarizes the appropriate HELP default textures for the various layers, the layer types, and their respective thicknesses:

3. The hydraulic conductivity of the geocmposite was determined from the geocomposite transmissivity as provided in the specifications provided in the application. Exhibit No. 6 provides the hydraulic conductivity conversion calculatioin.

HELP Model Operational Period Material Layers - Daily Cover					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	6	Daily Cover	CL	11
2	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
3	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	1
4	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
5	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
6	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
7	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
8	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
9	3	36	Compacted Earth (Cohesive Soil) Liner ($k < 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

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TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 1					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	240	Chemical Waste	ML	9
3	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
4	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
5	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
6	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
7	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
8	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
9	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
10	3	36	Compacted Earth (Cohesive Soil) Liner ($k \leq 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 2					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	240	Chemical Waste	ML	9
3	1	240	Chemical Waste	ML	9
4	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
5	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
6	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
7	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
8	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
9	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
10	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
11	3	36	Compacted Earth (Cohesive Soil) Liner ($k \leq 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 3					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	240	Chemical Waste	ML	9
3	1	240	Chemical Waste	ML	9
4	1	240	Chemical Waste	ML	9
5	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
6	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
7	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
8	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
9	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
10	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
11	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
12	3	36	Compacted Earth (Cohesive Soil) Liner ($k < 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 4					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	240	Chemical Waste	ML	9
3	1	240	Chemical Waste	ML	9
4	1	240	Chemical Waste	ML	9
5	1	240	Chemical Waste	ML	9
6	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
7	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
8	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
9	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
10	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
11	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
12	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
13	3	36	Compacted Earth (Cohesive Soil) Liner ($k < 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 5					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	240	Chemical Waste	ML	9
3	1	240	Chemical Waste	ML	9
4	1	240	Chemical Waste	ML	9
5	1	240	Chemical Waste	ML	9
6	1	240	Chemical Waste	ML	9
7	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
8	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
9	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
10	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
11	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
12	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
13	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
14	3	36	Compacted Earth (Cohesive Soil) Liner ($k < 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 6					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	240	Chemical Waste	ML	9
3	1	240	Chemical Waste	ML	9
4	1	240	Chemical Waste	ML	9
5	1	240	Chemical Waste	ML	9
6	1	240	Chemical Waste	ML	9
7	1	240	Chemical Waste	ML	9
8	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
9	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
10	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
11	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
12	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
13	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
14	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
15	3	36	Compacted Earth (Cohesive Soil) Liner ($k \leq 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 7					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	120	Chemical Waste	ML	9
3	1	240	Chemical Waste	ML	9
4	1	240	Chemical Waste	ML	9
5	1	240	Chemical Waste	ML	9
6	1	240	Chemical Waste	ML	9
7	1	240	Chemical Waste	ML	9
8	1	240	Chemical Waste	ML	9
9	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
10	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
11	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
12	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
13	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
14	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
15	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
16	3	36	Compacted Earth (Cohesive Soil) Liner ($k \leq 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Shaw Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
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Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

HELP Model Operational Period Material Layers - Intermediate Cover: Lift 8					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Waste					
1	1	12	Intermediate Cover	CL	11
2	1	132	Municipal Solid Waste	Municipal Waste	18
3	1	12	Separation Layer	CL	11
4	1	120	Chemical Waste	ML	9
5	1	240	Chemical Waste	ML	9
6	1	240	Chemical Waste	ML	9
7	1	240	Chemical Waste	ML	9
8	1	240	Chemical Waste	ML	9
9	1	240	Chemical Waste	ML	9
10	1	240	Chemical Waste	ML	9
11	1	120	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
12	2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	0
13	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
14	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \geq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
15	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
16	2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
17	4	0.06	60-mil HDPE Geomembrane ($k \geq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
18	3	36	Compacted Earth (Cohesive Soil) Liner ($k \leq 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Post Closure Period Layers:

1. The previous Exhibit (Exhibit 1) in this Appendix shows the landfill layers for the post closure simulation.

2. This Exhibit shows the HELP default classification characteristics. The following table summarizes the appropriate HELP default textures for the various layers, the layer

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/9/08
Checked By: JPV Date: 11/11/08

TITLE: LAYER TYPES AND DEFAULT TEXTURES FOR HELP MODELING

types, and their respective thicknesses:

HELP Model Post Closure Period Material Layers					
Layer No.	Layer Type	Layer Thickness (in.)	Layer Description	HELP Model Material Classification / Texture No.	
				Classification	Texture No.
Final Cover System					
1	1	12	Vegetative Layer	ML	8
2	1	24	Protective Layer	ML	9
3	2	0.200	Geocomposite Drainage Layer	Drainage Net (0.5 cm)	20
4	4	0.04	40-mil HDPE Geomembrane ($k \leq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
5	3	12	Compacted Cohesive Soil Liner (see note below)	Barrier Soil	16
6	1	12	Foundation Layer	CL	11
Waste					
7	1	133.2	Municipal Solid Waste	Municipal Waste	18
8	1	12	Separation Layer	CL	11
9	1	1,680	Chemical Waste	ML	9
Leachate Drainage & Bottom Liner System					
10	1 or 2	12	Leachate Drainage Layer ($k \geq 3.0 \times 10^{-2}$ cm/sec)	SP	1
11	4	0.06	60-mil HDPE Geomembrane ($k \leq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
12	1	0.2362	Geosynthetic Clay Liner (GCL) ($k \leq 3.0 \times 10^{-9}$ cm/sec)	Bentonite Mat (0.6 cm)	17
13	4	0.06	60-mil HDPE Geomembrane ($k \leq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
14	1 or 2	0.200	Geocomposite Drainage Layer ($k \geq 0.2 \times 10^{+1}$ cm/sec)	Drainage Net (0.5 cm)	20
15	4	0.06	60-mil HDPE Geomembrane ($k \leq 2.0 \times 10^{-13}$ cm/sec)	High Density Polyethylene (HDPE)	35
16	3	36	Compacted Earth (Cohesive Soil) Liner ($k \leq 1 \times 10^{-7}$ cm/sec)	Barrier Soil	16

Note: The Final Cover Soil Barrier layer was modeled with a hydraulic conductivity (k) of 1×10^{-5} cm/sec in order to be conservative and to account for possible dessication cracks and settlement that may occur over the long term period. Note however, the Design Report (Section 3) and the Construction Quality Assurance Plan (Section 5) require that the Final Cover Soil Barrier layer be constructed to have a hydraulic conductivity of 1×10^{-7} cm/sec.

EXHIBIT 3
WEATHER INPUT DATA

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.

Project: Clinton LF No. 3 Chemical Waste Unit

Proj. #: 128017

Calculated By: JPV Date: 10/4/07

Checked By: PCT Date: 10/4/07

TITLE: WEATHER INPUT PARAMETERS FOR HELP MODELING

Purpose:

Select appropriate weather input parameters for use in HELP modeling.

Solution:

1. Temperature and precipitation data were based on mean monthly precipitation and temperature data from a nearby National Weather Service station (Lincoln, Illinois) as reported by the National Oceanographic and Atmospheric Administration (NOAA).

2. Normal Mean Monthly Temperature and Precipitation Values for the period of 1950 - 2000.

Month	Normal Mean Temperature (°F)	Normal Mean Precipitation (inches)
January	24.80	1.86
February	30.00	1.65
March	39.90	2.93
April	52.50	3.99
May	63.50	4.09
June	72.50	4.24
July	75.80	4.14
August	73.60	3.71
September	66.70	3.04
October	55.10	2.74
November	41.60	2.96
December	30.00	2.40

3. Normal Average Annual Wind Speed = 10.30 mph.

4. Normal Average Monthly and Quarterly Relative Humidity Values.

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton LF No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: JPV Date: 10/4/07
Checked By: PCT Date: 10/4/07

TITLE: WEATHER INPUT PARAMETERS FOR HELP MODELING

Quarter	Normal Average Quarterly Relative Humidity %
1st	71
2nd	65
3rd	70
4th	72

5. The Growing Season Start and End Dates and is represented by the Julian Dates (day of the year):

   - Growing Season Start Date = 117
   - Growing Season End Date = 290

6. The Site Latitude was taken from USGS topographic map and is approximately 40.10°.

7. Maximum Leaf Area index is 0.0 for bare ground condition; 1.0 for poor vegetation condition; and 4.0 for good vegetation condition (refer to HELP documentation included in this Exhibit).

EXHIBIT 4
GROUNDWATER SEEPAGE CALCULATION

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton LF. No. 3 Chemical Waste Unit
Calculated By: ZPC Date: 1/24/08
Title: GROUNDWATER SEEPAGE Checked By: JPV Date: 1/24/08

Problem Statement:

Calculate inward leakage through the composite liner (CSL) design based on Giroud et al. (1989).

Given:

1) Inward gradient with 6 feet of head on the liner during operational and post-closure periods with a maximum potentiometric elevation of 670 ft.MSL and top of leachate drainage layer at lowest elevation equal to 664 ft.MSL (assumes drainage layer completely saturated, see Drawing D6):
   → ∴ 670 ft. - 664 ft. = 6 ft.
2) Poor contact between the geomembrane and the compacted earth liner is considered.
3) The rate of leakage was calculated using the equation: where $Q = (0.0008) * (X^{0.9176})$; source for the equation *is Giroud and Bonaparte (1989): Leakage Through Liner Constructed With Geomembrane-Part II (VI, pp. 71-111).*

Solution:

The rate of leakage through geomembrane defect (Q) expressed in m/yr =

$$Q = (0.0008) \cdot (X^{0.9176})$$ (Source: IEPA based on Giroud and Bonaparte (1989))

Where,

X = Leachate depth on top of top of the geomembrane (m)

Calculation:

X = Leachate depth on top of top of the geomembrane = 6 ft. = 1.8288 m

Q = Rate of leakage $= (0.0008) \cdot (X^{0.9176})$ = 1.39E-3 m/yr
= 4.57E-3 ft/yr
= 0.0548 in/yr

EXHIBIT 5
SCS CURVE NUMBER

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.

Project: Clinton Landfill No. 3 Chemical Waste Unit

Proj. #: 128017

Calculated By: PCT Date: 10/4/07

Checked By: JPV Date: 10/8/07

TITLE: SCS CURVE NUMBER FOR HELP MODELING - OPERATIONAL PERIODS

Purpose

The uppermost layers for the operational 'HELP' simulations are daily cover and intermediate cover. Estimate the runoff curve number for HELP model input.

Solution

1. The HELP default Texture No. 11 is assumed to represent the daily cover soil material and bare ground conditions were considered for the daily cover simulations. Using the chart presented on page 36 of the HELP v.3 User's Guide (see attached), an SCS Runoff Curve Number of 93.1 was interpolated for Texture No. 11 soils and bare ground conditions.

2. The HELP default Texture No. 11 is assumed to represent the intermediate cover soil material and poor vegetative conditions were considered for the intermediate cover simulations. Using the same chart as above (see attached), an SCS Runoff Curve Number of 89.1 was interpolated for Texture No. 11 soils and poor vegetative conditions.

Results

1. For the daily cover with bare ground conditions, SCS Runoff Curve Number Interpolated = 93.1.

2. For the intermediate cover with poor vegetative conditions, SCS Runoff Curve Number Interpolated = 89.1.

United States
Environmental Protection
Agency

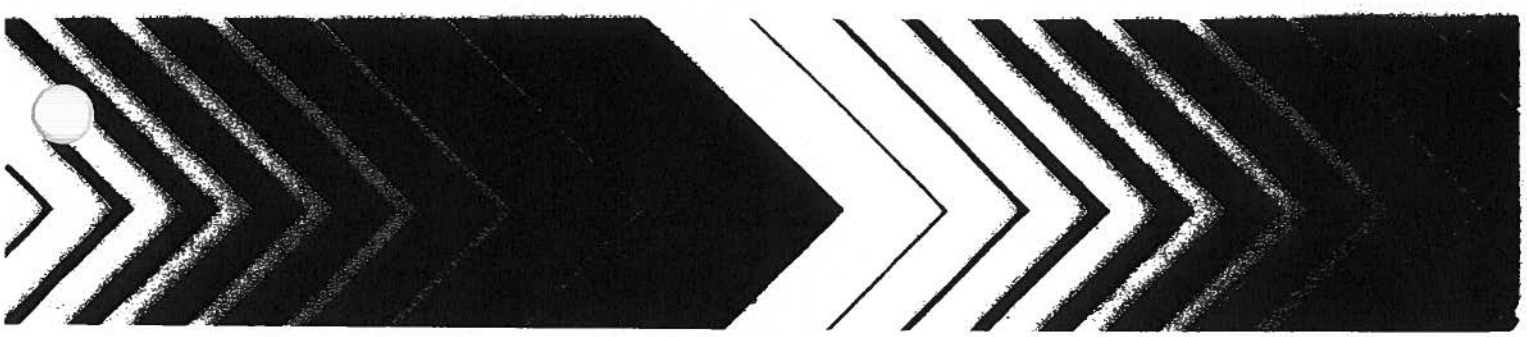
Office of Research and
Development
Washington DC 20460

EPA/600/R-94/168a
September 1994

EPA

The Hydrologic Evaluation of Landfill Performance (HELP) Model

User's Guide for Version 3



2. A curve number defined by the user and modified according to the surface slope and slope length of the landfill

3. A curve number is computed by the HELP model based on landfill surface slope, slope length, soil texture of the top layer, and the vegetative cover. Some general guidance for selection of runoff curve numbers is provided in Figure 2 (USDA, Soil Conservation Service, 1985).

Two of the options account for surface slope. The correlation between surface slope conditions and curve number were developed for slopes ranging from 1 percent to as high as 50 percent and for slope lengths ranging from 50 feet to 2000 feet.

3.8 OVERVIEW OF MODELING PROCEDURE

The hydrologic processes modeled by the program can be divided into two categories: surface processes and subsurface processes. The surface processes modeled are snowmelt, interception of rainfall by vegetation, surface runoff, and surface evaporation. The subsurface processes modeled are evaporation from soil profile, plant transpiration, unsaturated vertical drainage, barrier soil liner percolation, geomembrane leakage and saturated lateral drainage.

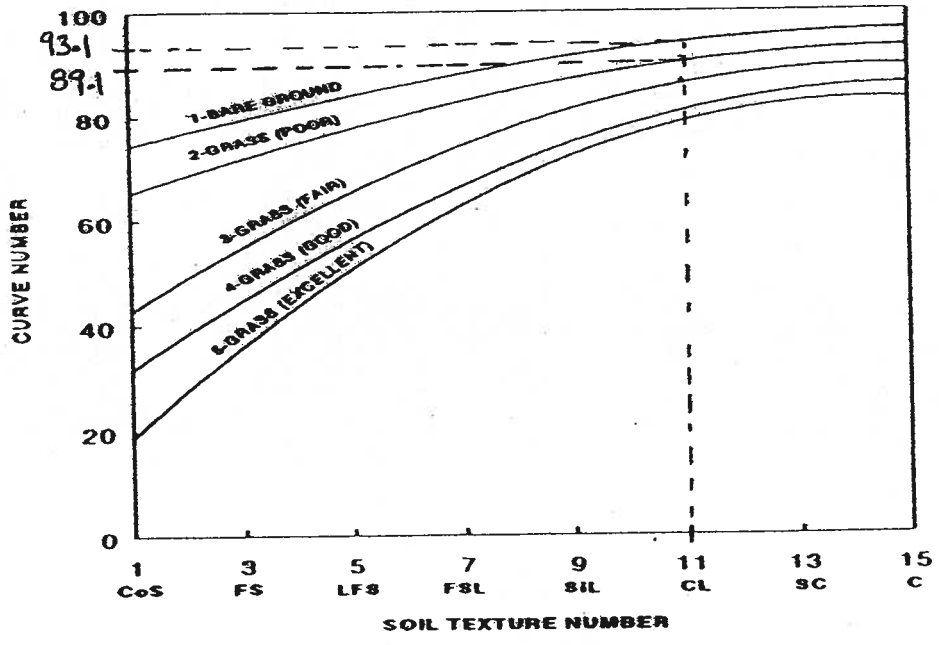


Figure 2. Relation between SCS Curve Number and Default Soil Texture Number for Various Levels of Vegetation

EXHIBIT 6
GEOCOMPOSITE TRANSMISSIVITY CONVERSION

Shaw® Shaw Environmental, Inc.

Client: Clinton Landfill, Inc.
Project: Clinton Landfill No. 3 Chemical Waste Unit
Proj. #: 128017
Calculated By: LJC Date: 11/5/08
Checked By: JPV Date: 11/10/08

TITLE: DETERMINATION OF THE HYDRAULIC CONDUCTIVITY OF THE GEOCOMPOSITE

Problem Statement:

Determine the saturated hydraulic conductivity of the geocomposite drainage layer (witness layer). The saturated hydraulic conductivity will be used in the HELP model to predict leachate generation and head build-up in the landfill.

Given

- ❑ The transmissivity of the geocomposite is 1 X 10^{-4} m^2/s from Table 02646-1.
- ❑ The thickness of the goecomposite is 0.2 inches (0.5 cm).

Calculations

Transmissivity = Saturated Hydraulic Conductivity (k) × thickness (t)

Therefore,

$$k = \frac{\text{Trasmissivity}}{t} = \left(\frac{1 \text{ X } 10^{-4} m^2 / s}{0.5 cm}\right)\left(\frac{100 cm}{m}\right)^2 = 2 \text{ cm/s}$$

Conclusion

The hydraulic conductivity for the geocomposite drainage layer is 2 cm/s.

TABLE 02646-1

GEOCOMPOSITE DRAINAGE LAYER MATERIAL PROPERTIES

PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUE	
		FINAL COVER	SIDEWALL LINER
Nonwoven Geotextile Fabric			
Fabric Weight	ASTM D5261	6.0 oz/yd^2	8.0 oz/yd^2
Apparent Opening Size	ASTM D4751	70 – 100 U.S. Sieve	70 – 100 U.S. Sieve
Grab Tensile Strength (MD and TD)	ASTM D4632	150	220
Grab Elongation	ASTM D4632	50%	50%
Puncture Resistance	ASTM D4833	80 lbs.	120 lbs.
Trapezoid Tear Strength (MD and TD)	ASTM D4533	60 lbs.	95 lbs.
Permittivity	ASTM D4491	1.5 sec^{-1}	1.5 sec^{-1}
Water Flow Rate	ASTM D4491	100 gpm/ft^2	100 gpm/ft^2
UV Resistance	ASTM D4355	70% strength retained after 500 hours	70% strength retained after 500 hours
Geonet Core			
Polymer Density	ASTM D1505	0.94 g/cm^3	0.94 g/cm^3
Thickness	ASTM D5199	0.200 inches	0.200 inches
Tensile Strength (MD)	ASTM D5035	40 lbs/inch	40 lbs per inch
Transmissivity	ASTM D4716	1 x 10^{-2} m^2 / sec	1 x 10^{-2} m^2 / sec
Carbon Black Content	ASTM D1603	1.5 - 3 %	1.5 - 3 %
Geocomposite (Two Sided Geotextile/Geonet)			
Transmissivity	ASTM D4716	1 x 10^{-4} m^2/sec	1 x 10^{-4} m^2/sec
Peel Adhesion	ASTM D7005	1.0 lb/inch	1.0 lb/inch

Note: Transmissivity corresponding to hydraulic gradient of 0.1 at a confining pressure of at least 10,000 psf, seat time at least 15 minutes, tested between two steel plates.

100% recycled paper

EXHIBIT 7
'HELP' MODEL RESULTS
DAILY COVER OPERATIONS

US EPA ARCHIVE DOCUMENT

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**********************************************************************************
**                                                                              **
**                                                                              **
**                 HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                   HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                 **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                      **
**                     USAE WATERWAYS EXPERIMENT STATION                        **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                              **
**                                                                              **
**********************************************************************************
**********************************************************************************

PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_DC.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\SOIL_DC.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CLIN_DC1.OUT


TIME:  13:24      DATE:   1/ 6/2009


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

    TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (DAILY COVER 1 YR.)

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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  11
          THICKNESS                      =      6.00   INCHES
          POROSITY                       =      0.4640 VOL/VOL
          FIELD CAPACITY                 =      0.3100 VOL/VOL
          WILTING POINT                  =      0.1870 VOL/VOL
          INITIAL SOIL WATER CONTENT     =      0.3100 VOL/VOL
          EFFECTIVE SAT. HYD. COND.      = 0.639999998000E-04 CM/SEC


                                LAYER  2
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US EPA ARCHIVE DOCUMENT

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2600	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	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.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7470	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 7

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 8

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 9

US EPA ARCHIVE DOCUMENT

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	93.10	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.860	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.784	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.122	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	49.150	INCHES
TOTAL INITIAL WATER	=	49.150	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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US EPA ARCHIVE DOCUMENT

1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.364	0.300	0.670	3.008	1.564	4.079
	2.441	3.051	1.803	2.092	0.800	0.639
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0490	0.1401	0.1240	0.3347	0.8491	0.7574
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO LAYER 9	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED FROM LAYER 7	0.0046	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

US EPA ARCHIVE DOCUMENT

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.079	0.000 0.226	0.000 0.207	0.000 0.540	0.000 1.415	0.000 1.222
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.057	0.000 0.032	0.000 0.144	0.000 0.151	0.000 0.170	0.000 0.280
AVERAGE DAILY HEAD ON TOP OF LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.006	0.000 0.032	0.000 0.078
TD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.003	0.000 0.013	0.000 0.011
VERAGE DAILY HEAD ON TOP OF LAYER 8	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
TD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 8	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	20.809	75537.781	68.34
DRAINAGE COLLECTED FROM LAYER 3	2.2542	8182.926	7.40
PERC./LEAKAGE THROUGH LAYER 4	0.000403	1.465	0.00
AVG. HEAD ON TOP OF LAYER 4	0.3073		
PERC./LEAKAGE THROUGH LAYER 6	0.000126	0.459	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0097		
SUBSURFACE INFLOW INTO LAYER 9	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 7	0.0548	199.037	0.18
ERC./LEAKAGE THROUGH LAYER 9	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0001		
CHANGE IN WATER STORAGE	7.386	26812.682	24.26

US EPA ARCHIVE DOCUMENT

SOIL WATER AT START OF YEAR	49.503	179696.875	
SOIL WATER AT END OF YEAR	56.890	206509.562	
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	0.025	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.364	0.300	0.670	3.008	1.564	4.079
	2.441	3.051	1.803	2.092	0.800	0.639
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0490	0.1401	0.1240	0.3347	0.8491	0.7574
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

US EPA ARCHIVE DOCUMENT

	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.00

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 9

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 7

TOTALS	0.0046	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.00
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

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0790	0.2259	0.2066	0.5398	1.4151	1.2216
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

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0002	0.0002	0.0061	0.0324	0.0778
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

US EPA ARCHIVE DOCUMENT

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 1 THROUGH 1

	INCHES		CU. FEET	PERCENT
PRECIPITATION	30.45	(0.000)	110533.5	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	20.809	(0.0000)	75537.78	68.339
LATERAL DRAINAGE COLLECTED FROM LAYER 3	2.25425	(0.00000)	8182.926	7.40312
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00040	(0.00000)	1.465	0.00133
AVERAGE HEAD ON TOP OF LAYER 4	0.307	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00013	(0.00000)	0.459	0.00042
AVERAGE HEAD ON TOP OF LAYER 6	0.010	(0.000)		
SUBSURFACE INFLOW INTO LAYER 9	0.05480		198.924	0.17997
LATERAL DRAINAGE COLLECTED FROM LAYER 7	0.05483	(0.00000)	199.037	0.18007
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 8	0.000	(0.000)		
CHANGE IN WATER STORAGE	7.386	(0.0000)	26812.68	24.258

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US EPA ARCHIVE DOCUMENT

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	0.03242	117.67963
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000006	0.02250
AVERAGE HEAD ON TOP OF LAYER 4	1.621	
MAXIMUM HEAD ON TOP OF LAYER 4	2.772	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	24.6 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000001	0.00378
AVERAGE HEAD ON TOP OF LAYER 6	0.092	
DRAINAGE COLLECTED FROM LAYER 7	0.00015	0.54877
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 8	0.000	
MAXIMUM HEAD ON TOP OF LAYER 8	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4640
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1870

*** 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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US EPA ARCHIVE DOCUMENT

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FINAL WATER STORAGE AT END OF YEAR 1

LAYER	(INCHES)	(VOL/VOL)
1	2.5364	0.4227
2	37.6614	0.3138
3	0.7882	0.0657
4	0.0000	0.0000
5	0.1767	0.7482
6	0.0000	0.0000
7	0.0021	0.0105
8	0.0000	0.0000
9	15.3720	0.4270
SNOW WATER	0.000	

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US EPA ARCHIVE DOCUMENT

EXHIBIT 8
'HELP' MODEL RESULTS
INTERMEDIATE COVER

US EPA ARCHIVE DOCUMENT

EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 1

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

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**                                                                              **
**                HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                 **
**                  HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                    USAE WATERWAYS EXPERIMENT STATION                         **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                              **
**                                                                              **
**********************************************************************************
**********************************************************************************

PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\SOIL_IL1.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CLIN_IL1.OUT


TIME:  14:35     DATE:   1/ 6/2009


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

    TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 1)

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


    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  11
          THICKNESS                      =     12.00   INCHES
          POROSITY                       =      0.4640 VOL/VOL
          FIELD CAPACITY                 =      0.3100 VOL/VOL
          WILTING POINT                  =      0.1870 VOL/VOL
          INITIAL SOIL WATER CONTENT     =      0.3100 VOL/VOL
          EFFECTIVE SAT. HYD. COND.      =  0.639999998000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2869	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3138	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 4

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	=	0.0657	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE

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FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7489	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.3000000030000E-08	CM/SEC

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 8

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER

US EPA ARCHIVE DOCUMENT

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 10

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	89.10	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.294	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.570	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.514	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	126.571	INCHES
TOTAL INITIAL WATER	=	126.571	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	117

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END OF GROWING SEASON (JULIAN DATE)	=	290
EVAPORATIVE ZONE DEPTH	=	14.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
RECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
UNOFF	0.022	0.055	0.639	0.049	0.000	0.00
	0.064	0.309	0.283	0.001	0.000	0.16
VAPOTRANSPIRATION	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624

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LATERAL DRAINAGE COLLECTED FROM LAYER 4	0.5637	0.7563	0.6956	0.7233	0.6753	0.4859
	0.2907	0.1857	0.3372	0.4886	0.4255	0.2282
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO LAYER 10	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 5	0.909	1.350	1.122	1.205	1.089	0.810
	0.469	0.300	0.562	0.788	0.709	0.368
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 5	0.155	0.036	0.156	0.042	0.085	0.096
	0.094	0.062	0.151	0.015	0.085	0.084
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.158	0.186	0.218	0.235	0.236	0.236
	0.236	0.236	0.236	0.236	0.236	0.236
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.006	0.010	0.008	0.002	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.599	5803.792	5.25
EVAPOTRANSPIRATION	25.494	92543.281	83.72
DRAINAGE COLLECTED FROM LAYER 4	5.8560	21257.264	19.23

US EPA ARCHIVE DOCUMENT

PERC./LEAKAGE THROUGH LAYER 5	0.001021	3.704	0.00
AVG. HEAD ON TOP OF LAYER 5	0.8068		
ERC./LEAKAGE THROUGH LAYER 7	0.000540	1.962	0.00
AVG. HEAD ON TOP OF LAYER 7	0.2238		
SUBSURFACE INFLOW INTO LAYER 10	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 8	0.0553	200.826	0.18
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0001		
CHANGE IN WATER STORAGE	-2.499	-9072.784	-8.21
SOIL WATER AT START OF YEAR	126.925	460737.969	
SOIL WATER AT END OF YEAR	124.426	451665.187	
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	0.076	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						

US EPA ARCHIVE DOCUMENT

TOTALS	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS	0.5637	0.7563	0.6956	0.7233	0.6753	0.4859
	0.2907	0.1857	0.3372	0.4886	0.4255	0.2282
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 7

TOTALS	0.0000	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

SUBSURFACE INFLOW INTO LAYER 10

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 8

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.9091	1.3504	1.1219	1.2054	1.0892	0.8098

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	0.4689	0.2996	0.5620	0.7880	0.7091	0.3680
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.00

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.1577	0.1859	0.2178	0.2352	0.2362	0.2362
	0.2362	0.2362	0.2362	0.2362	0.2362	0.2362
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

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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 1 THROUGH 1

	INCHES		CU. FEET	PERCEN
PRECIPITATION	30.45	(0.000)	110533.5	100.00
RUNOFF	1.599	(0.0000)	5803.79	5.251
EVAPOTRANSPIRATION	25.494	(0.0000)	92543.28	83.724
LATERAL DRAINAGE COLLECTED FROM LAYER 4	5.85600	(0.00000)	21257.264	19.23151
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00102	(0.00000)	3.704	0.00335
AVERAGE HEAD ON TOP OF LAYER 5	0.807	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00054	(0.00000)	1.962	0.00177
AVERAGE HEAD ON TOP OF LAYER 7	0.224	(0.000)		
SUBSURFACE INFLOW INTO LAYER 10	0.05480		198.924	0.17997
TERAL DRAINAGE COLLECTED FROM LAYER 8	0.05532	(0.00000)	200.826	0.1816
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000	(0.00000)	0.000	0.00000

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AVERAGE HEAD ON TOP OF LAYER 9	0.000	(0.000)		
IANGE IN WATER STORAGE	-2.499	(0.0000)	-9072.78	-8.208

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US EPA ARCHIVE DOCUMENT

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.529	1921.1997
DRAINAGE COLLECTED FROM LAYER 4	0.02777	100.79976
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000005	0.01865
AVERAGE HEAD ON TOP OF LAYER 5	1.388	
MAXIMUM HEAD ON TOP OF LAYER 5	2.409	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	22.4 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000002	0.00552
AVERAGE HEAD ON TOP OF LAYER 7	0.236	
DRAINAGE COLLECTED FROM LAYER 8	0.00015	0.55052
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000	
MAXIMUM HEAD ON TOP OF LAYER 9	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3768
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1796

*** 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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US EPA ARCHIVE DOCUMENT

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FINAL WATER STORAGE AT END OF YEAR 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5699	0.3808
2	69.2579	0.2886
3	34.0800	0.2840
4	0.6127	0.0511
5	0.0000	0.0000
6	0.1774	0.7509
7	0.0000	0.0000
8	0.0021	0.0105
9	0.0000	0.0000
10	15.3720	0.4270
SNOW WATER	0.000	

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US EPA ARCHIVE DOCUMENT

EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 2

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE       **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)        **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY             **
**                USAE WATERWAYS EXPERIMENT STATION                 **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY     **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:    C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:      C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\clinton\SOIL_IL2.D10
OUTPUT DATA FILE:           C:\HELP3\clinton\CLIN_IL2.OUT


TIME:  14:53     DATE:   1/ 6/2009


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    TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 2)

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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  11
          THICKNESS                      =     12.00   INCHES
          POROSITY                       =      0.4640 VOL/VOL
          FIELD CAPACITY                 =      0.3100 VOL/VOL
          WILTING POINT                  =      0.1870 VOL/VOL
          INITIAL SOIL WATER CONTENT     =      0.3100 VOL/VOL
          EFFECTIVE SAT. HYD. COND.      = 0.639999998000E-04 CM/SEC
       NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2869	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2886	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 5

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	=	0.0511	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

US EPA ARCHIVE DOCUMENT

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24 INCHES
POROSITY	=	0.7500 VOL/VOL
FIELD CAPACITY	=	0.7470 VOL/VOL
WILTING POINT	=	0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7489 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08 CM/SEC

LAYER 8

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR

LAYER 9

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20 INCHES

POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 10

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 11

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	89.10	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.294	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.570	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.514	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	192.084	INCHES

TOTAL INITIAL WATER	=	192.084	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/
PRECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
RUNOFF	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
EVAPOTRANSPIRATION	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
LATERAL DRAINAGE COLLECTED FROM LAYER 5	0.1194	0.1583	0.1480	0.2296	0.0922	0.0784
	0.1680	0.3544	0.3677	0.1715	0.0864	0.1318
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO LAYER 11	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED FROM LAYER 9	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
RCOLATION/LEAKAGE THROUGH LAYER 11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

VERAGE DAILY HEAD ON TOP OF LAYER 6	0.193	0.283	0.239	0.383	0.149	0.131
	0.271	0.572	0.613	0.277	0.144	0.213
TD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 6	0.019	0.033	0.054	0.050	0.053	0.016
	0.125	0.044	0.020	0.118	0.026	0.065
VERAGE DAILY HEAD ON TOP OF LAYER 8	0.146	0.142	0.138	0.137	0.134	0.126
	0.120	0.124	0.133	0.136	0.130	0.124
TD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 8	0.002	0.001	0.001	0.000	0.002	0.002
	0.001	0.002	0.003	0.001	0.002	0.002
VERAGE DAILY HEAD ON TOP OF LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
TD. DEVIATION OF DAILY EAD ON TOP OF LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.599	5803.792	5.25
EVAPOTRANSPIRATION	25.494	92543.281	83.72
DRAINAGE COLLECTED FROM LAYER 5	2.1056	7643.417	6.92
PERC./LEAKAGE THROUGH LAYER 6	0.000346	1.258	0.00
AVG. HEAD ON TOP OF LAYER 6	0.2887		
PERC./LEAKAGE THROUGH LAYER 8	0.000428	1.555	0.00
AVG. HEAD ON TOP OF LAYER 8	0.1327		
SUBSURFACE INFLOW INTO LAYER 11	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 9	0.0552	200.419	0.18
PERC./LEAKAGE THROUGH LAYER 11	0.000000	0.000	0.00
VG. HEAD ON TOP OF LAYER 10	0.0001		
CHANGE IN WATER STORAGE	1.251	4541.377	4.11
SOIL WATER AT START OF YEAR	192.438	698549.562	
SOIL WATER AT END OF YEAR	193.689	703090.937	
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	0.169	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54

	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00

RUNOFF

TOTALS	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

LATERAL DRAINAGE COLLECTED FROM LAYER 5

TOTALS	0.1194	0.1583	0.1480	0.2296	0.0922	0.0784
	0.1680	0.3544	0.3677	0.1715	0.0864	0.1318
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 11

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 9

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 11

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TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.1926	0.2826	0.2387	0.3826	0.1487	0.1307
	0.2710	0.5716	0.6127	0.2767	0.1440	0.2125
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

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.1464	0.1420	0.1385	0.1372	0.1341	0.1264
	0.1204	0.1237	0.1325	0.1363	0.1302	0.1241
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

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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 1 THROUGH 1

	INCHES		CU. FEET	PERCENT
PRECIPITATION	30.45	(0.000)	110533.5	100.00
RUNOFF	1.599	(0.0000)	5803.79	5.251
EVAPOTRANSPIRATION	25.494	(0.0000)	92543.28	83.724
LATERAL DRAINAGE COLLECTED FROM LAYER 5	2.10562	(0.00000)	7643.417	6.91502
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00035	(0.00000)	1.258	0.00114
AVERAGE HEAD ON TOP OF LAYER 6	0.289	(0.000)		

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PERCOLATION/LEAKAGE THROUGH LAYER 8	0.00043 (0.00000)	1.555	0.00141
/ERAGE HEAD ON TOP OF LAYER 8	0.133 (0.000)		
SUBSURFACE INFLOW INTO LAYER 11	0.05480	198.924	0.17997
LATERAL DRAINAGE COLLECTED FROM LAYER 9	0.05521 (0.00000)	200.419	0.18132
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00000 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 10	0.000 (0.000)		
CHANGE IN WATER STORAGE	1.251 (0.0000)	4541.38	4.109

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.529	1921.1997
DRAINAGE COLLECTED FROM LAYER 5	0.01304	47.32682
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000002	0.00791
AVERAGE HEAD ON TOP OF LAYER 6	0.652	
MAXIMUM HEAD ON TOP OF LAYER 6	1.196	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	13.9 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.000001	0.00447
AVERAGE HEAD ON TOP OF LAYER 8	0.150	
DRAINAGE COLLECTED FROM LAYER 9	0.00015	0.54945
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 10	0.000	
MAXIMUM HEAD ON TOP OF LAYER 10	0.004	
LOCATION OF MAXIMUM HEAD IN LAYER 9 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3768
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1796

*** 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 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5699	0.3808
2	69.2579	0.2886
3	68.1600	0.2840
4	35.1104	0.2926
5	0.6862	0.0572
6	0.0000	0.0000
7	0.1768	0.7486
8	0.0000	0.0000
9	0.0021	0.0105
10	0.0000	0.0000
11	15.3720	0.4270
SNOW WATER	0.000	

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EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 3

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE       **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)        **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY             **
**                USAE WATERWAYS EXPERIMENT STATION                 **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY     **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\SOIL_IL3.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CLIN_IL3.OUT

TIME:  15: 5     DATE:   1/ 6/2009

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    TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 3)

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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  11
      THICKNESS                      =     12.00   INCHES
      POROSITY                       =      0.4640 VOL/VOL
      FIELD CAPACITY                 =      0.3100 VOL/VOL
      WILTING POINT                  =      0.1870 VOL/VOL
      INITIAL SOIL WATER CONTENT     =      0.3100 VOL/VOL
      EFFECTIVE SAT. HYD. COND.      =  0.639999998000E-04 CM/SEC
   NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
          FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2869	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2886	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2926	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

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LAYER 6

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	=	0.0572	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7482	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL

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INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 10

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 11

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 12

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

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GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	89.10	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.294	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.570	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.514	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	261.349	INCHES
TOTAL INITIAL WATER	=	261.349	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60

73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
RUNOFF	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
EVAPOTRANSPIRATION	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.2538	0.2927	0.3480	0.3537	0.2456	0.3069
	0.1603	0.1271	0.0898	0.0922	0.2949	0.3464
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.0000	0.0000	0.0001	0.0001	0.0000	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO LAYER 12	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED FROM LAYER 10	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.409	0.523	0.561	0.589	0.396	0.511
	0.259	0.205	0.150	0.149	0.491	0.559
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.027	0.043	0.038	0.049	0.050	0.113
	0.010	0.015	0.013	0.055	0.093	0.083

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AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.096	0.100	0.107	0.116	0.120	0.125
	0.125	0.121	0.116	0.109	0.108	0.116
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.001	0.002	0.002	0.003	0.000	0.002
	0.001	0.001	0.002	0.002	0.002	0.0
AVERAGE DAILY HEAD ON TOP OF LAYER 11	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 11	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.599	5803.792	5.25
EVAPOTRANSPIRATION	25.494	92543.281	83.72
DRAINAGE COLLECTED FROM LAYER 6	2.9112	10567.732	9.56
PERC./LEAKAGE THROUGH LAYER 7	0.000479	1.741	0.00
AVG. HEAD ON TOP OF LAYER 7	0.4002		
PERC./LEAKAGE THROUGH LAYER 9	0.000405	1.472	0.00
AVG. HEAD ON TOP OF LAYER 9	0.1133		
SUBSURFACE INFLOW INTO LAYER 12	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 10	0.0552	200.335	0.18
PERC./LEAKAGE THROUGH LAYER 12	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 11	0.0001		
CHANGE IN WATER STORAGE	0.446	1617.371	1.46
SOIL WATER AT START OF YEAR	261.703	949980.375	
SOIL WATER AT END OF YEAR	262.148	951597.750	
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	-0.057	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6						
TOTALS	0.2538	0.2927	0.3480	0.3537	0.2456	0.3069
	0.1603	0.1271	0.0898	0.0922	0.2949	0.3464
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 7						
TOTALS	0.0000	0.0000	0.0001	0.0001	0.0000	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 9						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 12

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 10

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 12

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.4094	0.5226	0.5612	0.5895	0.3960	0.51
	0.2585	0.2049	0.1497	0.1487	0.4914	0.558
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

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0960	0.1001	0.1071	0.1160	0.1203	0.1250
	0.1253	0.1213	0.1157	0.1091	0.1081	0.1161
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

DAILY AVERAGE HEAD ON TOP OF LAYER 11

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 1

	INCHES	CU. FEET	PERCENT

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PRECIPITATION	30.45 (0.000)	110533.5	100.00
RUNOFF	1.599 (0.0000)	5803.79	5.251
EVAPOTRANSPIRATION	25.494 (0.0000)	92543.28	83.724
LATERAL DRAINAGE COLLECTED FROM LAYER 6	2.91122 (0.00000)	10567.732	9.56066
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00048 (0.00000)	1.741	0.00157
AVERAGE HEAD ON TOP OF LAYER 7	0.400 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00041 (0.00000)	1.472	0.00133
AVERAGE HEAD ON TOP OF LAYER 9	0.113 (0.000)		
SUBSURFACE INFLOW INTO LAYER 12	0.05480	198.924	0.17997
LATERAL DRAINAGE COLLECTED FROM LAYER 10	0.05519 (0.00000)	200.335	0.18124
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.00000 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 11	0.000 (0.000)		
CHANGE IN WATER STORAGE	0.446 (0.0000)	1617.37	1.463

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.529	1921.1997
DRAINAGE COLLECTED FROM LAYER 6	0.01297	47.09740
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000002	0.00786
AVERAGE HEAD ON TOP OF LAYER 7	0.649	
MAXIMUM HEAD ON TOP OF LAYER 7	1.191	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	13.9 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000001	0.00419
AVERAGE HEAD ON TOP OF LAYER 9	0.127	
DRAINAGE COLLECTED FROM LAYER 10	0.00015	0.54919
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 11	0.000	
MAXIMUM HEAD ON TOP OF LAYER 11	0.004	
LOCATION OF MAXIMUM HEAD IN LAYER 10 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3768
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1796

*** 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 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5699	0.3808
2	69.2579	0.2886
3	68.1600	0.2840
4	69.4261	0.2893
5	34.1566	0.2846
6	0.6734	0.0561
7	0.0000	0.0000
8	0.1768	0.7485
9	0.0000	0.0000
10	0.0021	0.0105
11	0.0000	0.0000
12	15.3720	0.4270
SNOW WATER	0.000	

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US EPA ARCHIVE DOCUMENT

EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 4

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)        **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY             **
**                USAE WATERWAYS EXPERIMENT STATION                 **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY     **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\SOIL_IL4.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CLIN_IL4.OUT

TIME:  15:13     DATE:   1/ 6/2009

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    TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 4)

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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  11
      THICKNESS                    =     12.00   INCHES
      POROSITY                     =      0.4640 VOL/VOL
      FIELD CAPACITY               =      0.3100 VOL/VOL
      WILTING POINT                =      0.1870 VOL/VOL
      INITIAL SOIL WATER CONTENT   =      0.3100 VOL/VOL
      EFFECTIVE SAT. HYD. COND.    =  0.639999998000E-04 CM/SEC
    NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
             FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2869	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2886	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2893	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

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LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2846	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 7

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	=	0.0561	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 8

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL

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INITIAL SOIL WATER CONTENT	=	0.7481 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.3000000003000E-08 CM/SEC

LAYER 10

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR

LAYER 11

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20 INCHES
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000 CM/SEC
SLOPE	=	2.00 PERCENT
DRAINAGE LENGTH	=	170.0 FEET

LAYER 12

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR

LAYER 13

US EPA ARCHIVE DOCUMENT

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	89.10	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.294	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.570	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.514	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	329.808	INCHES
TOTAL INITIAL WATER	=	329.808	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

US EPA ARCHIVE DOCUMENT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
RECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
UNOFF	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
VAPOTRANSPIRATION	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
ATERAL DRAINAGE COLLECTED FROM LAYER 7	0.2023	0.1864	0.1562	0.1268	0.1224	0.2573
	0.1878	0.1456	0.2894	0.4233	0.3616	0.1892
ERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000
ERCOLATION/LEAKAGE THROUGH LAYER 10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UBSURFACE INFLOW INTO AYER 13	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
ATERAL DRAINAGE COLLECTED FROM LAYER 11	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

US EPA ARCHIVE DOCUMENT

PERCOLATION/LEAKAGE THROUGH LAYER 13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 8	0.326	0.333	0.252	0.211	0.197	0.429
	0.303	0.235	0.482	0.683	0.603	0.305
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 8	0.017	0.021	0.021	0.037	0.056	0.042
	0.037	0.021	0.124	0.028	0.049	0.064
AVERAGE DAILY HEAD ON TOP OF LAYER 10	0.087	0.087	0.086	0.084	0.080	0.080
	0.083	0.081	0.082	0.092	0.104	0.108
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 10	0.000	0.000	0.001	0.001	0.001	0.001
	0.000	0.001	0.002	0.004	0.003	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.599	5803.792	5.25
EVAPOTRANSPIRATION	25.494	92543.281	83.72
DRAINAGE COLLECTED FROM LAYER 7	2.6482	9612.942	8.70
PERC./LEAKAGE THROUGH LAYER 8	0.000435	1.580	0.00
AVG. HEAD ON TOP OF LAYER 8	0.3632		
PERC./LEAKAGE THROUGH LAYER 10	0.000375	1.360	0.00
AVG. HEAD ON TOP OF LAYER 10	0.0878		
SUBSURFACE INFLOW INTO LAYER 13	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 11	0.0552	200.225	0.18
PERC./LEAKAGE THROUGH LAYER 13	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0001		

US EPA ARCHIVE DOCUMENT

CHANGE IN WATER STORAGE	0.709	2572.395	2.33
SOIL WATER AT START OF YEAR	330.161	1198485.370	
SOIL WATER AT END OF YEAR	330.870	1201057.750	
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	-0.180	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 7						
TOTALS	0.2023	0.1864	0.1562	0.1268	0.1224	0.2573
	0.1878	0.1456	0.2894	0.4233	0.3616	0.1892
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 8

US EPA ARCHIVE DOCUMENT

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 13

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 11

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 13

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.3263	0.3328	0.2519	0.2113	0.1974	0.4288
	0.3030	0.2348	0.4823	0.6827	0.6026	0.3051
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

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0869	0.0873	0.0864	0.0841	0.0799	0.0804
	0.0827	0.0811	0.0815	0.0918	0.1036	0.1079
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

DAILY AVERAGE HEAD ON TOP OF LAYER 12

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AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.00

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 1

	INCHES		CU. FEET	PERCENT
PRECIPITATION	30.45	(0.000)	110533.5	100.00
RUNOFF	1.599	(0.0000)	5803.79	5.251
EVAPOTRANSPIRATION	25.494	(0.0000)	92543.28	83.724
LATERAL DRAINAGE COLLECTED FROM LAYER 7	2.64819	(0.00000)	9612.942	8.69686
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.00044	(0.00000)	1.580	0.00143
AVERAGE HEAD ON TOP OF LAYER 8	0.363	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00037	(0.00000)	1.360	0.00123
AVERAGE HEAD ON TOP OF LAYER 10	0.088	(0.000)		
SUBSURFACE INFLOW INTO LAYER 13	0.05480		198.924	0.17997
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.05516	(0.00000)	200.225	0.18114
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 12	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.709	(0.0000)	2572.39	2.327

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.529	1921.1997
DRAINAGE COLLECTED FROM LAYER 7	0.01444	52.41887
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.000002	0.00883
AVERAGE HEAD ON TOP OF LAYER 8	0.722	
MAXIMUM HEAD ON TOP OF LAYER 8	1.317	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	14.9 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000001	0.00397
AVERAGE HEAD ON TOP OF LAYER 10	0.108	
DRAINAGE COLLECTED FROM LAYER 11	0.00015	0.54897
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 12	0.000	
MAXIMUM HEAD ON TOP OF LAYER 12	0.005	
LOCATION OF MAXIMUM HEAD IN LAYER 11 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3768
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1796

*** 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 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5699	0.3808
2	69.2579	0.2886
3	68.1600	0.2840
4	69.4261	0.2893
5	68.2366	0.2843
6	34.6985	0.2892
7	0.6168	0.0514
8	0.0000	0.0000
9	0.1768	0.7484
10	0.0000	0.0000
11	0.0021	0.0105
12	0.0000	0.0000
13	15.3720	0.4270
SNOW WATER	0.000	

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US EPA ARCHIVE DOCUMENT

EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 5

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**                HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE     **
**                  HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)      **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY           **
**                    USAE WATERWAYS EXPERIMENT STATION             **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY   **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\SOIL_IL5.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CLIN_IL5.OUT


TIME:  15:19     DATE:   1/ 6/2009


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    TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 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  11
       THICKNESS                       =      12.00   INCHES
       POROSITY                        =       0.4640 VOL/VOL
       FIELD CAPACITY                  =       0.3100 VOL/VOL
       WILTING POINT                   =       0.1870 VOL/VOL
       INITIAL SOIL WATER CONTENT      =       0.3100 VOL/VOL
       EFFECTIVE SAT. HYD. COND.       =  0.639999998000E-04 CM/SEC
     NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
              FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2869	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2886	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2893	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

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LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2843	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2892	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 8

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	=	0.0514	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE

US EPA ARCHIVE DOCUMENT

FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7480	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

LAYER 11

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 12

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 13

TYPE 4 - FLEXIBLE MEMBRANE LINER

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MATERIAL TEXTURE NUMBER 35

THICKNESS	= 0.06	INCHES
POROSITY	= 0.0000	VOL/VOL
FIELD CAPACITY	= 0.0000	VOL/VOL
WILTING POINT	= 0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	= 1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	= 10.00	HOLES/ACRE
FML PLACEMENT QUALITY	= 4 - POOR	

LAYER 14

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	= 36.00	INCHES
POROSITY	= 0.4270	VOL/VOL
FIELD CAPACITY	= 0.4180	VOL/VOL
WILTING POINT	= 0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	= 0.05	INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	= 89.10	
FRACTION OF AREA ALLOWING RUNOFF	= 75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	= 1.000	ACRES
EVAPORATIVE ZONE DEPTH	= 14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	= 4.294	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	= 6.570	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	= 2.514	INCHES
INITIAL SNOW WATER	= 0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	= 398.536	INCHES
TOTAL INITIAL WATER	= 398.536	INCHES
TOTAL SUBSURFACE INFLOW	= 0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	= 40.10	DEGREES
MAXIMUM LEAF AREA INDEX	= 1.00	
START OF GROWING SEASON (JULIAN DATE)	= 117	

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END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
RECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
INOFF	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
VAPOTRANSPIRATION	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624

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LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.1856	0.2159	0.2796	0.2980	0.2788	0.1521
	0.1735	0.1339	0.1324	0.0918	0.0730	0.1174
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO LAYER 14	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED FROM LAYER 12	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
PERCOLATION/LEAKAGE THROUGH LAYER 14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.299	0.385	0.451	0.497	0.450	0.253
	0.280	0.216	0.221	0.148	0.122	0.189
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.035	0.032	0.046	0.037	0.086	0.048
	0.059	0.016	0.010	0.031	0.029	0.035
AVERAGE DAILY HEAD ON TOP OF LAYER 11	0.078	0.079	0.083	0.088	0.095	0.09[illegible]
	0.093	0.091	0.088	0.084	0.077	0.073
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 11	0.000	0.001	0.001	0.002	0.001	0.001
	0.000	0.001	0.001	0.002	0.002	0.001
AVERAGE DAILY HEAD ON TOP OF LAYER 13	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 13	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.599	5803.792	5.25
EVAPOTRANSPIRATION	25.494	92543.281	83.72
DRAINAGE COLLECTED FROM LAYER 8	2.1318	7738.279	7.00

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PERC./LEAKAGE THROUGH LAYER 9	0.000349	1.267	0.00
AVG. HEAD ON TOP OF LAYER 9	0.2926		
ERC./LEAKAGE THROUGH LAYER 11	0.000372	1.350	0.00
AVG. HEAD ON TOP OF LAYER 11	0.0854		
SUBSURFACE INFLOW INTO LAYER 14	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 12	0.0552	200.214	0.18
PERC./LEAKAGE THROUGH LAYER 14	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 13	0.0001		
CHANGE IN WATER STORAGE	1.225	4447.104	4.02
SOIL WATER AT START OF YEAR	398.889	1447966.250	
SOIL WATER AT END OF YEAR	400.114	1452413.370	
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	-0.0001	-0.216	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						

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TOTALS	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.00

LATERAL DRAINAGE COLLECTED FROM LAYER 8

TOTALS	0.1856	0.2159	0.2796	0.2980	0.2788	0.1521
	0.1735	0.1339	0.1324	0.0918	0.0730	0.1174
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 11

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

UBSURFACE INFLOW INTO LAYER 14

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 12

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 14

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.2994	0.3854	0.4509	0.4967	0.4496	0.2534

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	0.2797	0.2159	0.2206	0.1480	0.1217	0.1893
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

DAILY AVERAGE HEAD ON TOP OF LAYER 11

AVERAGES	0.0783	0.0795	0.0829	0.0885	0.0948	0.0954
	0.0928	0.0909	0.0876	0.0836	0.0774	0.0727
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

DAILY AVERAGE HEAD ON TOP OF LAYER 13

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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 1 THROUGH 1

	INCHES		CU. FEET	PERCENT
PRECIPITATION	30.45	(0.000)	110533.5	100.00
RUNOFF	1.599	(0.0000)	5803.79	5.251
EVAPOTRANSPIRATION	25.494	(0.0000)	92543.28	83.724
LATERAL DRAINAGE COLLECTED FROM LAYER 8	2.13176	(0.00000)	7738.279	7.00084
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00035	(0.00000)	1.267	0.00115
AVERAGE HEAD ON TOP OF LAYER 9	0.293	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00037	(0.00000)	1.350	0.00122
AVERAGE HEAD ON TOP OF LAYER 11	0.085	(0.000)		
SUBSURFACE INFLOW INTO LAYER 14	0.05480		198.924	0.17997
TERAL DRAINAGE COLLECTED FROM LAYER 12	0.05516	(0.00000)	200.214	0.18113
PERCOLATION/LEAKAGE THROUGH LAYER 14	0.00000	(0.00000)	0.000	0.00000

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AVERAGE HEAD ON TOP OF LAYER 13	0.000 (0.000)		
CHANGE IN WATER STORAGE	1.225 (0.0000)	4447.10	4.023

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.529	1921.1997
DRAINAGE COLLECTED FROM LAYER 8	0.01213	44.04344
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000002	0.00732
AVERAGE HEAD ON TOP OF LAYER 9	0.607	
MAXIMUM HEAD ON TOP OF LAYER 9	1.118	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	13.3 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000001	0.00383
AVERAGE HEAD ON TOP OF LAYER 11	0.096	
DRAINAGE COLLECTED FROM LAYER 12	0.00015	0.54882
PERCOLATION/LEAKAGE THROUGH LAYER 14	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 13	0.000	
MAXIMUM HEAD ON TOP OF LAYER 13	0.005	
LOCATION OF MAXIMUM HEAD IN LAYER 12 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3768
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1796

*** 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 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5699	0.3808
2	69.2579	0.2886
3	68.1600	0.2840
4	69.4261	0.2893
5	68.2366	0.2843
6	69.1071	0.2879
7	34.8094	0.2901
8	0.6429	0.0536
9	0.0000	0.0000
10	0.1767	0.7479
11	0.0000	0.0000
12	0.0021	0.0105
13	0.0000	0.0000
14	15.3720	0.4270
SNOW WATER	0.000	

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US EPA ARCHIVE DOCUMENT

EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 6

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE       **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)        **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY             **
**                  USAE WATERWAYS EXPERIMENT STATION               **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY       **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:    C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:      C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\clinton\SOIL_IL6.D10
OUTPUT DATA FILE:           C:\HELP3\clinton\CLIN_IL6.OUT


TIME:  15:22     DATE:   1/ 6/2009


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    TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 6)

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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  11
       THICKNESS                      =     12.00   INCHES
       POROSITY                       =      0.4640 VOL/VOL
       FIELD CAPACITY                 =      0.3100 VOL/VOL
       WILTING POINT                  =      0.1870 VOL/VOL
       INITIAL SOIL WATER CONTENT     =      0.3100 VOL/VOL
       EFFECTIVE SAT. HYD. COND.      =  0.639999998000E-04 CM/SEC
     NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
              FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2869	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2886	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2893	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

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LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2843	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2879	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2901	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 9

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	=	0.0536	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

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LAYER 10

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 11

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7470	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

LAYER 12

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 13

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES

POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 14

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 15

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	89.10	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.294	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.570	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.514	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	467.766	INCHES

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TOTAL INITIAL WATER	=	467.766	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
RUNOFF	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
EVAPOTRANSPIRATION	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
LATERAL DRAINAGE COLLECTED FROM LAYER 9	0.2162	0.2239	0.2717	0.2600	0.2408	0.1930
	0.1995	0.3116	0.2962	0.3550	0.3653	0.1753
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0000	0.0001	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO LAYER 15	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED FROM LAYER 13	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LKCOLATION/LEAKAGE THROUGH LAYER 15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

VERAGE DAILY HEAD ON TOP OF LAYER 10	0.349	0.400	0.438	0.433	0.388	0.322
	0.322	0.503	0.494	0.573	0.609	0.283
TD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 10	0.031	0.032	0.026	0.027	0.024	0.024
	0.039	0.045	0.034	0.021	0.099	0.041
VERAGE DAILY HEAD ON TOP OF LAYER 12	0.002	0.006	0.012	0.019	0.024	0.027
	0.029	0.035	0.042	0.051	0.062	0.067
TD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.001	0.001	0.002	0.002	0.001	0.001
	0.001	0.003	0.002	0.003	0.004	0.000
VERAGE DAILY HEAD ON TOP OF LAYER 14	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
TD. DEVIATION OF DAILY EAD ON TOP OF LAYER 14	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.00

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.599	5803.792	5.25
EVAPOTRANSPIRATION	25.494	92543.281	83.72
DRAINAGE COLLECTED FROM LAYER 9	3.1085	11283.858	10.21
PERC./LEAKAGE THROUGH LAYER 10	0.000510	1.850	0.00
AVG. HEAD ON TOP OF LAYER 10	0.4260		
PERC./LEAKAGE THROUGH LAYER 12	0.000309	1.123	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0315		
SUBSURFACE INFLOW INTO LAYER 15	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 13	0.0551	199.987	0.18
PERC./LEAKAGE THROUGH LAYER 15	0.000000	0.000	0.00
VG. HEAD ON TOP OF LAYER 14	0.0001		
CHANGE IN WATER STORAGE	0.248	901.740	0.82
SOIL WATER AT START OF YEAR	468.119	1699270.250	
SOIL WATER AT END OF YEAR	468.367	1700172.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-0.203	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54

	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00

RUNOFF

TOTALS	0.022	0.055	0.639	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.375	0.307	0.671	3.715	2.311	4.988
	2.896	4.109	1.970	2.375	1.154	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

LATERAL DRAINAGE COLLECTED FROM LAYER 9

TOTALS	0.2162	0.2239	0.2717	0.2600	0.2408	0.1930
	0.1995	0.3116	0.2962	0.3550	0.3653	0.1753
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0000	0.0001	0.0001	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 12

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 15

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 13

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000

PERCOLATION/LEAKAGE THROUGH LAYER 15

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TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.3486	0.3998	0.4381	0.4333	0.3884	0.3216
	0.3217	0.5026	0.4937	0.5726	0.6088	0.2828
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

DAILY AVERAGE HEAD ON TOP OF LAYER 12

AVERAGES	0.0018	0.0062	0.0122	0.0189	0.0241	0.0272
	0.0292	0.0349	0.0421	0.0511	0.0625	0.0674
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

DAILY AVERAGE HEAD ON TOP OF LAYER 14

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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 1 THROUGH 1

	INCHES		CU. FEET	PERCENT
PRECIPITATION	30.45	(0.000)	110533.5	100.00
RUNOFF	1.599	(0.0000)	5803.79	5.251
EVAPOTRANSPIRATION	25.494	(0.0000)	92543.28	83.724
LATERAL DRAINAGE COLLECTED FROM LAYER 9	3.10850	(0.00000)	11283.858	10.20854
ERCOLATION/LEAKAGE THROUGH LAYER 10	0.00051	(0.00000)	1.850	0.00167
AVERAGE HEAD ON TOP OF LAYER 10	0.426	(0.000)		

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PERCOLATION/LEAKAGE THROUGH LAYER 12	0.00031 (0.00000)	1.123	0.00102
ERAGE HEAD ON TOP OF LAYER 12	0.031 (0.000)		
SUBSURFACE INFLOW INTO LAYER 15	0.05480	198.924	0.17997
LATERAL DRAINAGE COLLECTED FROM LAYER 13	0.05509 (0.00000)	199.987	0.18093
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.00000 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 14	0.000 (0.000)		
CHANGE IN WATER STORAGE	0.248 (0.0000)	901.74	0.816

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.529	1921.1997
DRAINAGE COLLECTED FROM LAYER 9	0.01422	51.61040
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000002	0.00868
AVERAGE HEAD ON TOP OF LAYER 10	0.711	
MAXIMUM HEAD ON TOP OF LAYER 10	1.298	
LOCATION OF MAXIMUM HEAD IN LAYER 9 (DISTANCE FROM DRAIN)	14.7 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000001	0.00349
AVERAGE HEAD ON TOP OF LAYER 12	0.068	
DRAINAGE COLLECTED FROM LAYER 13	0.00015	0.54849
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 14	0.000	
MAXIMUM HEAD ON TOP OF LAYER 14	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 13 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3768
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1796

*** 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 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5699	0.3808
2	69.2579	0.2886
3	68.1600	0.2840
4	69.4261	0.2893
5	68.2366	0.2843
6	69.1071	0.2879
7	68.9788	0.2874
8	34.0896	0.2841
9	0.6375	0.0531
10	0.0000	0.0000
11	0.1766	0.7478
12	0.0000	0.0000
13	0.0021	0.0105
14	0.0000	0.0000
15	15.3720	0.4270
SNOW WATER	0.000	

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EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 7

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**                                                                  **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE            **
**            HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)            **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY               **
**                USAE WATERWAYS EXPERIMENT STATION                 **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY         **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\SOIL_IL7.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CLIN_IL7.OUT

TIME:  15:26     DATE:   1/ 6/2009

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     TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 7)

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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  11
       THICKNESS                      =     12.00   INCHES
       POROSITY                       =      0.4640 VOL/VOL
       FIELD CAPACITY                 =      0.3100 VOL/VOL
       WILTING POINT                  =      0.1870 VOL/VOL
       INITIAL SOIL WATER CONTENT     =      0.3100 VOL/VOL
       EFFECTIVE SAT. HYD. COND.      =  0.639999998000E-04 CM/SEC
     NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
              FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2600	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2886	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2893	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

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LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2843	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2879	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2874	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2841	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

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LAYER 10

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	=	0.0531	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 11

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 12

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7474	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

LAYER 13

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL

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INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 14

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 15

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 16

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

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GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	89.10	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.240	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.570	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.514	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	498.360	INCHES
TOTAL INITIAL WATER	=	498.360	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60

73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
RUNOFF	0.022	0.055	0.637	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
EVAPOTRANSPIRATION	0.375	0.307	0.671	3.715	2.311	4.984
	2.897	4.109	1.970	2.375	1.154	0.624
LATERAL DRAINAGE COLLECTED	0.1592	0.1507	0.1821	0.1806	0.1749	0.2165
FROM LAYER 10	0.1705	0.1433	0.0695	0.1047	0.1455	0.3319
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
LAYER 16	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
FROM LAYER 14	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.257	0.269	0.294	0.301	0.282	0.359
TOP OF LAYER 11	0.275	0.231	0.116	0.169	0.242	0.53
STD. DEVIATION OF DAILY	0.014	0.026	0.014	0.012	0.020	0.057
HEAD ON TOP OF LAYER 11	0.009	0.054	0.013	0.033	0.072	0.047

AVERAGE DAILY HEAD ON TOP OF LAYER 13	0.031 0.038	0.031 0.038	0.032 0.035	0.033 0.030	0.034 0.028	0.037 0.033
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 13	0.000 0.000	0.000 0.000	0.000 0.001	0.000 0.001	0.000 0.000	0.001 0.003
AVERAGE DAILY HEAD ON TOP OF LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.596	5795.011	5.24
EVAPOTRANSPIRATION	25.492	92537.344	83.72
DRAINAGE COLLECTED FROM LAYER 10	2.0284	7363.048	6.66
PERC./LEAKAGE THROUGH LAYER 11	0.000331	1.203	0.00
AVG. HEAD ON TOP OF LAYER 11	0.2775		
PERC./LEAKAGE THROUGH LAYER 13	0.000312	1.131	0.00
AVG. HEAD ON TOP OF LAYER 13	0.0334		
SUBSURFACE INFLOW INTO LAYER 16	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 14	0.0551	199.995	0.18
PERC./LEAKAGE THROUGH LAYER 16	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 15	0.0001		
CHANGE IN WATER STORAGE	1.332	4836.824	4.38
SOIL WATER AT START OF YEAR	498.713	1810327.620	
SOIL WATER AT END OF YEAR	500.045	1815164.500	
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	0.0001	0.236	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.022	0.055	0.637	0.049	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.168
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.375	0.307	0.671	3.715	2.311	4.984
	2.897	4.109	1.970	2.375	1.154	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 10						
TOTALS	0.1592	0.1507	0.1821	0.1806	0.1749	0.2155
	0.1705	0.1433	0.0695	0.1047	0.1455	0.3319
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 11						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 13						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
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

SUBSURFACE INFLOW INTO LAYER 16

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 14

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 16

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 11

AVERAGES	0.2568	0.2691	0.2937	0.3010	0.2821	0.3592
	0.2749	0.2311	0.1159	0.1688	0.2425	0.5352
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

DAILY AVERAGE HEAD ON TOP OF LAYER 13

AVERAGES	0.0314	0.0314	0.0323	0.0333	0.0342	0.0366
	0.0379	0.0379	0.0345	0.0304	0.0284	0.0330
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

DAILY AVERAGE HEAD ON TOP OF LAYER 15

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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 1 THROUGH 1

	INCHES	CU. FEET	PERCENT

PRECIPITATION	30.45 (0.000)	110533.5	100.00
RUNOFF	1.596 (0.0000)	5795.01	5.243
EVAPOTRANSPIRATION	25.492 (0.0000)	92537.34	83.719
LATERAL DRAINAGE COLLECTED FROM LAYER 10	2.02839 (0.00000)	7363.048	6.66137
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00033 (0.00000)	1.203	0.00109
AVERAGE HEAD ON TOP OF LAYER 11	0.278 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.00031 (0.00000)	1.131	0.00102
AVERAGE HEAD ON TOP OF LAYER 13	0.033 (0.000)		
SUBSURFACE INFLOW INTO LAYER 16	0.05480	198.924	0.17997
LATERAL DRAINAGE COLLECTED FROM LAYER 14	0.05510 (0.00000)	199.995	0.18094
PERCOLATION/LEAKAGE THROUGH LAYER 16	0.00000 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 15	0.000 (0.000)		
CHANGE IN WATER STORAGE	1.332 (0.0000)	4836.82	4.376

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.528	1918.4374
DRAINAGE COLLECTED FROM LAYER 10	0.01163	42.20994
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000002	0.00699
AVERAGE HEAD ON TOP OF LAYER 11	0.581	
MAXIMUM HEAD ON TOP OF LAYER 11	1.074	
LOCATION OF MAXIMUM HEAD IN LAYER 10 (DISTANCE FROM DRAIN)	12.9 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.000001	0.00315
AVERAGE HEAD ON TOP OF LAYER 13	0.038	
DRAINAGE COLLECTED FROM LAYER 14	0.00015	0.54815
PERCOLATION/LEAKAGE THROUGH LAYER 16	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 15	0.000	
MAXIMUM HEAD ON TOP OF LAYER 15	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 14 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3732
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1796

*** 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 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5699	0.3808
2	33.7113	0.2809
3	68.1600	0.2840
4	68.1600	0.2840
5	68.1600	0.2840
6	68.1600	0.2840
7	69.2101	0.2884
8	68.4158	0.2851
9	34.8397	0.2903
10	0.7549	0.0629
11	0.0000	0.0000
12	0.1766	0.7475
13	0.0000	0.0000
14	0.0021	0.0105
15	0.0000	0.0000
16	15.3720	0.4270
SNOW WATER	0.000	

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EXHIBIT 8 (CONTINUED)
'HELP' MODEL RESULTS
INTERMEDIATE COVER - LIFT 8

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**                                                                  **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE            **
**            HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)            **
**            DEVELOPED BY ENVIRONMENTAL LABORATORY                 **
**              USAE WATERWAYS EXPERIMENT STATION                   **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY         **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_IC.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\SOIL_IL8.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CLIN_IL8.OUT


TIME:  15:32     DATE:   1/ 6/2009


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     TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (INTERMED.COVER LIFT 8)

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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  11
       THICKNESS                      =      12.00   INCHES
       POROSITY                       =       0.4640 VOL/VOL
       FIELD CAPACITY                 =       0.3100 VOL/VOL
       WILTING POINT                  =       0.1870 VOL/VOL
       INITIAL SOIL WATER CONTENT     =       0.3100 VOL/VOL
       EFFECTIVE SAT. HYD. COND.      =  0.639999998000E-04 CM/SEC
     NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
            FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

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	=	0.2000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4640	VOL/VOL
FIELD CAPACITY	=	0.3100	VOL/VOL
WILTING POINT	=	0.1870	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3808	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2809	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

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LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	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.	=	0.190000006000E-03	CM/SEC

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2884	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

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LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2851	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 11

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	120.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2903	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 12

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	=	0.0629	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 13

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE

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FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 14

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7472	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

LAYER 15

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 16

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 17

TYPE 4 - FLEXIBLE MEMBRANE LINER

US EPA ARCHIVE DOCUMENT

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 18

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	89.10	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.120	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.910	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.398	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	529.819	INCHES
TOTAL INITIAL WATER	=	529.819	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	117

US EPA ARCHIVE DOCUMENT

END OF GROWING SEASON (JULIAN DATE)	=	290
EVAPORATIVE ZONE DEPTH	=	14.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
RUNOFF	0.022	0.054	0.634	0.047	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.16
EVAPOTRANSPIRATION	0.375	0.307	0.671	3.714	2.311	4.937
	2.911	4.105	1.968	2.372	1.153	0.624

LATERAL DRAINAGE COLLECTED FROM LAYER 12	0.3037	0.2513	0.2977	0.3761	0.2741	0.1458
	0.1084	0.1084	0.1047	0.3192	0.3635	0.0936
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUBSURFACE INFLOW INTO LAYER 18	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
LATERAL DRAINAGE COLLECTED FROM LAYER 16	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
PERCOLATION/LEAKAGE THROUGH LAYER 18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 13	0.490	0.449	0.480	0.627	0.442	0.243
	0.175	0.175	0.174	0.515	0.606	0.151
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 13	0.052	0.038	0.071	0.030	0.074	0.039
	0.017	0.019	0.040	0.109	0.154	0.073
AVERAGE DAILY HEAD ON TOP OF LAYER 15	0.020	0.027	0.033	0.043	0.053	0.055
	0.052	0.048	0.045	0.047	0.059	0.061
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 15	0.002	0.002	0.002	0.004	0.002	0.000
	0.001	0.001	0.001	0.003	0.004	0.001
AVERAGE DAILY HEAD ON TOP OF LAYER 17	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 17	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	110533.531	100.00
RUNOFF	1.587	5760.961	5.21
EVAPOTRANSPIRATION	25.449	92379.047	83.58
DRAINAGE COLLECTED FROM LAYER 12	2.7465	9969.761	9.02

PERC./LEAKAGE THROUGH LAYER 13	0.000453	1.645	0.00
AVG. HEAD ON TOP OF LAYER 13	0.3772		
PERC./LEAKAGE THROUGH LAYER 15	0.000325	1.180	0.00
AVG. HEAD ON TOP OF LAYER 15	0.0453		
SUBSURFACE INFLOW INTO LAYER 18	0.054800	198.924	0.18
DRAINAGE COLLECTED FROM LAYER 16	0.0551	200.044	0.18
PERC./LEAKAGE THROUGH LAYER 18	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 17	0.0001		
CHANGE IN WATER STORAGE	0.667	2422.290	2.19
SOIL WATER AT START OF YEAR	530.172	1924524.370	
SOIL WATER AT END OF YEAR	530.839	1926946.620	
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	0.0001	0.355	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.66	0.58	2.21	3.11	1.87	4.54
	3.84	3.56	3.15	2.02	2.10	2.81
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF						
TOTALS	0.022	0.054	0.634	0.047	0.000	0.009
	0.064	0.309	0.283	0.001	0.000	0.164
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						

TOTALS	0.375	0.307	0.671	3.714	2.311	4.937
	2.911	4.105	1.968	2.372	1.153	0.624
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

LATERAL DRAINAGE COLLECTED FROM LAYER 12

TOTALS	0.3037	0.2513	0.2977	0.3761	0.2741	0.1458
	0.1084	0.1084	0.1047	0.3192	0.3635	0.0936
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 13

TOTALS	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 15

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 18

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047

LATERAL DRAINAGE COLLECTED FROM LAYER 16

TOTALS	0.0047	0.0042	0.0047	0.0045	0.0047	0.0045
	0.0047	0.0047	0.0045	0.0047	0.0045	0.0047
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 18

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 13

AVERAGES	0.4899	0.4487	0.4802	0.6268	0.4422	0.2430

	0.1748	0.1748	0.1745	0.5148	0.6059	0.1509
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

DAILY AVERAGE HEAD ON TOP OF LAYER 15

AVERAGES	0.0204	0.0268	0.0330	0.0434	0.0529	0.0547
	0.0521	0.0484	0.0452	0.0468	0.0588	0.0613
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

DAILY AVERAGE HEAD ON TOP OF LAYER 17

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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 1 THROUGH 1

	INCHES		CU. FEET	PERCEN
PRECIPITATION	30.45	(0.000)	110533.5	100.00
RUNOFF	1.587	(0.0000)	5760.96	5.212
EVAPOTRANSPIRATION	25.449	(0.0000)	92379.05	83.576
LATERAL DRAINAGE COLLECTED FROM LAYER 12	2.74649	(0.00000)	9969.761	9.01967
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.00045	(0.00000)	1.645	0.00149
AVERAGE HEAD ON TOP OF LAYER 13	0.377	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.00033	(0.00000)	1.180	0.00107
AVERAGE HEAD ON TOP OF LAYER 15	0.045	(0.000)		
SUBSURFACE INFLOW INTO LAYER 18	0.05480		198.924	0.17997
TERAL DRAINAGE COLLECTED FROM LAYER 16	0.05511	(0.00000)	200.044	0.18098
PERCOLATION/LEAKAGE THROUGH LAYER 18	0.00000	(0.00000)	0.000	0.00000

AVERAGE HEAD ON TOP OF LAYER 17	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.667	(0.0000)	2422.29	2.191

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1

	(INCHES)	(CU. FT.)
PRECIPITATION	1.81	6570.300
RUNOFF	0.527	1913.6677
DRAINAGE COLLECTED FROM LAYER 12	0.01540	55.90450
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.000003	0.00948
AVERAGE HEAD ON TOP OF LAYER 13	0.770	
MAXIMUM HEAD ON TOP OF LAYER 13	1.399	
LOCATION OF MAXIMUM HEAD IN LAYER 12 (DISTANCE FROM DRAIN)	15.5 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000001	0.00343
AVERAGE HEAD ON TOP OF LAYER 15	0.063	
DRAINAGE COLLECTED FROM LAYER 16	0.00015	0.54843
PERCOLATION/LEAKAGE THROUGH LAYER 18	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 17	0.000	
MAXIMUM HEAD ON TOP OF LAYER 17	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 16 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.84	3034.7012

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3672
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1713

*** 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 1

LAYER	(INCHES)	(VOL/VOL)
1	4.5594	0.3799
2	28.9748	0.2195
3	3.7200	0.3100
4	34.0800	0.2840
5	68.1600	0.2840
6	68.1600	0.2840
7	68.1600	0.2840
8	68.1600	0.2840
9	68.1600	0.2840
10	68.1600	0.2840
11	34.0800	0.2840
12	0.5615	0.0468
13	0.0000	0.0000
14	0.1766	0.7477
15	0.0000	0.0000
16	0.0021	0.0105
17	0.0000	0.0000
18	15.3720	0.4270
SNOW WATER	0.000	

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EXHIBIT 9
'HELP' MODEL RESULTS
POST CLOSURE PERIOD YEARS 1 - 30
WITH LEACHATE COLLECTION AND REMOVAL

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)        **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY      **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\clinton\EVAP_C.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\clinton\CL_30.D10
OUTPUT DATA FILE:            C:\HELP3\clinton\CL_30.OUT

TIME:  15:49     DATE:   1/ 6/2009

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     TITLE:  CLINTON LF. NO.3 CHEMICAL WASTE UNIT (CLOSURE 30 YRS/LCS)

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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   8
          THICKNESS                      =     12.00   INCHES
          POROSITY                       =      0.4630 VOL/VOL
          FIELD CAPACITY                 =      0.2320 VOL/VOL
          WILTING POINT                  =      0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT     =      0.3195 VOL/VOL
          EFFECTIVE SAT. HYD. COND.      =  0.369999994000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  4.90
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

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	=	0.3128	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0169	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	25.00	PERCENT
DRAINAGE LENGTH	=	875.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

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.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 5

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL

US EPA ARCHIVE DOCUMENT

INITIAL SOIL WATER CONTENT	=	0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05 CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	12.00 INCHES
POROSITY	=	0.4640 VOL/VOL
FIELD CAPACITY	=	0.3100 VOL/VOL
WILTING POINT	=	0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04 CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	133.20 INCHES
POROSITY	=	0.6710 VOL/VOL
FIELD CAPACITY	=	0.2920 VOL/VOL
WILTING POINT	=	0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2195 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	12.00 INCHES
POROSITY	=	0.4640 VOL/VOL
FIELD CAPACITY	=	0.3100 VOL/VOL
WILTING POINT	=	0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04 CM/SEC

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	1680.00 INCHES
POROSITY	=	0.5010 VOL/VOL
FIELD CAPACITY	=	0.2840 VOL/VOL
WILTING POINT	=	0.1350 VOL/VOL

US EPA ARCHIVE DOCUMENT

INITIAL SOIL WATER CONTENT	=	0.2840	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 10

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	=	0.0468	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.299999993000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 11

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 12

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7473	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

LAYER 13

TYPE 4 - FLEXIBLE MEMBRANE LINER

US EPA ARCHIVE DOCUMENT

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 14

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0104	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	170.0	FEET

LAYER 15

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 16

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

US EPA ARCHIVE DOCUMENT

SUBSURFACE INFLOW = 0.05 INCHES/YR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 25.% AND A SLOPE LENGTH OF 875. FEET.

SCS RUNOFF CURVE NUMBER	=	72.60	
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	=	6.336	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.564	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.472	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	546.378	INCHES
TOTAL INITIAL WATER	=	546.378	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

US EPA ARCHIVE DOCUMENT

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.47	1.46	2.39	3.26	3.34	4.22
	3.43	3.42	3.11	2.19	2.10	2.22
STD. DEVIATIONS	0.68	0.71	1.18	1.52	1.65	2.14
	1.83	1.76	1.76	1.22	1.06	0.97
RUNOFF						
TOTALS	0.126	0.594	1.353	0.190	0.004	0.018
	0.014	0.009	0.003	0.000	0.000	0.077
STD. DEVIATIONS	0.279	0.549	1.241	0.405	0.019	0.074
	0.051	0.027	0.017	0.001	0.001	0.163
EVAPOTRANSPIRATION						
TOTALS	0.544	0.466	0.830	2.962	3.907	4.485
	3.486	3.229	2.405	1.280	0.939	0.599
STD. DEVIATIONS	0.111	0.081	0.434	0.685	0.975	1.483
	1.706	1.610	1.088	0.311	0.216	0.157
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.1085	0.0020	0.7397	1.9581	0.7207	0.1512
	0.1956	0.0293	0.0571	0.1684	0.4731	0.5886
STD. DEVIATIONS	0.2244	0.0108	0.8080	0.9929	0.7783	0.2619
	0.6244	0.0818	0.1591	0.4074	0.8362	0.5800

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0000	0.0000	0.0001	0.0002	0.0001	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000
	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001

LATERAL DRAINAGE COLLECTED FROM LAYER 10

TOTALS	0.0006	0.0001	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0032	0.0006	0.0001	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 11

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 13

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.00
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 16

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 14

TOTALS	0.0042	0.0039	0.0042	0.0041	0.0042	0.0041
	0.0042	0.0042	0.0041	0.0042	0.0041	0.0042
STD. DEVIATIONS	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 16

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0002	0.0000	0.0016	0.0043	0.0015	0.0003
	0.0004	0.0001	0.0001	0.0004	0.0010	0.0012
STD. DEVIATIONS	0.0005	0.0000	0.0017	0.0022	0.0016	0.0006
	0.0013	0.0002	0.0003	0.0009	0.0018	0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 11

AVERAGES	0.0009	0.0002	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0052	0.0010	0.0002	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

DAILY AVERAGE HEAD ON TOP OF LAYER 13

AVERAGES	0.0007	0.0004	0.0002	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0037	0.0023	0.0010	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

DAILY AVERAGE HEAD ON TOP OF LAYER 15

AVERAGES	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
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 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	32.60	(5.565)	118325.9	100.00
RUNOFF	2.389	(1.4447)	8670.79	7.328
EVAPOTRANSPIRATION	25.130	(4.0771)	91223.05	77.095
LATERAL DRAINAGE COLLECTED FROM LAYER 3	5.19245	(1.77084)	18848.602	15.92940
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00058	(0.00019)	2.109	0.00178
AVERAGE HEAD ON TOP OF LAYER 4	0.001	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 10	0.00072	(0.00394)	2.613	0.00221
PERCOLATION/LEAKAGE THROUGH	0.00000	(0.00000)	0.001	0.00000

LAYER 11

AVERAGE HEAD ON TOP OF LAYER 11	0.000 (0.001)		
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.00000 (0.00001)	0.009	0.00001
AVERAGE HEAD ON TOP OF LAYER 13	0.000 (0.001)		
SUBSURFACE INFLOW INTO LAYER 16	0.00000	0.000	0.00000
LATERAL DRAINAGE COLLECTED FROM LAYER 14	0.05003 (0.00005)	181.625	0.15350
PERCOLATION/LEAKAGE THROUGH LAYER 16	0.00000 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 15	0.000 (0.000)		
CHANGE IN WATER STORAGE	-0.115 (1.3434)	-419.16	-0.354

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	4.09	14846.700
RUNOFF	1.478	5366.9531
DRAINAGE COLLECTED FROM LAYER 3	0.64153	2328.76001
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000058	0.21053
AVERAGE HEAD ON TOP OF LAYER 4	0.042	
MAXIMUM HEAD ON TOP OF LAYER 4	0.186	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 10	0.00114	4.13145
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000000	0.00073
AVERAGE HEAD ON TOP OF LAYER 11	0.057	
MAXIMUM HEAD ON TOP OF LAYER 11	0.112	
LOCATION OF MAXIMUM HEAD IN LAYER 10 (DISTANCE FROM DRAIN)	2.4 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.000001	0.00299
AVERAGE HEAD ON TOP OF LAYER 13	0.024	
DRAINAGE COLLECTED FROM LAYER 14	0.00014	0.50024
PERCOLATION/LEAKAGE THROUGH LAYER 16	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 15	0.000	
MAXIMUM HEAD ON TOP OF LAYER 15	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 14 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	4.86	17645.5430

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4284
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1236

*** 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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US EPA ARCHIVE DOCUMENT

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	1.8238	0.1520
2	5.7423	0.2393
3	0.0020	0.0100
4	0.0000	0.0000
5	5.1240	0.4270
6	3.3810	0.2818
7	29.5938	0.2222
8	3.7200	0.3100
9	477.1200	0.2840
10	0.5400	0.0450
11	0.0000	0.0000
12	0.1764	0.7470
13	0.0000	0.0000
14	0.0021	0.0104
15	0.0000	0.0000
16	15.3720	0.4270
SNOW WATER	0.316	

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EXHIBIT 10
'HELP' MODEL RESULTS
POST CLOSURE PERIOD YEARS 31 - 131
WITH NO LEACHATE COLLECTION AND REMOVAL

US EPA ARCHIVE DOCUMENT

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**                                                                  **
**                                                                  **
**                HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE      **
**                  HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)      **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY           **
**                    USAE WATERWAYS EXPERIMENT STATION             **
**               FOR USEPA RISK REDUCTION ENGINEERING LABORATORY     **
**                                                                  **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE: C:\HELP3\clinton\PRECIP.D4
TEMPERATURE DATA FILE: C:\HELP3\clinton\TEMP.D7
SOLAR RADIATION DATA FILE: C:\HELP3\clinton\SOLAR.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\clinton\EVAP_C.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\clinton\CL_100.D10
OUTPUT DATA FILE: C:\HELP3\clinton\CL_100.OUT

TIME: 16: 7 DATE: 1/ 6/2009

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TITLE: CLINTON LF. NO.3 CHEMICAL WASTE UNIT (CLOSURE 31-131 YRS)

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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 8

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4630	VOL/VOL
FIELD CAPACITY	=	0.2320	VOL/VOL
WILTING POINT	=	0.1160	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1520	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.369999994000E-03	CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.90 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

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	=	0.2393	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	25.00	PERCENT
DRAINAGE LENGTH	=	875.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

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.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 5

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL

US EPA ARCHIVE DOCUMENT

INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4640	VOL/VOL
FIELD CAPACITY	=	0.3100	VOL/VOL
WILTING POINT	=	0.1870	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2818	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	133.20	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2222	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4640	VOL/VOL
FIELD CAPACITY	=	0.3100	VOL/VOL
WILTING POINT	=	0.1870	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04	CM/SEC

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	1680.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL

US EPA ARCHIVE DOCUMENT

INITIAL SOIL WATER CONTENT	=	0.2840 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03 CM/SEC

LAYER 10

TYPE 1 - VERTICAL PERCOLATION 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.	=	0.299999993000E-01 CM/SEC

LAYER 11

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR

LAYER 12

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24 INCHES
POROSITY	=	0.7500 VOL/VOL
FIELD CAPACITY	=	0.7470 VOL/VOL
WILTING POINT	=	0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7470 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08 CM/SEC

LAYER 13

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES

US EPA ARCHIVE DOCUMENT

POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	10.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 14

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0103	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.00000000000	CM/SEC

LAYER 15

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 16

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC
SUBSURFACE INFLOW	=	0.05	INCHES/YR

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 25.% = 14° AND A SLOPE LENGTH OF 875. FEET.

SCS RUNOFF CURVE NUMBER	=	72.60	
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	=	3.738	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.564	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.472	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	542.602	INCHES
TOTAL INITIAL WATER	=	542.602	INCHES
TOTAL SUBSURFACE INFLOW	=	0.05	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lincoln Illinois

STATION LATITUDE	=	40.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 40.10 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.51	1.36	2.62	3.62	3.12	4.39
	4.02	3.61	3.26	2.35	2.23	2.07
STD. DEVIATIONS	0.65	0.69	1.12	1.58	1.43	2.05
	1.99	1.85	1.76	1.34	1.21	1.03
RUNOFF						
TOTALS	0.136	0.507	1.484	0.460	0.001	0.017
	0.019	0.018	0.003	0.002	0.001	0.135
STD. DEVIATIONS	0.338	0.515	1.308	0.874	0.011	0.061
	0.065	0.083	0.013	0.010	0.005	0.364
EVAPOTRANSPIRATION						
TOTALS	0.538	0.450	0.763	2.909	3.753	4.674
	3.970	3.515	2.359	1.287	0.898	0.583
STD. DEVIATIONS	0.116	0.103	0.452	0.764	1.016	1.384
	1.616	1.545	0.983	0.256	0.197	0.162
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.1182	0.0006	0.6173	2.0618	0.7700	0.1978
	0.1551	0.1040	0.1248	0.2859	0.5206	0.6607
STD. DEVIATIONS	0.2169	0.0060	0.8605	1.0584	0.6937	0.3782
	0.4434	0.3553	0.4562	0.7458	0.7740	0.7173
ERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0001	0.0002	0.0001	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

STD. DEVIATIONS	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000
	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001

PERCOLATION/LEAKAGE THROUGH LAYER 11

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 13

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

SUBSURFACE INFLOW INTO LAYER 16

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 16

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0003	0.0000	0.0013	0.0045	0.0016	0.0004
	0.0003	0.0002	0.0003	0.0006	0.0011	0.0014
STD. DEVIATIONS	0.0005	0.0000	0.0018	0.0023	0.0015	0.0008
	0.0009	0.0008	0.0010	0.0016	0.0017	0.0015

DAILY AVERAGE HEAD ON TOP OF LAYER 11

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

DAILY AVERAGE HEAD ON TOP OF LAYER 13

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

US EPA ARCHIVE DOCUMENT

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

DAILY AVERAGE HEAD ON TOP OF LAYER 15

AVERAGES	0.1957	0.1959	0.1961	0.1963	0.1964	0.1966
	0.1967	0.1969	0.1970	0.1972	0.1973	0.1975
STD. DEVIATIONS	0.0251	0.0244	0.0236	0.0228	0.0220	0.0212
	0.0204	0.0196	0.0189	0.0181	0.0174	0.0166

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100

	INCHES		CU. FEET	PERCENT
PRECIPITATION	34.15	(5.545)	123948.9	100.00
RUNOFF	2.784	(1.6894)	10105.47	8.153
EVAPOTRANSPIRATION	25.699	(3.5728)	93288.76	75.264
LATERAL DRAINAGE COLLECTED FROM LAYER 3	5.61675	(2.38092)	20388.785	16.44935
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00063	(0.00026)	2.270	0.00183
AVERAGE HEAD ON TOP OF LAYER 4	0.001	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 11	0.000	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 13	0.000	(0.000)		
SUBSURFACE INFLOW INTO LAYER 16	0.00000		0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 16	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 15	0.197	(0.021)		
CHANGE IN WATER STORAGE	0.096	(1.7755)	347.53	0.280

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 100

	(INCHES)	(CU. FT.)
PRECIPITATION	4.64	16843.199
RUNOFF	2.044	7419.4585
DRAINAGE COLLECTED FROM LAYER 3	0.72687	2638.54932
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000063	0.23041
AVERAGE HEAD ON TOP OF LAYER 4	0.048	
MAXIMUM HEAD ON TOP OF LAYER 4	0.105	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 11	0.000	
PERCOLATION/LEAKAGE THROUGH LAYER 13	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 13	0.000	
PERCOLATION/LEAKAGE THROUGH LAYER 16	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 15	0.200	
SNOW WATER	7.00	25420.0430

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4350
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1236

*** 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 100

LAYER	(INCHES)	(VOL/VOL)
1	5.0548	0.4212
2	7.0196	0.2925
3	0.0020	0.0100
4	0.0000	0.0000
5	5.1240	0.4270
6	3.3836	0.2820
7	29.6576	0.2227
8	3.7200	0.3100
9	477.1200	0.2840
10	0.5400	0.0450
11	0.0000	0.0000
12	0.1764	0.7470
13	0.0000	0.0000
14	5.0060	25.0300
15	0.0000	0.0000
16	15.3720	0.4270
SNOW WATER	0.000	

140' tall waste
x .284% W.C. V/V
x 12"/ft
477.12"
exactly

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