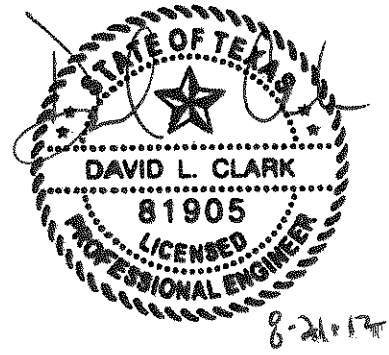
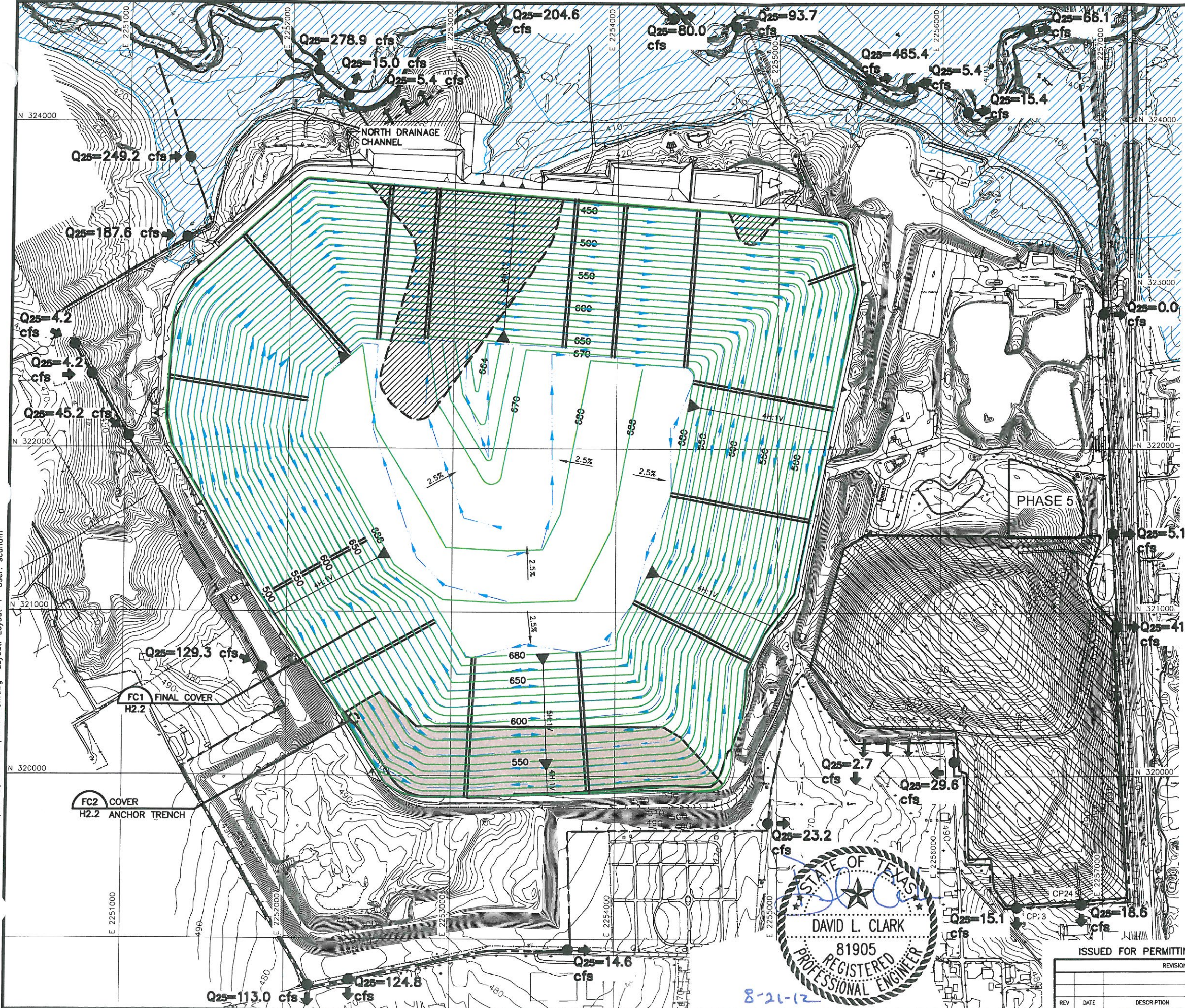


**SKYLINE LANDFILL**  
**APPENDIX H2**  
**FINAL COVER SYSTEM DETAILS**



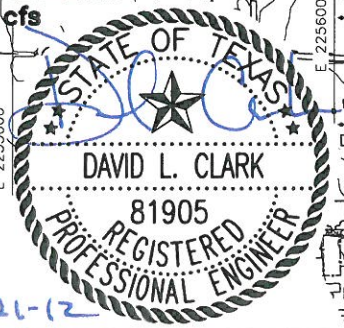


J:\101\01\12\ATT H\H2.1-CompletionPlan.dwg Layout: Layout 1 User: scundiff



- LEGEND**
- PERMIT BOUNDARY
  - LANDFILL FOOTPRINT
  - 500 EXISTING CONTOUR
  - N 323000 STATE PLANE GRID (NAD 27)
  - 650 PROPOSED FINAL CONTOUR
  - PROPOSED DRAINAGE SWALE
  - AREA WITH SUBTITLE D FINAL COVER
  - PRE-SUBTITLE D AREA WITH FINAL COVER
  - 100-YEAR FLOODPLAIN
  - AREAS TO BE COVERED WITH SUBTITLE D FINAL COVER
  - ↓ ↓ ↓ SHEET FLOW
  - ↓ Q25=22.6 cfs 25 YEAR PEAK FLOW RATE

- NOTES:**
1. EXISTING CONTOURS COMPILED BY AEROMETRIC FROM AERIAL SURVEY FLOWN MARCH 6, 2011. COORDINATE SYSTEM IS BASED ON TEXAS STATE PLANE NAD 27, TEXAS NORTH CENTRAL.
  2. PROPOSED CONTOURS DEPICT TOP OF FINAL COVER.
  3. MAXIMUM FINAL COVER ELEVATION: 688 FT-MSL  
MAXIMUM WASTE FILL ELEVATION: 683.5 FT-MSL



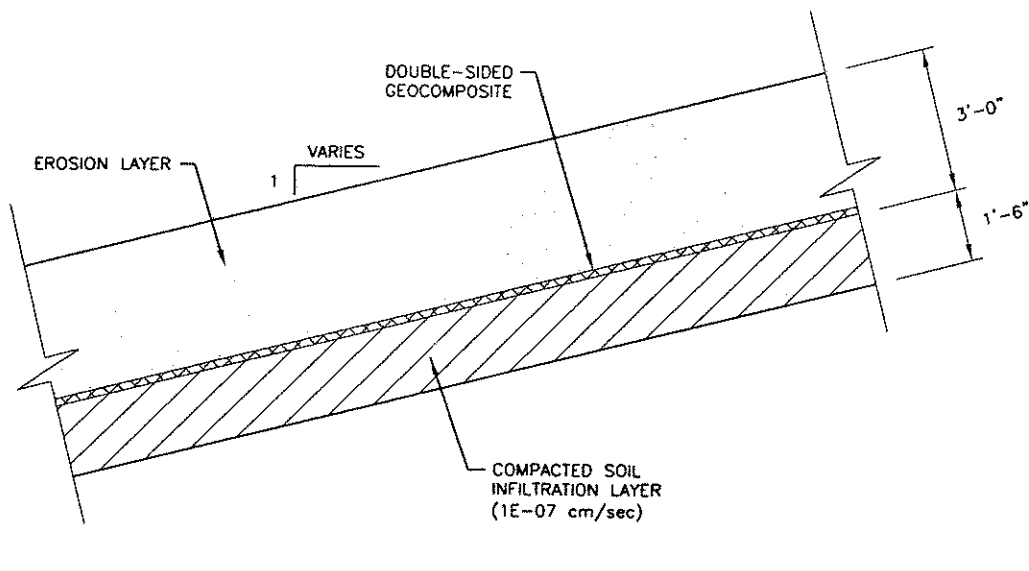
8-21-12

<b>LANDFILL COMPLETION PLAN</b>	
<b>WASTE MANAGEMENT OF TEXAS, INC. SKYLINE LANDFILL MAJOR PERMIT AMENDMENT</b>	
	BIGGS & MATHEWS ENVIRONMENTAL CONSULTING ENGINEERS MANSFIELD • WICHITA FALLS 817-563-1144
ISSUED FOR PERMITTING PURPOSES ONLY	
TBPE FIRM NO. F-256      TBPG FIRM NO. 50222	
DSN. SAB      DATE : 04/12	
DWN. SRC      SCALE : GRAPHIC	
CHK. DLC      DWG : H2.1-CompletionPlan.dwg	
<b>DRAWING H2.1</b>	

REVISIONS						
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

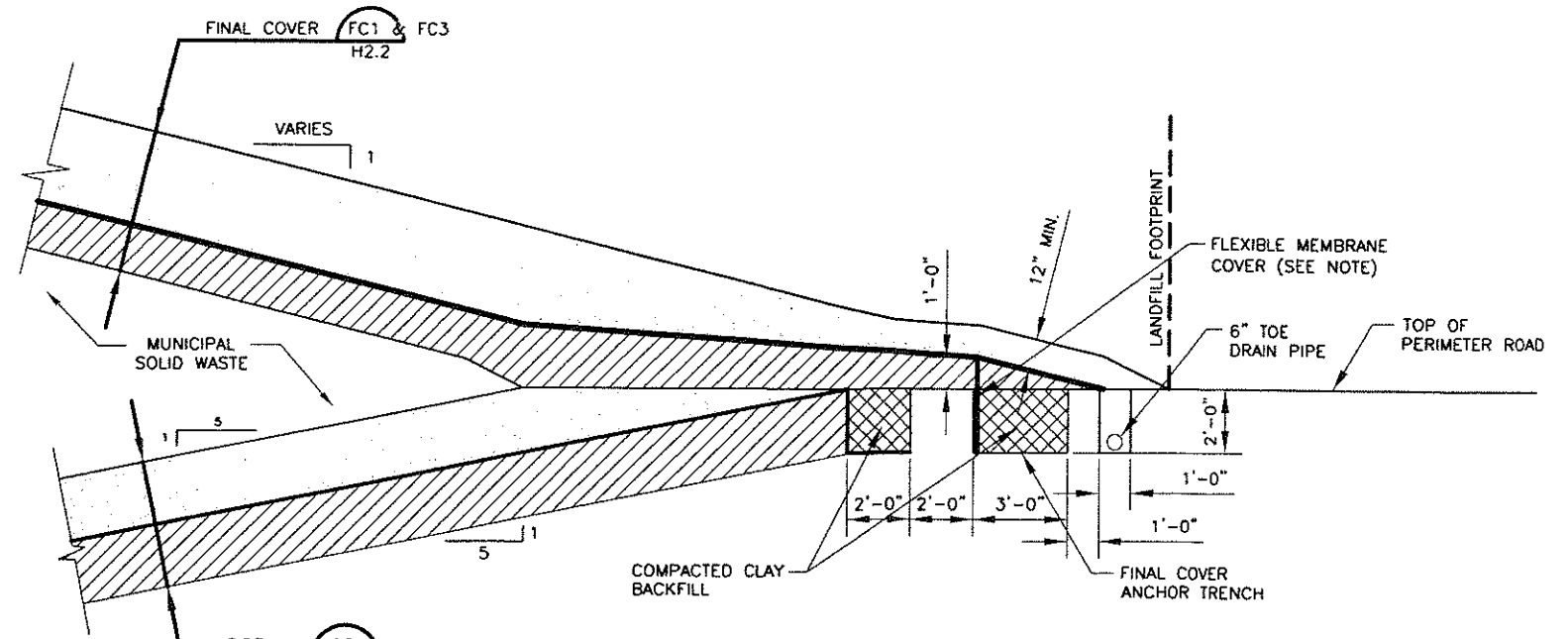


j:\101\01\120\ATT H\H2.2-FCDetails.dwg Layout: D3.10 User: scundiff



**ALTERNATE FINAL COVER** FC1 H2.2

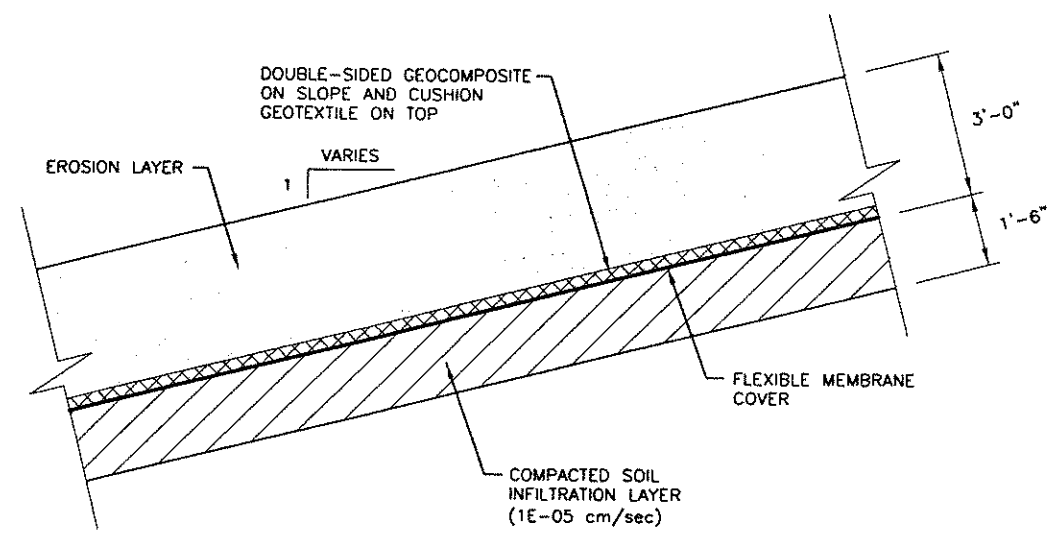
0 2 4  
SCALE IN FEET



**COVER ANCHOR TRENCH** FC2 H2.2

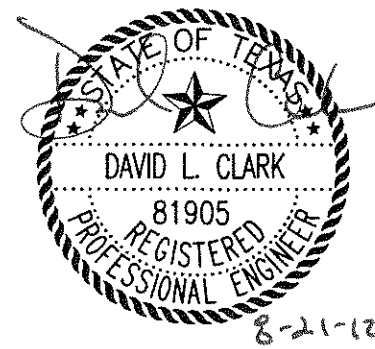
0 3 6  
SCALE IN FEET

**NOTE:** FOR SUBTITLE D FINAL COVER, FLEXIBLE MEMBRANE COVER TO BE TERMINATED IN BOTTOM OF FINAL COVER ANCHOR TRENCH.



**SUBTITLE D FINAL COVER** FC3 H2.2

0 2 4  
SCALE IN FEET



ISSUED FOR PERMITTING PURPOSES ONLY

<b>FINAL COVER DETAILS</b>	
<b>WASTE MANAGEMENT OF TEXAS, INC. SKYLINE LANDFILL MAJOR PERMIT AMENDMENT</b>	
	<b>BIGGS &amp; MATHEWS ENVIRONMENTAL CONSULTING ENGINEERS</b>  MANSFIELD • WICHITA FALLS 817-563-1144

REVISIONS		TBPE FIRM NO. F-256		TBPG FIRM NO. 50222	
1	8/12	NOD NO. 1 RESPONSE	SRC	DLC	DLC
DSN.	SAB	DATE :	04/12		
DWN.	SRC	SCALE :	GRAPHIC		
CHK.	DLC	DWG :	H2.2-FCDetails.dwg		
					<b>DRAWING H2.2</b>

**SKYLINE LANDFILL**

**APPENDIX H3**  
**ALTERNATE FINAL COVER APPROVAL**

Robert J. Huston, *Chairman*  
R. B. "Ralph" Marquez, *Commissioner*  
John M. Baker, *Commissioner*  
Jeffrey A. Saitas, *Executive Director*



## TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

*Protecting Texas by Reducing and Preventing Pollution*

March 21, 2000

Mr. Jack Steele  
Area Manager  
Waste Management  
P.O. Box 141968  
Austin, Texas 78714-1968

Re: Municipal Solid Waste, Dallas and Ellis Counties  
Skyline Landfill and Recycling Center, MSW Permit No. 42-C  
Class I Permit Modification for Alternate Final Cover System  
Tracking Number 1431

Dear Mr. Steele:

Enclosed is a copy of the above-referenced permit modification for a municipal solid waste facility issued pursuant to Chapter 361, Texas Health & Safety Code. The documentation, including the application, prepared and submitted to support the modification request shall be considered a part of this permit and shall be considered as operational requirements of this permit. Please contact Mr. George P. Hartmann, P.E. at (512) 239-3419 if you have any questions concerning this matter.

Sincerely,

A handwritten signature in cursive script that reads "Dorca Zaragoza Stone".

Dorca Zaragoza Stone, Manager  
MSW Permits Section  
Waste Permits Division

DZS/gph

enclosure

cc: Ms. Beth A. Gross, P.E., GeoSyntech Consultants, Austin

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION



MODIFICATION TO

MUNICIPAL SOLID WASTE PERMIT N° MSW 42-C

Waste Management of Texas, Inc. - Skyline Landfill and Recycling Center

Municipal Solid Waste Permit No. MSW 42-C is hereby modified as follows:

Description of Changes: Revision to Final Cover System Design to allow alternate and previously permitted final cover designs.

Permit Sections Revised: Part III, Site Development Plan

This modification is a part of Permit No. MSW 42-C and should be attached thereto.

APPROVED, ISSUED, AND EFFECTIVE in accordance with 30 Texas Administrative Code Section 305.70(i).

ISSUED DATE:

MAR 21 2000

A handwritten signature in black ink, appearing to read "Jeffrey A. Duto".

For the Commission



WASTE MANAGEMENT

P.O. Box 141968  
Austin, Texas 78714-1968  
(512) 272-6225 (office)  
(512) 272-9370 (fax)

December 27, 1999

Ms. Dorca Zaragoza-Stone  
Manager, MSW Permits Section  
Texas Natural Resource Conservation Commission  
P.O. Box 13087 (MC-124)  
Austin, Texas 78711-3087

RE: Municipal Solid Waste - Ferris, Texas  
Skyline Landfill and Recycling Center - Permit No. MSW 42-C  
Request for Class I Permit Modification

Dear Ms. Zaragoza-Stone:

Waste Management of Texas, Inc. (WMTX) hereby requests a Class I permit modification for the referenced facility pursuant to 30 TAC § 305.70 (g)(15). The modification consists of including an alternate final cover system (i.e., either the currently permitted final cover system or the alternate will be used). Attached for your review please find three copies of the permit modification document.

In accordance with the requirements of 30 TAC § 305.44, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions regarding this submittal, please do not hesitate to contact me at (512) 272-6225.

Sincerely,  
Waste Management of Texas, Inc.

A handwritten signature in black ink, appearing to read 'Jack Steele'.

Jack Steele  
Area Manager



27 December 1999

Mr. Jack Steele  
Area Manager  
Waste Management of Texas, Inc.  
9900 Giles Road  
Austin, Texas 78754

Subject: Permit Modification, Permit No. MSW 42-C  
WMTX Skyline Landfill and Recycling Center  
Ferris, Texas

Dear Mr. Steele:

As you requested, GeoSyntec Consultants (GeoSyntec) has prepared a Class I permit modification for the Skyline Landfill and Recycling Center (Skyline Landfill). The permit modification consists of including an alternate final cover system (i.e., either the currently permitted final cover system or the alternate will be used). The alternate final cover system utilizes excess site soils and consists of the following components, from top to bottom:

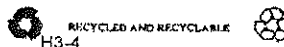
- 3-ft thick (minimum) erosion layer consisting of on-site clay soil;
- geocomposite drainage layer; and
- 18-in. thick soil infiltration layer ( $k \leq 1 \times 10^{-7}$  cm/s).

The upper 6-in. of the erosion layer supports vegetation and has no compaction criteria. It is only required to receive the minimal compaction needed for stability (typically incident to the placement and spreading process). Below the upper 6 in., the erosion layer soil must be compacted with pad-foot or prong-foot rollers to at least 95% of the soil's maximum dry unit weight and at or up to five percentage points greater than the soil's optimum moisture content as determined by ASTM D 698. During construction, field moisture/density tests should be conducted on the erosion layer at a minimum frequency of 1 test per 8,000 ft<sup>2</sup> per lift to verify that these compaction criteria are met.

GT0936-01/TX990029

**Regional Offices:**

Atlanta, GA • Austin, TX • Boca Raton, FL • Chicago, IL  
Columbia, MD • Huntington Beach, CA • Walnut Creek, CA  
Biggs & Mathews Environmental  
M:\PROJ\101\101\120\PART 3 ATT H.PDF



**Laboratories:**

Alpharetta, GA • Atlanta, GA  
Boca Raton, FL

Skyline Landfill  
Rev. 1, 8/17/12  
Part III, Attachment H



Mr. Jack Steele  
27 December 1999  
Page 2

In support of this modification, the following documentation has been prepared:

- A detail of the alternate final cover system is shown on Attachment 7L-a, which is presented in Appendix A to this letter.
- A performance evaluation of the alternative final cover system is presented in Appendix B. The hydraulic performance of the cover system was analyzed using the U.S. Environmental Protection Agency's Hydrologic Evaluation of Landfill Performance (HELP) computer model. The results of the analysis demonstrate that the alternate final cover system should perform better than the prescriptive minimum criteria final cover system defined in 30 TAC § 330.253 (b) and essentially equivalent to the currently permitted final cover system.

If you have any questions regarding the information presented in this permit modification, please do not hesitate to contact me.

Sincerely,

*Beth A. Gross*

Beth A. Gross, P.E.  
Senior Project Engineer

Appendicies



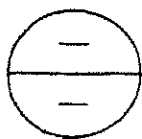
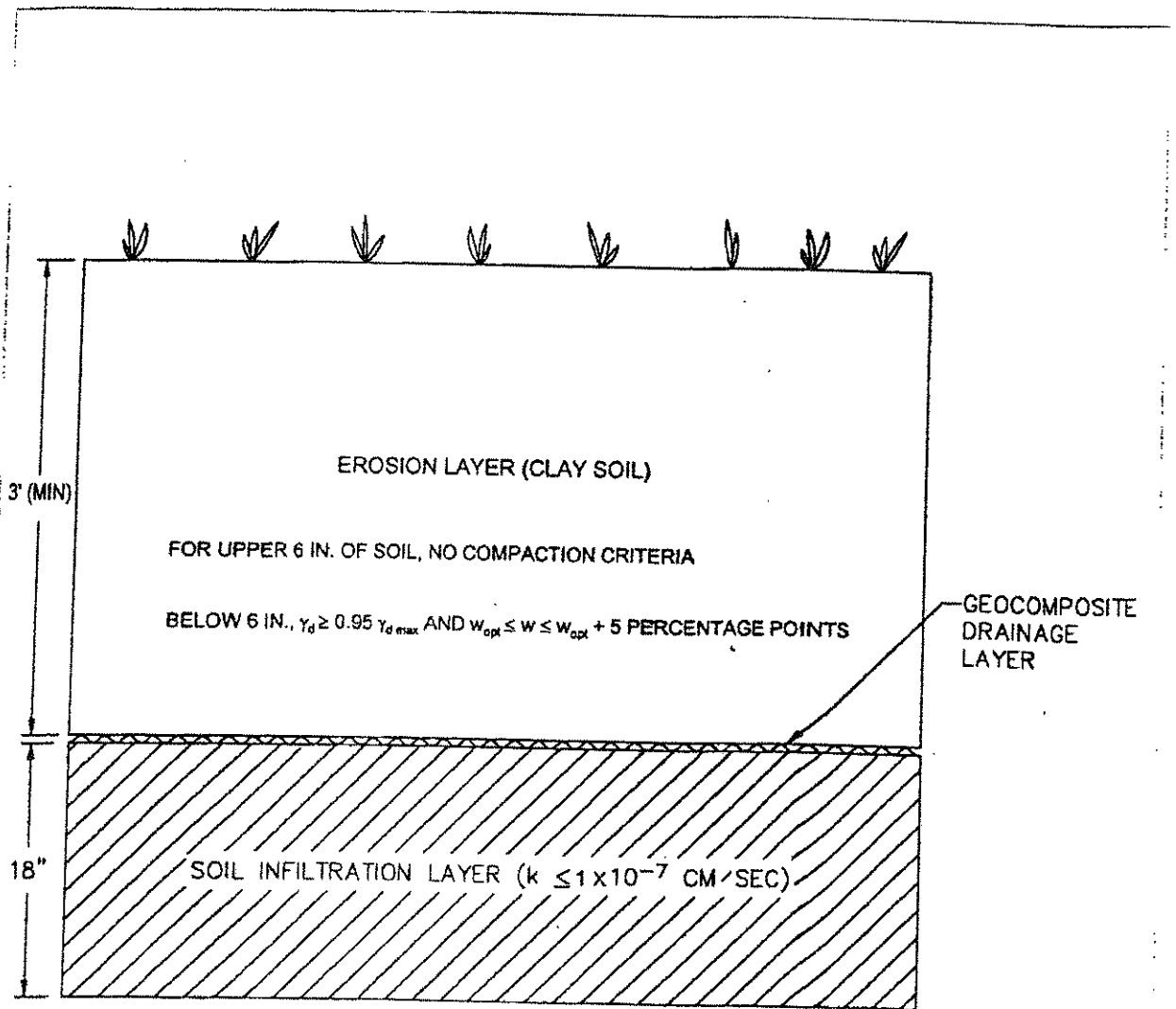
*Beth Ann Gross*

GT0936-01/TX990029



**APPENDIX A**

**ATTACHMENT 7L-a**



DETAIL

ALTERNATE FINAL COVER SYSTEM

SCALE: NTS



**GEOSYNTEC CONSULTANTS**  
AUSTIN, TEXAS

ATTACHMENT NO.	7L-a
PROJECT NO.	GT0936-01
DOCUMENT NO.	TX990029
FILE NO.	0936F001




# APPENDIX B

## ALTERNATE FINAL COVER SYSTEM PERFORMANCE EVALUATION

Written By: M. Christman Date: 10/12/99 Reviewed by: B. Gross Date: 12/21/99

Client: WMTX Project: Skyline Landfill Permit Mod. Project/Proposal No.: GT0936 Task No.: 01

**ALTERNATE FINAL COVER SYSTEM  
PERFORMANCE EVALUATION**

12/27/99  
46 pages  
  
*Beth Ann Gross*

**INTRODUCTION**

The purpose of this calculation package is to assess the performance of the alternate final cover system for the Skyline Landfill and Recycling Center (Skyline Landfill). In accordance with 30 TAC § 330.253 (c), an alternate final cover system for a municipal solid waste landfill (MSWLF) must provide reduction in infiltration and protection from wind and water erosion equivalent to that of the prescriptive minimum criteria final cover system defined in 30 TAC § 330.253 (b). In addition, for the Skyline Landfill, an alternate final cover system must perform equivalently to the currently permitted final cover system.

The prescriptive minimum criteria final cover system (prescriptive cover system) for modern MSWLFs is defined in 30 TAC § 330.253 (b)(1) and (3) to consist of the following components, from top to bottom:

- 6-in. thick soil erosion layer;
- geomembrane barrier; and
- 18-in. thick soil infiltration layer ( $k \leq 1 \times 10^{-5}$  cm/s).

The currently permitted final cover system (permitted cover system) for the Skyline Landfill consists of the following components, from top to bottom:

Written By: M. Christman Date: 10.12.99 Reviewed by: B. Gross Date: 12/21/99Client: WMTX Project: Skyline Landfill Permit Mod. Project/Proposal No.: GT0936 Task No.: 01

- 28-in. thick clayey soil erosion layer;
- geocomposite (i.e., geotextile/geonet/geotextile) drainage layer on sideslopes steeper than 6H:1V;
- polyethylene geomembrane barrier; and
- 18-in. thick soil infiltration layer ( $k \leq 1 \times 10^{-7}$  cm/s).

The proposed alternate final cover system (alternate cover system) consists of the following components, from top to bottom:

- 3-ft thick clayey soil erosion layer;
- geocomposite drainage layer on the top deck and the sideslopes; and
- 18-in. thick soil infiltration layer ( $k \leq 1 \times 10^{-7}$  cm/s).

Like the erosion layer for the permitted cover system, the erosion layer for the alternate cover system will consist of clayey soil vegetated with grass. However, the erosion layer for the alternate cover system is thicker than those for the prescriptive and permitted cover systems. Therefore, the proposed alternate cover system is considered to provide protection from wind and water erosion at least equivalent to that provided by the prescriptive and permitted cover systems.

The ability of the alternate cover system to provide equivalent reduction in infiltration as the prescriptive and permitted cover systems is analyzed below.

### METHOD OF ANALYSIS

The most common method used to evaluate the hydraulic performance of landfill cover systems is the U.S. EPA Hydrologic Evaluation of Landfill Performance (HELP) computer model. The HELP model simulates hydrologic processes for a landfill by performing daily, sequential water budget analyses using a quasi-two-dimensional, deterministic approach (Schroeder et al., 1994a, 1994b). The hydrologic processes considered in the HELP model include precipitation, surface-water storage (i.e., storage as snow), interception of precipitation by foliage, surface-water evaporation, runoff, snow melt, infiltration, plant transpiration, soil water evaporation, soil water storage, vertical drainage (saturated and unsaturated), lateral drainage (saturated), vertical percolation (saturated) through compacted soil liners and geosynthetic clay liners, and leakage through geomembranes.



Written By : M. Christman Date: 10/12/99 Reviewed by: B. Gross Date: 12/21/99  
Client: WMTX Project: Skyline Landfill Permit Mod. Project/Proposal No.: GT0936 Task No.: 01

The HELP model requires the input of daily and general climatic data, material properties data for the landfill components being modeled, and landfill design data. The input data used for the Skyline Landfill site and the considered final cover systems are described below.

Thirty years of climatic data for the Skyline Landfill site were synthetically generated by HELP using default climatic parameters for Dallas, Texas. The average annual precipitation during these thirty years ranged from 16.70 to 39.60 in.

The erosion layer was modeled as a vertical percolation layer with a good stand of grass. The geocomposite drainage layer was modeled as a lateral drainage layer. The geomembrane was modeled as a flexible membrane liner. The soil infiltration layer was modeled as a barrier soil liner. The erosion layer and soil infiltration layer will primarily be constructed of on-site clayey soils. From the results of laboratory tests conducted previously on site soil samples (see Table 1 1-1 in facility permit and the Soil and Liner Evaluation Reports), the site soils are predominantly classified as CH materials and generally have liquid limits in the range of 65 to 90% and plastic indices in the range of 40 to 65%.

The material properties used for the layers were generally taken from the HELP model database and are shown on the attached HELP model output. The material properties of the layers are summarized below:

- Erosion layer: material texture number 10 for upper 6 in. of layer and material texture number 15 for soil below 6 in. depth; evaporative zone depth = erosion layer thickness; default hydraulic conductivity of  $1.7 \times 10^{-5}$  cm/s for the soil below 6 in. depth in the permitted cover and modified hydraulic conductivity of  $1 \times 10^{-6}$  cm/s for the for the soil below 6 in. depth in the alternate cover.
- Geocomposite drainage layer: material texture number 20 with default hydraulic conductivity of 10 cm/s (transmissivity of  $5 \times 10^{-4}$  m<sup>2</sup>/s).
- Geomembrane: material texture number 35 (0.06-in. thick) with one pinhole and two installation defects/acre; good placement quality.

Written By: M. Christman Date: 10/12/99 Reviewed by: B. Gross Date: 12/21/99Client: WMTX Project: Skyline Landfill Permit Mod. Project/Proposal No.: GT0936 Task No.: 01

- Soil infiltration layer: material texture number 16 with modified hydraulic conductivity of  $1 \times 10^{-5}$  cm/s for the prescriptive cover and default hydraulic conductivity of  $1 \times 10^{-7}$  cm/s for the permitted and alternate covers.

The design data required by the HELP model consists of the cover system surface slope and slope length, the drainage layer slope and slope length, and the runoff curve number. The final cover system grades are shown on Attachment 9, which is included in this calculation package and taken from the facility permit application. The cover system surface slope and slope length were assumed to equal the drainage layer slope and slope length. The design data used for the Skyline Landfill were as follows:

- representative top deck slope and slope length (from peak to elevation 650 ft msl) = 8.5% and 450 ft;
- representative sideslope slope and slope length (between drainage terraces; the geocomposite outlets on these terraces) = 20% and 150 ft; and
- HELP model computed runoff curve number = 80.60 for top deck and 82.20 for sideslope.

Six HELP model simulations were performed to calculate percolation through the three cover systems with the representative top deck and sideslope geometries. The results of the simulations are described below.

## RESULTS

The results of the analysis are tabulated below. HELP model output files for the six simulations are attached. The simulations demonstrate that the permitted and alternate cover systems should provide enhanced reduction in infiltration over the prescriptive cover system and that the alternate cover system provides an essentially equivalent reduction in infiltration as the permitted cover system. The relatively high performance of the alternate cover system is primarily due to: (i) the ability of the thick erosion layer to store infiltration until it is removed by evapotranspiration; and (ii) the ability of the geocomposite drainage layer beneath the erosion layer to rapidly remove rainwater that infiltrates through the erosion layer.

Written By: M. Christman Date: 10/12/99 Reviewed by: B. Gross Date: 12/21/99  
 Client: WMTX Project: Skyline Landfill Permit Mod. Project/Proposal No.: GT0936 Task No.: 01

Cover System Configuration	Location	Avg. Annual Percolation	
		(in.)	(gal/acre/day)
Prescriptive	Top Deck	0.02	1.3
	Side Slope	0.02	1.3
Permitted	Top Deck	0.002	0.1
	Side Slope	0.00000	<0.00001
Alternate	Top Deck	0.004	0.3
	Side Slope	0.002	0.1

**CONCLUSIONS**

The alternate cover system should perform better than the prescriptive cover system and essentially equivalent to the currently permitted cover system.

**REFERENCES**

Schroeder, P.R., Lloyd, C.M., and Zappi, P.A., "The Hydrologic Evaluation of Landfill Performance (HELP) Model, User's Guide for Version 3", U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C., Report No. EPA/600/R-94/168a, 1994a.

Schroeder, P.R., Dozier, T.S., Zappi, P.A., McEnroe, B.M., Sjostrom, J.W., and Peyton, R.L., "The Hydrologic Evaluation of Landfill Performance (HELP) Model Engineering Documentation for Version 3", U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C., Report No. EPA/600/R-94/168b, 116 p., 1994b.










6/46



**LEGEND**

-  FINAL FLOORPLAN DATE TYPE
-  ILLUSTRATION TYPE
-  DRAINAGE DITCH WITH FLOW DIRECTION
-  PERIMETER ACCESS
-  PROPERTY BOUNDARY

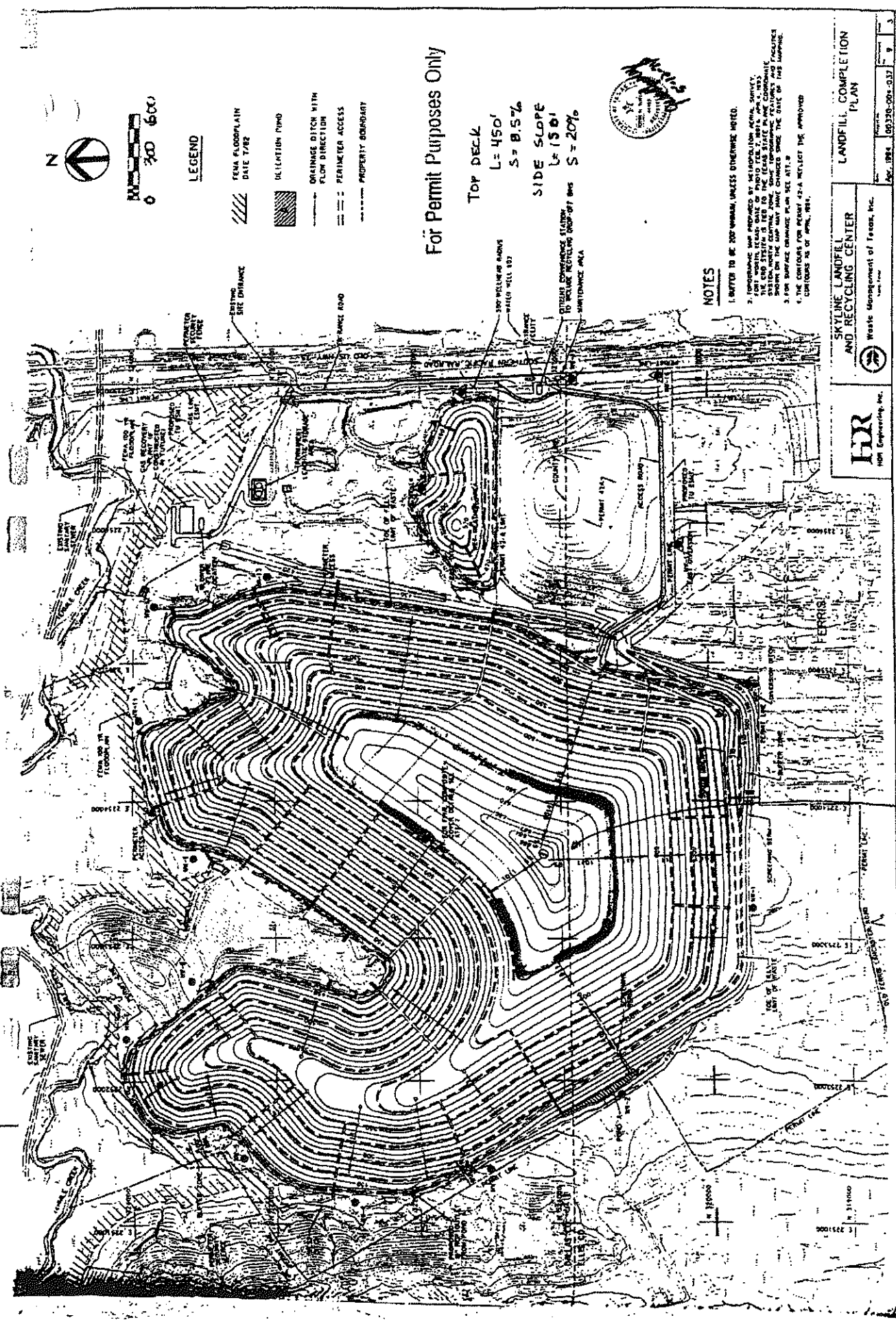
For Permit Purposes Only

**TOP DECK**  
 L = 450'  
 S = 8.5%  
**SIDE SLOPE**  
 L = 150'  
 S = 20%



**NOTES**

1. LETTER TO BE 200 MINIMUM UNLESS OTHERWISE NOTED.
2. TOPOGRAPHIC WAS PROVIDED BY SKYLINE LANDFILL AND RECYCLING CENTER. DATE OF PHOTO TAKEN IS 7/20/12. THIS PLAN IS BASED ON THE PHOTOGRAPHIC SURVEY AND THE TOPOGRAPHIC WAS PROVIDED BY SKYLINE LANDFILL AND RECYCLING CENTER. THE DATE OF THIS SURVEY IS 7/20/12. THE DATE OF THIS SURVEY IS 7/20/12.
3. FOR SURFACE DRAINAGE PLAN SEE SET.
4. THE CONTOURS FOR PERMIT 42-A REFLECT THE APPROVED CONTOURS AS OF APRIL, 1981.



**HR**  
 HORN ENGINEERING, INC.

**SKYLINE LANDFILL AND RECYCLING CENTER**  
 Waste Management of Texas, Inc.

**LANDFILL COMPLETION PLAN**

APR 1981 100-30-004-037 9 3

TOP DECK



8/46

LAYER 2

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	=	2.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3	- GOOD

LAYER 3

TYPE 3 - BARRIER SOIL LINER  
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	18.00	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.	=	0.999999975000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 8.% AND A SLOPE LENGTH OF 450. FEET.

SCS RUNOFF CURVE NUMBER	=	80.60	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.563	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.816	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	9.249	INCHES
TOTAL INITIAL WATER	=	9.249	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

9/46

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM DALLAS TEXAS

STATION LATITUDE = 32.85 DEGREES
MAXIMUM LEAF AREA INDEX = 3.50
START OF GROWING SEASON (JULIAN DATE) = 63
END OF GROWING SEASON (JULIAN DATE) = 329
EVAPORATIVE ZONE DEPTH = 6.0 INCHES
AVERAGE ANNUAL WIND SPEED = 10.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 63.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

Table with 6 columns: JAN/JUL, FEB/AUG, MAR/SEP, APR/OCT, MAY/NOV, JUN/DEC. Values range from 1.65 to 4.27 inches.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

Table with 6 columns: JAN/JUL, FEB/AUG, MAR/SEP, APR/OCT, MAY/NOV, JUN/DEC. Values range from 44.00 to 86.30 degrees Fahrenheit.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR DALLAS TEXAS AND STATION LATITUDE = 32.85 DEGREES

10/4/86

\*\*\*\*\*

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
<u>PRECIPITATION</u>						
TOTALS	1.29 2.76	1.79 1.67	2.22 3.70	3.48 2.52	3.85 1.61	2.64 1.76
STD. DEVIATIONS	0.88 2.20	1.03 1.24	1.32 2.03	2.14 2.07	1.79 1.21	1.71 1.26
<u>RUNOFF</u>						
TOTALS	0.197 0.457	0.185 0.049	0.338 0.671	0.785 0.687	0.589 0.231	0.352 0.382
STD. DEVIATIONS	0.362 1.004	0.330 0.122	0.666 0.861	1.216 1.201	1.029 0.596	0.549 0.635
<u>EVAPOTRANSPIRATION</u>						
TOTALS	1.291 2.304	1.516 1.603	2.015 2.675	2.713 1.908	3.335 1.152	2.537 1.323
STD. DEVIATIONS	0.621 1.401	0.713 1.200	1.011 1.210	1.270 1.100	1.111 0.574	1.353 0.593
<u>PERCOLATION/LEAKAGE THROUGH LAYER 3</u>						
TOTALS	0.0023 0.0004	0.0021 0.0002	0.0018 0.0010	0.0015 0.0018	0.0011 0.0016	0.0006 0.0027
STD. DEVIATIONS	0.0019 0.0005	0.0014 0.0004	0.0013 0.0008	0.0011 0.0017	0.0006 0.0018	0.0005 0.0021

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

<u>DAILY AVERAGE HEAD ON TOP OF LAYER 2</u>						
AVERAGES	1.7779 0.3287	1.8023 0.1704	1.3804 0.7975	1.1968 1.4116	0.8251 1.3058	0.5249 2.1338
STD. DEVIATIONS	1.5821 0.3870	1.2761 0.2789	1.0676 0.6993	0.9301 1.3725	0.5031 1.4665	0.4275 1.6982

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10/4/46

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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
<b>PRECIPITATION</b>						
TOTALS	1.29 2.76	1.79 1.67	2.22 3.70	3.48 2.52	3.85 1.61	2.64 1.76
STD. DEVIATIONS	0.88 2.20	1.03 1.24	1.32 2.03	2.14 2.07	1.79 1.21	1.71 1.26
<b>RUNOFF</b>						
TOTALS	0.197 0.457	0.185 0.049	0.338 0.671	0.785 0.687	0.589 0.231	0.352 0.382
STD. DEVIATIONS	0.362 1.004	0.330 0.122	0.666 0.861	1.216 1.201	1.029 0.596	0.549 0.635
<b>EVAPOTRANSPIRATION</b>						
TOTALS	1.291 2.304	1.516 1.603	2.015 2.675	2.713 1.908	3.335 1.152	2.537 1.323
STD. DEVIATIONS	0.621 1.401	0.713 1.200	1.011 1.210	1.270 1.100	1.111 0.574	1.353 0.593
<b>PERCOLATION/LEAKAGE THROUGH LAYER 3</b>						
TOTALS	0.0023 0.0004	0.0021 0.0002	0.0018 0.0010	0.0015 0.0018	0.0011 0.0016	0.0006 0.0027
STD. DEVIATIONS	0.0019 0.0005	0.0014 0.0004	0.0013 0.0008	0.0011 0.0017	0.0006 0.0018	0.0005 0.0021

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	1.7779 0.3287	1.8023 0.1704	1.3804 0.7975	1.1968 1.4116	0.8251 1.3058	0.5249 2.1338
STD. DEVIATIONS	1.5821 0.3870	1.2761 0.2789	1.0676 0.6993	0.9301 1.3725	0.5031 1.4665	0.4275 1.6982

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11/46

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	29.29 ( 5.380)	106304.6	100.00
RUNOFF	4.921 ( 2.5803)	17863.14	16.804
EVAPOTRANSPIRATION	24.372 ( 3.5640)	88470.19	83.223
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.01697 ( 0.00568)	61.609	0.05796
AVERAGE HEAD ON TOP OF LAYER 2	1.138 ( 0.391)	= 460.8 gallons/acre/year = 1.3 gallons/acre/day	
CHANGE IN WATER STORAGE	-0.025 ( 0.5740)	-90.39	-0.085

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	4.98	18077.400
RUNOFF	3.347	12150.0088
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000234	0.85078
AVERAGE HEAD ON TOP OF LAYER 2	6.000	
SNOW WATER	1.00	3631.1433
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3980
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1360

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12/26

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	0.8160	0.1360
2	0.0000	0.0000
3	7.6860	0.4270
SNOW WATER	0.000	

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13/46

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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\DALLAS.D4
TEMPERATURE DATA FILE:    C:\HELP3\DALLAS.D7
SOLAR RADIATION DATA FILE: C:\HELP3\DALLAS.D13
EVAPOTRANSPIRATION DATA:  C:\HELP3\DAL28.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\EPAS.D10
OUTPUT DATA FILE:         C:\HELP3\EPAS.OUT

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TIME: 6:26 DATE: 10/25/1999

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*****
TITLE:  WMTX SKYLINE LANDFILL -- PRESCRIPTIVE COVER SYSTEM (SIDESLOPE)
*****

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

LAYER 1  
 -----

TYPE 1 - VERTICAL PERCOLATION LAYER  
 MATERIAL TEXTURE NUMBER 10

```

THICKNESS           =      6.00  INCHES
POROSITY             =      0.3980 VOL/VOL
FIELD CAPACITY      =      0.2440 VOL/VOL
WILTING POINT       =      0.1360 VOL/VOL
INITIAL SOIL WATER  =      0.2605 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.63
      FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

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LAYER 2

-----

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	=	2.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3	- GOOD

LAYER 3

-----

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS	=	18.00	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.	=	0.999999975000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

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NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 20.3 AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	82.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.563	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.816	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	9.249	INCHES
TOTAL INITIAL WATER	=	9.249	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR



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EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM DALLAS TEXAS

STATION LATITUDE = 32.85 DEGREES
MAXIMUM LEAF AREA INDEX = 3.50
START OF GROWING SEASON (JULIAN DATE) = 63
END OF GROWING SEASON (JULIAN DATE) = 329
EVAPORATIVE ZONE DEPTH = 6.0 INCHES
AVERAGE ANNUAL WIND SPEED = 10.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 63.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

Table with 6 columns: JAN/JUL, FEB/AUG, MAR/SEP, APR/OCT, MAY/NOV, JUN/DEC. Values range from 1.65 to 4.27 inches.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

Table with 6 columns: JAN/JUL, FEB/AUG, MAR/SEP, APR/OCT, MAY/NOV, JUN/DEC. Values range from 44.00 to 86.30 degrees Fahrenheit.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR DALLAS TEXAS AND STATION LATITUDE = 32.85 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
<b>PRECIPITATION</b>						
TOTALS	1.29 2.76	1.79 1.67	2.22 3.70	3.48 2.52	3.85 1.61	2.64 1.76
STD. DEVIATIONS	0.88 2.20	1.03 1.24	1.32 2.03	2.14 2.07	1.79 1.21	1.71 1.26
<b>RUNOFF</b>						
TOTALS	0.196 0.456	0.187 0.050	0.338 0.673	0.791 0.672	0.592 0.231	0.353 0.382
STD. DEVIATIONS	0.362 0.989	0.330 0.122	0.666 0.861	1.212 1.204	1.028 0.596	0.548 0.635
<b>EVAPOTRANSPIRATION</b>						
TOTALS	1.293 2.305	1.513 1.602	2.011 2.672	2.713 1.926	3.333 1.149	2.533 1.322
STD. DEVIATIONS	0.624 1.407	0.716 1.199	1.016 1.207	1.274 1.091	1.109 0.573	1.354 0.593
<b>PERCOLATION/LEAKAGE THROUGH LAYER 3</b>						
TOTALS	0.0023 0.0004	0.0021 0.0002	0.0018 0.0010	0.0015 0.0018	0.0010 0.0016	0.0006 0.0027
STD. DEVIATIONS	0.0019 0.0005	0.0014 0.0004	0.0013 0.0008	0.0011 0.0017	0.0006 0.0018	0.0005 0.0021

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	1.7828 0.3303	1.8087 0.1694	1.3782 0.7953	1.2119 1.3950	0.8220 1.3028	0.5207 2.1372
STD. DEVIATIONS	1.5759 0.3948	1.2853 0.2782	1.0687 0.7001	0.9263 1.3679	0.5015 1.4636	0.4244 1.7003

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17/46

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	29.29	( 5.380)	106304.6	100.00
RUNOFF	4.923	( 2.6023)	17871.05	16.811
EVAPOTRANSPIRATION	24.370	( 3.5527)	88462.27	83.216
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.01697	( 0.00568)	61.618	0.05796
AVERAGE HEAD ON TOP OF LAYER 2	1.138	( 0.392)	= 460.9 gallons/acre/yr = 1.3 gallons/acre/day	
CHANGE IN WATER STORAGE	-0.025	( 0.5770)	-90.39	-0.085

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	4.98	18077.400
RUNOFF	3.347	12149.8057
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000234	0.85078
AVERAGE HEAD ON TOP OF LAYER 2	6.000	
SNOW WATER	1.00	3631.1433
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3980
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1360

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	0.8160	0.1360
2	0.0000	0.0000
3	7.6860	0.4270
SNOW WATER	0.000	

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10/25/99

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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\DALLAS.D4
TEMPERATURE DATA FILE:   C:\HELP3\DALLAS.D7
SOLAR RADIATION DATA FILE: C:\HELP3\DALLAS.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\DAL28.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\EXIST.D10
OUTPUT DATA FILE:        C:\HELP3\EXIST.OUT

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TIME: 5:51      DATE: 10/25/1999

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*****
TITLE:  WMTX SKYLINE LANDFILL -- PERMITTED COVER SYSTEM (TOP DECK)
*****

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

LAYER 1  
 -----

TYPE 1 - VERTICAL PERCOLATION LAYER  
 MATERIAL TEXTURE NUMBER 10

```

THICKNESS           =      6.00  INCHES
POROSITY            =      0.3980 VOL/VOL
FIELD CAPACITY      =      0.2440 VOL/VOL
WILTING POINT      =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT =    0.2119 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.63
      FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

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LAYER 2

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TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 15

THICKNESS	=	22.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3045	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000003000E-04	CM/SEC

LAYER 3

-----

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	2.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3	- GOOD

LAYER 4

-----

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 16

THICKNESS	=	18.00	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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

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NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 8.3% AND A SLOPE LENGTH OF 450. FEET.

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SCS RUNOFF CURVE NUMBER = 80.60  
 FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT  
 AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES  
 EVAPORATIVE ZONE DEPTH = 28.0 INCHES  
 INITIAL WATER IN EVAPORATIVE ZONE = 7.971 INCHES  
 UPPER LIMIT OF EVAPORATIVE STORAGE = 12.838 INCHES  
 LOWER LIMIT OF EVAPORATIVE STORAGE = 6.646 INCHES  
 INITIAL SNOW WATER = 0.000 INCHES  
 INITIAL WATER IN LAYER MATERIALS = 15.657 INCHES  
 TOTAL INITIAL WATER = 15.657 INCHES  
 TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA  
 -----

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM  
 DALLAS TEXAS .

STATION LATITUDE = 32.85 DEGREES  
 MAXIMUM LEAF AREA INDEX = 3.50  
 START OF GROWING SEASON (JULIAN DATE) = 63  
 END OF GROWING SEASON (JULIAN DATE) = 329  
 EVAPORATIVE ZONE DEPTH = 28.0 INCHES  
 AVERAGE ANNUAL WIND SPEED = 10.80 MPH  
 AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %  
 AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 68.00 %  
 AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 63.00 %  
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.65	1.93	2.42	3.63	4.27	2.59
2.00	1.76	3.31	2.47	1.76	1.67

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.00	48.50	56.10	65.90	73.70	82.00
86.30	85.50	78.60	67.90	55.60	47.80

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NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS  
 AND STATION LATITUDE = 32.85 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
<u>PRECIPITATION</u>						
TOTALS	1.29 2.76	1.79 1.67	2.22 3.70	3.48 2.52	3.85 1.61	2.64 1.76
STD. DEVIATIONS	0.88 2.20	1.03 1.24	1.32 2.03	2.14 2.07	1.79 1.21	1.71 1.26
<u>RUNOFF</u>						
TOTALS	0.018 0.109	0.051 0.008	0.035 0.098	0.250 0.093	0.222 0.043	0.048 0.070
STD. DEVIATIONS	0.075 0.262	0.207 0.022	0.075 0.164	0.476 0.223	0.533 0.168	0.111 0.190
<u>EVAPOTRANSPIRATION</u>						
TOTALS	1.346 2.665	1.534 1.705	2.057 2.814	3.935 1.713	5.280 0.981	2.985 1.240
STD. DEVIATIONS	0.551 1.784	0.572 1.370	0.817 1.440	1.061 0.793	1.761 0.398	1.545 0.508
<u>PERCOLATION/LEAKAGE THROUGH LAYER 4</u>						
TOTALS	0.0003 0.0000	0.0003 0.0000	0.0003 0.0000	0.0004 0.0001	0.0001 0.0001	0.0000 0.0003
STD. DEVIATIONS	0.0004 0.0000	0.0003 0.0000	0.0003 0.0000	0.0003 0.0002	0.0002 0.0002	0.0000 0.0004

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

DAILY AVERAGE HEAD ON TOP OF LAYER 3  
 -----

AVERAGES	7.4356	7.4137	8.2696	8.9732	3.2549	0.0249
	0.0914	0.0275	0.0177	1.5709	3.3367	6.2163
STD. DEVIATIONS	9.5376	8.7396	7.4393	7.5339	4.9528	0.1224
	0.3497	0.1505	0.0725	3.8277	6.0361	8.8041

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30  
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	INCHES		CU. FEET	PERCENT
PRECIPITATION	29.29	( 5.380)	106304.6	100.00
RUNOFF	1.045	( 0.9460)	3793.39	3.568
EVAPOTRANSPIRATION	28.255	( 4.4927)	102565.26	96.482
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00189	( 0.00147)	6.869	0.00646
AVERAGE HEAD ON TOP OF LAYER 3	3.886	( 3.077)	= 51.4 gallons /acre / year = 0.14 gallons /acre / day	
CHANGE IN WATER STORAGE	-0.017	( 2.6386)	-60.98	-0.057

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24/46

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	4.98	18077.400
RUNOFF	2.220	8059.9077
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000037	0.13367
AVERAGE HEAD ON TOP OF LAYER 3	28.000	
SNOW WATER	1.00	3631.1433
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4585
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.2374

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	1.2981	0.2163
2	6.1684	0.2804
3	0.0000	0.0000
4	7.6860	0.4270
SNOW WATER	0.000	

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25/11/99

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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\DALLAS.D4
TEMPERATURE DATA FILE:   C:\HELP3\DALLAS.D7
SOLAR RADIATION DATA FILE: C:\HELP3\DALLAS.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\DAL28.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\EXISTS.D10
OUTPUT DATA FILE:        C:\HELP3\EXISTS.OUT

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TIME: 6:12 DATE: 10/25/1999

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*****
TITLE:  WMTX SKYLINE LANDFILL -- PERMITTED COVER SYSTEM (SIDESLOPE)
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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE  
 COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1  
 -----

```

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 10
THICKNESS           = 6.00 INCHES
POROSITY             = 0.3980 VOL/VOL
FIELD CAPACITY      = 0.2440 VOL/VOL
WILTING POINT       = 0.1360 VOL/VOL
INITIAL SOIL WATER  = 0.2114 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.63
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

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LAYER 2  
-----

TYPE 1 - VERTICAL PERCOLATION LAYER  
MATERIAL TEXTURE NUMBER 15

THICKNESS	=	22.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3053	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000003000E-04	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	=	20.00	PERCENT
DRAINAGE LENGTH	=	150.0	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	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3	- GOOD

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LAYER 5

TYPE 3 - BARRIER SOIL LINER  
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	18.00	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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 20.8 AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	82.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	28.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	7.985	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.838	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	6.646	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	15.673	INCHES
TOTAL INITIAL WATER	=	15.673	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM DALLAS TEXAS

STATION LATITUDE	=	32.85	DEGREES
MAXIMUM LEAF AREA INDEX	=	3.50	
START OF GROWING SEASON (JULIAN DATE)	=	63	
END OF GROWING SEASON (JULIAN DATE)	=	329	
EVAPORATIVE ZONE DEPTH	=	28.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00	%

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NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING  
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.65	1.93	2.42	3.63	4.27	2.59
2.00	1.76	3.31	2.47	1.76	1.67

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING  
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.00	48.50	56.10	65.90	73.70	82.00
86.30	85.50	78.60	67.90	55.60	47.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING  
COEFFICIENTS FOR DALLAS TEXAS  
AND STATION LATITUDE = 32.85 DEGREES

\*\*\*\*\*

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.29	1.79	2.22	3.48	3.85	2.64
	2.76	1.67	3.70	2.52	1.61	1.76
STD. DEVIATIONS	0.88	1.03	1.32	2.14	1.79	1.71
	2.20	1.24	2.03	2.07	1.21	1.26
RUNOFF						
TOTALS	0.002	0.013	0.037	0.201	0.182	0.068
	0.160	0.013	0.142	0.127	0.035	0.017
STD. DEVIATIONS	0.004	0.036	0.093	0.434	0.444	0.141
	0.374	0.033	0.207	0.291	0.117	0.054

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EVAPOTRANSPIRATION

TOTALS	1.351	1.504	2.090	3.774	4.166	2.838
	2.616	1.695	2.803	1.741	1.021	1.247
STD. DEVIATIONS	0.551	0.561	0.794	1.096	1.641	1.639
	1.713	1.350	1.430	0.829	0.431	0.511

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.2229	0.1028	0.2042	0.1676	0.1661	0.0012
	0.0006	0.0004	0.0002	0.1788	0.1067	0.3143
STD. DEVIATIONS	0.3960	0.2390	0.4244	0.3269	0.4093	0.0026
	0.0016	0.0012	0.0003	0.4952	0.2380	0.5450

PERCOLATION/LEAKAGE THROUGH LAYER 5

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	0.0002	0.0003	0.0002	0.0002	0.0000
	0.0000	0.0000	0.0000	0.0002	0.0002	0.0004
STD. DEVIATIONS	0.0005	0.0004	0.0006	0.0005	0.0006	0.0000
	0.0000	0.0000	0.0000	0.0007	0.0003	0.0007

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	29.29 ( 5.380)	106304.6	100.00
RUNOFF	0.995 ( 0.8099)	3611.35	3.397
EVAPOTRANSPIRATION	26.846 ( 4.1025)	97451.73	91.672
LATERAL DRAINAGE COLLECTED FROM LAYER 3	1.46578 ( 1.30760)	5320.791	5.00523
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000 ( 0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000 ( 0.000)	<i>&lt; 0.0037 gallons/year</i> <i>&lt; 0.00001 gallons/day</i>	
CHANGE IN WATER STORAGE	-0.022 ( 1.7187)	-79.33	-0.075

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3/4/86

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PEAK DAILY VALUES FOR YEARS	1 THROUGH	30
	(INCHES)	(CU. FT.)
PRECIPITATION	4.98	18077.400
RUNOFF	2.081	7555.4185
DRAINAGE COLLECTED FROM LAYER 3	0.55779	2024.79541
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00004
AVERAGE HEAD ON TOP OF LAYER 4	0.024	
MAXIMUM HEAD ON TOP OF LAYER 4	0.038	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	1.00	3631.1433
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4481
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.2374

\*\*\* 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 30

LAYER	(INCHES)	(VOL/VOL)
1	1.2370	0.2062
2	6.0925	0.2769
3	0.0020	0.0100
4	0.0000	0.0000
5	7.6860	0.4270
SNOW WATER	0.000	

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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:\FLOWMO~1\HELP3\DALLAS.D4
TEMPERATURE DATA FILE:   C:\FLOWMO~1\HELP3\DALLAS.D7
SOLAR RADIATION DATA FILE: C:\FLOWMO~1\HELP3\DALLAS.D13
EVAPOTRANSPIRATION DATA: C:\FLOWMO~1\HELP3\DAL48.D11
SOIL AND DESIGN DATA FILE: C:\FLOWMO~1\HELP3\ALT1T.D10
OUTPUT DATA FILE:        C:\FLOWMO~1\HELP3\ALT1T.OUT

```

TIME: 7:10      DATE: 10/25/1999

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*****
TITLE:  WMTX SKYLINE LANDFILL -- ALTERNATE COVER SYSTEM (TOP DECK)
*****

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

LAYER 1  
 -----

TYPE 1 - VERTICAL PERCOLATION LAYER  
 MATERIAL TEXTURE NUMBER 10

```

THICKNESS           =      6.00  INCHES
POROSITY             =      0.3980 VOL/VOL
FIELD CAPACITY      =      0.2440 VOL/VOL
WILTING POINT       =      0.1360 VOL/VOL
INITIAL SOIL WATER  =      0.2309 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.63
      FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

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LAYER 2

-----

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS	=	30.00	INCHES
PORCSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2863	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	CM/SEC

LAYER 3

-----

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
PORCSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2564	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	8.50	PERCENT
DRAINAGE LENGTH	=	450.0	FEET

LAYER 4

-----

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 16

THICKNESS	=	18.00	INCHES
PORCSITY	=	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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

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NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 8. % AND A SLOPE LENGTH OF 450. FEET.

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SCS RUNOFF CURVE NUMBER = 80.60  
 FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT  
 AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES  
 EVAPORATIVE ZONE DEPTH = 36.2 INCHES  
 INITIAL WATER IN EVAPORATIVE ZONE = 10.025 INCHES  
 UPPER LIMIT OF EVAPORATIVE STORAGE = 16.808 INCHES  
 LOWER LIMIT OF EVAPORATIVE STORAGE = 8.767 INCHES  
 INITIAL SNOW WATER = 0.000 INCHES  
 INITIAL WATER IN LAYER MATERIALS = 17.711 INCHES  
 TOTAL INITIAL WATER = 17.711 INCHES  
 TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM  
 DALLAS TEXAS

STATION LATITUDE = 32.85 DEGREES  
 MAXIMUM LEAF AREA INDEX = 3.50  
 START OF GROWING SEASON (JULIAN DATE) = 63  
 END OF GROWING SEASON (JULIAN DATE) = 329  
 EVAPORATIVE ZONE DEPTH = 36.2 INCHES  
 AVERAGE ANNUAL WIND SPEED = 10.80 MPH  
 AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %  
 AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 68.00 %  
 AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 63.00 %  
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.65	1.93	2.42	3.63	4.27	2.59
2.00	1.76	3.31	2.47	1.76	1.67

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.00	48.50	56.10	65.90	73.70	82.00
86.30	85.50	78.60	67.90	55.60	47.80

3/6/46

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS  
 AND STATION LATITUDE = 32.85 DEGREES

\*\*\*\*\*

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
<b>PRECIPITATION</b>						
TOTALS	1.29 2.76	1.79 1.67	2.22 3.70	3.48 2.52	3.85 1.61	2.64 1.76
STD. DEVIATIONS	0.88 2.20	1.03 1.24	1.32 2.03	2.14 2.07	1.79 1.21	1.71 1.26
<b>RUNOFF</b>						
TOTALS	0.180 0.521	0.224 0.072	0.372 0.819	0.882 0.704	0.651 0.232	0.406 0.353
STD. DEVIATIONS	0.344 1.078	0.384 0.162	0.670 0.991	1.254 1.238	1.065 0.542	0.601 0.649
<b>EVAPOTRANSPIRATION</b>						
TOTALS	0.723 2.276	0.969 1.587	1.652 2.423	3.611 1.418	5.226 0.778	2.583 0.618
STD. DEVIATIONS	0.141 1.303	0.143 1.152	0.233 1.034	0.829 0.567	1.271 0.245	1.185 0.177
<b>LATERAL DRAINAGE COLLECTED FROM LAYER 3</b>						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0077 0.0000	0.0110 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0401 0.0000	0.0330 0.0000	0.0000 0.0000
<b>PERCOLATION/LEAKAGE THROUGH LAYER 4</b>						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0019 0.0000	0.0023 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0098 0.0000	0.0071 0.0000	0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0000	0.0007	0.0010	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0038	0.0031	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS). FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	29.29	( 5.380)	106304.6	100.00
RUNOFF	5.417	( 2.8201)	19662.00	18.496
EVAPOTRANSPIRATION	23.854	( 3.1470)	86591.05	81.456
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.01868	( 0.06945)	67.822	0.06380
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00419	( 0.01609)	15.214	0.01431
AVERAGE HEAD ON TOP OF LAYER 4	0.000	( 0.001)	= 113.8 gallons/acre/year	= 0.31 gallons/acre/day
CHANGE IN WATER STORAGE	-0.009	( 1.9008)	-31.55	-0.030

\*\*\*\*\*

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	4.98	18077.400
RUNOFF	3.727	13527.6777
DRAINAGE COLLECTED FROM LAYER 3	0.02680	97.27611
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.003416	12.39968
AVERAGE HEAD ON TOP OF LAYER 4	0.076	
MAXIMUM HEAD ON TOP OF LAYER 4	0.157	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	1.00	3631.1433
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4232
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.2422

\*\*\* 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 30

LAYER	(INCHES)	(VOL/VOL)
1	1.2229	0.2038
2	8.4901	0.2830
3	0.3513	0.2564
4	7.6860	0.4270
SNOW WATER	0.000	

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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:\FLOWMO~1\HELP3\DALLAS.D4
TEMPERATURE DATA FILE:   C:\FLOWMO~1\HELP3\DALLAS.D7
SOLAR RADIATION DATA FILE: C:\FLOWMO~1\HELP3\DALLAS.D13
EVAPOTRANSPIRATION DATA:  C:\FLOWMO~1\HELP3\DAL48.D11
SOIL AND DESIGN DATA FILE: C:\FLOWMO~1\HELP3\ALT1S.D10
OUTPUT DATA FILE:        C:\FLOWMO~1\HELP3\ALT1S.OUT

```

TIME: 15:44      DATE: 12/27/1999

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*****
*****
TITLE:  WMTX SKYLINE LANDFILL -- ALTERNATE COVER SYSTEM (SIDE SLOPE)
*****
*****

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

LAYER 1  
-----

TYPE 1 - VERTICAL PERCOLATION LAYER  
MATERIAL TEXTURE NUMBER 10

```

THICKNESS           =      6.00  INCHES
POROSITY             =      0.3980 VOL/VOL
FIELD CAPACITY       =      0.2440 VOL/VOL
WILTING POINT        =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.2309 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.63
      FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

```



LAYER 2  
-----

TYPE 1 - VERTICAL PERCOLATION LAYER  
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	30.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2863	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06	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	=	0.2564	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	20.00	PERCENT
DRAINAGE LENGTH	=	150.0	FEET

LAYER 4  
-----

TYPE 3 - BARRIER SOIL LINER  
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	18.00	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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA  
-----

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 20.0% AND A SLOPE LENGTH OF 150. FEET.

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SCS RUNOFF CURVE NUMBER = 82.20  
 FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT  
 AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES  
 EVAPORATIVE ZONE DEPTH = 36.2 INCHES  
 INITIAL WATER IN EVAPORATIVE ZONE = 10.025 INCHES  
 UPPER LIMIT OF EVAPORATIVE STORAGE = 16.808 INCHES  
 LOWER LIMIT OF EVAPORATIVE STORAGE = 8.767 INCHES  
 INITIAL SNOW WATER = 0.000 INCHES  
 INITIAL WATER IN LAYER MATERIALS = 17.711 INCHES  
 TOTAL INITIAL WATER = 17.711 INCHES  
 TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA  
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NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM  
 DALLAS TEXAS

STATION LATITUDE = 32.85 DEGREES  
 MAXIMUM LEAF AREA INDEX = 3.50  
 START OF GROWING SEASON (JULIAN DATE) = 63  
 END OF GROWING SEASON (JULIAN DATE) = 329  
 EVAPORATIVE ZONE DEPTH = 36.2 INCHES  
 AVERAGE ANNUAL WIND SPEED = 10.80 MPH  
 AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %  
 AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 68.00 %  
 AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 63.00 %  
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.65	1.93	2.42	3.63	4.27	2.59
2.00	1.76	3.31	2.47	1.76	1.67

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.00	48.50	56.10	65.90	73.70	82.00
86.30	85.50	78.60	67.90	55.60	47.80

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NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING  
 COEFFICIENTS FOR DALLAS TEXAS  
 AND STATION LATITUDE = 32.85 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
<u>PRECIPITATION</u>						
TOTALS	1.29 2.76	1.79 1.57	2.22 3.70	3.48 2.52	3.85 1.61	2.64 1.76
STD. DEVIATIONS	0.88 2.20	1.03 1.24	1.32 2.03	2.14 2.07	1.79 1.21	1.71 1.26
<u>RUNOFF</u>						
TOTALS	0.181 0.525	0.225 0.073	0.377 0.820	0.887 0.704	0.653 0.232	0.407 0.353
STD. DEVIATIONS	0.344 1.076	0.384 0.163	0.669 0.990	1.252 1.239	1.064 0.542	0.600 0.649
<u>EVAPOTRANSPIRATION</u>						
TOTALS	0.723 2.272	0.969 1.586	1.652 2.412	3.611 1.419	5.214 0.778	2.580 0.618
STD. DEVIATIONS	0.141 1.300	0.143 1.151	0.235 1.034	0.830 0.568	1.270 0.245	1.183 0.177
<u>LATERAL DRAINAGE COLLECTED FROM LAYER 3</u>						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0086 0.0000	0.0118 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0453 0.0000	0.0353 0.0000	0.0000 0.0000
<u>PERCOLATION/LEAKAGE THROUGH LAYER 4</u>						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0009 0.0000	0.0011 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0049 0.0000	0.0035 0.0000	0.0000 0.0000

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 AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)  
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DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0000	0.0003	0.0004	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0015	0.0012	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  
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	INCHES		CU. FEET	PERCENT
PRECIPITATION	29.29	( 5.380)	106304.6	100.00
RUNOFF	5.437	( 2.8173)	19736.09	18.566
EVAPOTRANSPIRATION	23.834	( 3.1445)	86518.88	81.388
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.02036	( 0.07595)	73.892	0.06951
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00199	( 0.00818)	7.227	0.00680
AVERAGE HEAD ON TOP OF LAYER 4	0.000	( 0.000)	= 54.1 gallons/acre/year = 0.15 gallons/acre/day	
CHANGE IN WATER STORAGE	-0.009	( 1.8994)	-31.55	-0.030

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PEAK DAILY VALUES FOR YEARS	1 THROUGH 30	
	(INCHES)	(CU. FT.)
PRECIPITATION	4.98	18077.400
RUNOFF	3.727	13528.2090
DRAINAGE COLLECTED FROM LAYER 3	0.02900	105.28500
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.002906	10.54977
AVERAGE HEAD ON TOP OF LAYER 4	0.030	
MAXIMUM HEAD ON TOP OF LAYER 4	0.023	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	1.00	3631.1433
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4231
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.2422

\*\*\* 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 30

LAYER	(INCHES)	(VOL/VOL)
1	1.2229	0.2038
2	8.4901	0.2830
3	0.0513	0.2564
4	7.6860	0.4270
SNOW WATER	0.000	

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