PUBLIC NOTICE
LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY (LDEQ)
VERMILION PARISH POLICE JURY / VERMILION PARISH SOLID WASTE PLANT
TECHNICALLY COMPLETE SOLID WASTE PERMIT MODIFICATION APPLICATION

The LDEQ, Office of Environmental Services, has determined that a Type II & III solid waste permit modification application for Vermilion Parish Police Jury, P.O. Box 209, Abbeville, Louisiana 70510 for the Vermilion Parish Solid Waste Plant is technically complete and acceptable for public review. The facility is located at Highway 696, Meaux, Vermilion Parish.

Vermilion Parish Police Jury requested a solid waste permit modification to expand the existing Subtitle D cell airspace by lining the side slopes above grade and to increase the overall height of the landfill. By lining the side slopes of the existing cell, the facility is maximizing the existing permitted Subtitle D acreage.

Written comments, written requests for a public hearing or written requests for notification of the final decision regarding this permit action may be submitted to Ms. Soumaya Ghosn at LDEQ, Public Participation Group, P.O. Box 4313, Baton Rouge, LA 70821-4313. **Written comments and/or written requests must be received by 12:30 p.m., Tuesday, June 12, 2007.** Written comments will be considered prior to a final permit decision.

If LDEQ finds a significant degree of public interest, a public hearing will be held. LDEQ will send notification of the final permit decision to the applicant and to each person who has submitted written comments or a written request for notification of the final decision.

The technically complete solid waste application is available for review at the LDEQ Public Records Center, Room 127, 602 North 5th Street, Baton Rouge, LA. Viewing hours are from 8:00 a.m. to 4:30 p.m., Monday through Friday (except holidays). The available information can also be accessed electronically on the Electronic Document Management System (EDMS) on the DEQ public website at **www.deq.louisiana.gov**.

Additional copies may be reviewed at the Vermilion Parish Library – Headquarters located at 405 E. St.Victor, Abbeville, LA 70511, Vermilion Parish Police Jury, 100 N. State Street, Ste. 200, Abbeville, LA 70510 and at the LDEQ, Acadiana Regional Office, 111 New Center Drive, Lafayette, LA 70508.

Inquiries or requests for additional information regarding this permit action should be directed to Ms. Kenya Gillingham, LDEQ, Waste Permits Division, P.O. Box 4313, Baton Rouge, LA 70821-4313, phone (225) 219-3070.

Persons wishing to be included on the LDEQ permit public notice mailing list or for other public participation related questions should contact the Public Participation Group in writing at LDEQ, P.O. Box 4313, Baton Rouge, LA 70821-4313, by email at deqmaillistrequest@la.gov or contact the LDEQ Customer Service Center at (225) 219-LDEQ (219-5337).

Permit public notices including electronic access to general information from the technically complete solid waste permit application can be viewed at the LDEQ permits public notice webpage at www.deq.louisiana.gov/apps/pubNotice/default.asp and general information related to the public participation in permitting activities can be viewed at www.deq.louisiana.gov/portal/tabid/2198/Default.aspx.

Alternatively, individuals may elect to receive the permit public notices via email by subscribing to the LDEQ permits public notice List Server at www.doa.louisiana.gov/oes/listservpage/ldeq_pn_listserv.htm

All correspondence should specify **AI Number 148, Permit Number P-0030, and Activity Number PER20040001.**

Scheduled Publication Date: Tuesday, May 8, 2007

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DEPARTMENT OF ENVIRONMENTAL QUALITY

KATHLEEN BABINEAUX BLANCO
GOVERNOR

MIKE D. McDANIEL, Ph.D.
SECRETARY

APR 25 2007

CERTIFIED MAIL 7003 2260 0005 9326 8771

Mr. Hubert Faulk
Vermillion Parish Municipal C&D Landfill
P.O. Box 209
Abbeville, Louisiana 70510

RE: Notice of Technical Completeness
Vermillion Parish Municipal C&D Landfill
AI# 148/ P-0030/ D-113-0023/ PER 20040001
Vermillion Parish

Dear Mr. Faulk:

The Waste Permits Division is in receipt of your finalized copies of your submittal dated April 20, 2007. After reviewing this submittal, we have determined that your permit modification is technically complete and ready for public review.

The Environmental Assistance Division will distribute copies of your application for public review and place public notices in the appropriate newspapers in accordance with LAC 33:VII.513.F.3. Please contact Soumaya Ghosn at (225) 219-3276 for the date of publication and the dates of public comment period. At the conclusion of the comment period, the Waste Permits Division will consider all comments and a decision will be made regarding your application.

Please reference your Agency Interest Number (AI# 148), Permit Number (P-0030), Site Identification Number D-113-0023, and Permit Activity Number (PER 20040001) on all future correspondence pertaining to this facility. If you have any questions concerning this matter, please contact Ms. Kenya Gillingham of the Waste Permits Section at (225) 219-3139.

Sincerely,

Bijan Sharafkhani, P.E.
Administrator
Waste Permits Division

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ENVIRONMENTAL **SERVICES**
: PO BOX 4313, BATON ROUGE, LA 70821-4313
P:225-219-3181 F:225-219-3309
WWW.DEQ.LOUISIANA.GOV

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2007 APR 19 AM 11 22

April 18, 2007

Mr. Bijan Sharafkhani, P.E., Administrator
Waste Permits Division
Office of Environmental Services
LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Post Office Box 4313
Baton Rouge, Louisiana 70821-4313

original to IOSW
copy to SW/GI/Counsel
AUG

RECEIVED
APR 19 2007
DEPT. OF ENVIRONMENTAL QUALITY
OFFICE OF ENVIRONMENTAL SERVICES
PERMIT DIVISION

RE: Vermilion Parish Police Jury
Vermilion Parish Solid Waste Plant
Type II and III Landfill
✓AI#148 / D-113-0023 / P-0030
PER20040001
Permit Modification #8 - ***Final Copies***
File Number 5263-27

Dear Mr. Sharafkhani:

On behalf of the Vermilion Parish Police Jury and as per your direction during the week of April 16, 2007, we are hereby forwarding six (6) bound copies of the complete document for the above referenced project.

The complete document includes the original submittal along with all previously accepted revisions incorporated into the appropriate sections.

Should you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,

SELLERS & ASSOCIATES, INC.

DANA MONTET SIMON, M.S., P.E.

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Attachments (6 copies)
c: Mr. Luther "Buster" Hardee, President - Vermilion Parish Police Jury
Mr. Chris P. Theriot, Administrator/Secretary-Treasurer, VPPJ (w/attachment)
All Vermilion Parish Police Jurors
Mr. Rick LeBlanc, Superintendent - Vermilion Parish Solid Waste Plant (w/attachment)
LDEQ - Acadiana Regional Office
Ms. Linda Brown, LDEQ - Baton Rouge

VERMILION PARISH SOLID WASTE PLANT

Facility Number D-113-0023
Permit Number P-0030
AI #148

Permit Modification Number 8
Tie-In Liner System & Height Increase

(Meets the requirements of LAC 33:VII.315)

April 2007

Prepared for:
Vermilion Parish Police Jury

Prepared by:

Sellers & Associates, Inc.
ENGINEERS SURVEYORS PLANNERS
Lafayette – Abbeville Louisiana

Vermilion Parish Solid Waste Plant
Permit Modification Number 8
Tie-In Liner System & Height Increase

Introduction

This permit modification requests the Administrative Authority to allow the Vermilion Parish Solid Waste Plant to continue with the slope liner system in the existing Subtitle D areas above grade along the Pre-Subtitle D slopes, as well as increase the overall height of the landfill. The list of items contained in this permit modification is as follows:

- List of Appendices
- Summary of Permit Modifications
- Responses to §521 Part II: Supplementary Information, All Processing and Disposal Facilities
- Responses to §523 Part III: Additional Supplementary Information
- LAC 33:I.1701 - Addendum to Permit Applications
- Appendix A:7a: Supplemental Sheet - Leachate Collection System Details
- Appendix A:8: Site Plan Showing Final Contours
- Appendix A:8a: Supplemental Sheet - Cross Sections
- Appendix B:4: Letters of Notification to the FAA and Airport Operator
- Appendix F:7: Geoscience Investigation Performed by Soil Testing Engineers, Inc. for Permit Modification No. 8, Vertical Expansion, May 2, 2005
- Appendix G:2: Closure & Post-Closure Care Cost Estimate
- Appendix H:1: Engineering Certification
- Appendix H:2: Engineering Calculations

List of Appendices

VERMILION PARISH SOLID WASTE PLANT
D-113-0023/P-0030
PERMIT MODIFICATION NUMBER 8
(Meets the Requirements of LAC 33:VII.315)

List of Appendices

- **Appendix A - Drawings**

A:1 Parish Map Showing Landfill Location

A:2 Aerial Map Showing the Landfill and Surrounding Area

A:3 State Map Showing Landfill Location and Service Area

A:4 Flood Insurance Rate Map (FIRM) Showing Landfill Location

A:5 Site Plan Showing Existing Topography
A:5a Aerial Photograph Showing Landfill Topography

A:6 Site Excavation Plan

A:7 Leachate Collection System and Force Main
A:7a Supplemental Sheet - Leachate Collection System Details
A:7b Supplemental Sheet - Leachate Collection System Details

A:8 Site Plan Showing Final Contours
A:8a Supplemental Sheet - Cross Sections

A:9 Oxidation Pond

A:10 Site Grid System

A:11 Site Plan Showing Groundwater Monitoring Well Locations and Bore Hole Locations

A:12 Site Plan Showing Gas Monitoring Probe Locations

VERMILION PARISH SOLID WASTE PLANT
D-113-0023/P-0030
PERMIT MODIFICATION NUMBER 8
(Meets the Requirements of LAC 33:VII.315)

List of Appendices

- **Appendix B - Supporting Documentation**

B:1 Letter From Louisiana Department of Culture, Recreation & Tourism

B:2 Letter From Louisiana Department of Wildlife & Fisheries

B:3 Letter From U.S. Army Corps of Engineers
B:3a Letter From U.S.D.A. Natural Resources Conservation Service

B:4 Letters of Notification to the FAA and Airport Operator

B:5 State Water Quality Permit

B:6 BMP Plan

B:7 NPDES Permit Application

B:8 Entrance Sign

B:9 Letter Regarding the Impact of Landfill Operations on Road Infrastructure

B:10 Letters from LDEQ Regarding Daily Cover Requirements

B:11 Letter to LDEQ Requesting an Exemption to the Boring Requirements of LAC 33:VII.709.C.1.c.

VERMILION PARISH SOLID WASTE PLANT
D-113-0023/P-0030
PERMIT MODIFICATION NUMBER 8
(Meets the Requirements of LAC 33:VII.315)

List of Appendices

- **Appendix C - Environmental Monitoring**

  C:1 Groundwater Monitoring Plan

  C:2 Gas Monitoring Plan

- **Appendix D - Construction**

  D:1 Quality Assurance/Quality Control Plan For Liner System and Final Cap Construction

  D:2 Quality Assurance/Quality Control Plan For Synthetic Liner Installation

  D:3 Erosion Control Plan

- **Appendix E - Operations**

  E:1 Municipal Waste Acceptance Quality Assurance Quality Control Plan

  E:2 Waste Shredder Specifications

  E:3 Emergency/Training Plan

  E:4 Sample Report Forms

  E:5 Citizens Disposal Area Operation

  E:6 Plan of Operation Parish Tire Collection Facility

VERMILION PARISH SOLID WASTE PLANT
D-113-0023/P-0030
PERMIT MODIFICATION NUMBER 8
(Meets the Requirements of LAC 33:VII.315)

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- **Appendix F - Geoscience Investigations**

  F:1 Geotechnical Investigation Performed by Woodward-Clyde Consultants, 1977

  F:2 Solid Waste Site Suitably Study Performed by URS Company, Under Contract With the Louisiana Department of Natural Resources, Office of Environmental Affairs, Solid Waste Division, 1982

  F:3 Geotechnical Investigation Performed by Louisiana Testing and Inspection, Inc., 1983

  F:4 Boring Logs Performed by Louisiana Testing and Inspection, Inc., 1993

  F:5 Geoscience Investigation Performed by Soil Testing Engineers, Inc. for Permit Modification 5, Mandatory Permit Modification, 1994

  F:6 Geoscience Investigation Performed by Soil Testing Engineers, Inc. for Permit Modification 9, Area II-B Subtitle D Expansion Permit Modification, 2004

  F:7 Geoscience Investigation Performed by Soil Testing Engineers, Inc. for Permit Modification 8, Vertical Expansion, May 2, 2005

- **Appendix G - Closure and Post Closure**

  G:1 Closure Document to be Filed in the Parish Courthouse

  G:2 Closure and Post Closure Care Cost Estimate

- **Appendix H - Engineering**

  H:1 Engineering Certification

  H:2 Engineering Calculations

Summary of Permit Modifications

VERMILION PARISH SOLID WASTE PLANT
Facility Number D-113-0023 / Permit Number P-0030

SUMMARY OF PERMIT MODIFICATIONS

Modification Number	Description	Date Submitted	Date Approved
0	Standard Permit Issued *Facility No. D-113-0023* *Permit No. P-0030*	-	6-1-84
1	QA/QC Plan for POTW Sludge & Gas Venting System	3-31-89	2-23-89
2	Permit Modification to Establish a Separate Disposal Area	10-4-89	7-2-90
3	Permit Modification to Separate the Air Curtain Destructor Facility from the Solid Waste Plant; revised QA/QC Plan for the Acceptance of Domestic Sewage Sludge	9-23-93	5-18-94
4	Permit Modification to Increase the Permitted Height	5-26-94	5-11-95
5	Mandatory Permit Modification	8-1-94	10-17-97
6	Tire Collection Facility and Citizen Disposal Area	7-5-95	8-15-95
7	Permit Modification to Install Liner System	1-17-96	(withdrawn)
8	Permit Modification - Tie-In Liner System & Height Increase	10-04	-
9	Permit Modification - Area II-B Subtitle D Expansion	11-04	-

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Responses to §521
Part II: Supplementary Information, All Processing and Disposal Facilities

§521. PART II: SUPPLEMENTARY INFORMATION, ALL PROCESSING AND DISPOSAL FACILITIES

THE FOLLOWING INFORMATION IS REQUIRED IN THE PERMIT APPLICATION FOR SOLID WASTE PROCESSING AND DISPOSAL FACILITIES. ALL RESPONSES AND EXHIBITS MUST BE IDENTIFIED IN THE FOLLOWING SEQUENCE TO FACILITATE THE EVALUATION. ADDITIONALLY, ALL APPLICABLE SECTIONS OF LAC 33:VII. CHAPTER 7 MUST BE ADDRESSED AND INCORPORATED INTO THE APPLICATION RESPONSES. IF A SECTION DOES NOT APPLY, THE APPLICANT MUST STATE THAT IT DOES NOT APPLY AND EXPLAIN WHY.

§521.A. LOCATION CHARACTERISTICS. STANDARDS PERTAINING TO LOCATION CHARACTERISTICS ARE CONTAINED IN LAC 33:VII.709.A (TYPE I AND II FACILITIES), LAC 33:VII.717.A (TYPE I-A AND II-A FACILITIES) AND LAC 33:719.A (TYPE III FACILITIES).

§521.A.1. THE FOLLOWING INFORMATION ON LOCATION CHARACTERISTICS IS REQUIRED FOR ALL FACILITIES:

§521.A.1.a. AREA MASTER PLANS-A LOCATION MAP SHOWING THE FACILITY, ROAD NETWORK, MAJOR DRAINAGE SYSTEMS, DRAINAGE-FLOW PATTERNS, LOCATION OF CLOSEST POPULATION CENTER(S), LOCATION OF THE PUBLIC-USE AIRPORT(S) USED BY TURBOJET AIRCRAFT OR PISTON-TYPE AIRCRAFT, PROOF OF NOTIFICATION OF AFFECTED AIRPORT AND FEDERAL AVIATION ADMINISTRATION AS PROVIDED IN LAC 33:VII.709.A.2, LOCATION OF THE 100-YEAR FLOOD PLAIN AND OTHER PERTINENT INFORMATION. THE SCALE OF THE MAPS AND DRAWINGS MUST BE LEGIBLE AND ENGINEERING DRAWINGS ARE REQUIRED.

Exhibit A:1, "Parish Map Showing Landfill Location" depicts the location of the landfill with respect to roads, major drainage channels, municipalities, and airports. Appendix H:2 contains a reproduction of a portion of a USGS quadrangle map showing the landfill location. This map also depicts the watershed boundary in which the landfill is located. Exhibit A:4 is a reproduction of Flood Insurance Rate Map, Community-Panel Number 220221 0150D, which shows the location of the landfill. This map also indicates that portions of the landfill are located within Zone C, "Areas of minimal flooding" (outside of the 100 year flood boundary) and Zone A5, "Areas of 100-year flood; base flood elevations and flood hazard factors determined." According to this map, the 100-year Base Flood Elevation is 15.0 NGVD 1929 in the area of the landfill site.

The Vermilion Parish Solid Waste Plant is located approximately 4.5 miles Northwest of the Abbeville Municipal Airport. In accordance with §709.A.2, the landfill is required to notify the Abbeville Municipal Airport and the Federal Aviation Administration. The letter of notification to the Federal Aviation Administration (FAA) and airport operator are contained in Appendix B:4. **Also included in Appendix B:4 is the FAA's letter dated March 13, 2006. All conditions set forth in this letter shall be adhered to by the Solid Waste Plant.**

§521.C. FACILITY SURFACE HYDROLOGY. STANDARDS GOVERNING FACILITY SURFACE HYDROLOGY ARE CONTAINED IN LAC 33:VII.711.A (TYPE I AND II LANDFILLS), LAC 33:VII.713.A (TYPE I AND II SURFACE IMPOUNDMENTS), LAC 33:VII.715.A (TYPE I AND II LANDFARMS), LAC 33:VII.717.C (TYPE I-A AND II-A FACILITIES) AND LAC 33:VII.719.C (TYPE III FACILITIES).

§521.C.1. THE FOLLOWING INFORMATION REGARDING SURFACE HYDROLOGY IS REQUIRED FOR ALL FACILITIES:

§521.C.1.a. A DESCRIPTION OF THE METHOD TO BE USED TO PREVENT SURFACE DRAINAGE THROUGH THE OPERATING AREAS OF THE FACILITY;

Based on U.S. Weather Bureau Technical Paper Number 40, the 24-hour, 25-year rainfall at the Vermilion Parish Solid Waste Plant is approximately 10.5 inches (refer to H:2a). Because the site is located below 31 degrees latitude, the design standard is 12 inches. Based on §711.A.3, the design storm for this site is, therefore, 12 inches.

The system of diversion levees and ditches on this site have been designed based on the peak discharges for the designated drainage areas. The discharges were computed using the Louisiana Department of Transportation and Development's hydraulic program, HYDR 1130 for Peak Runoff. Then, a graph of depth in feet versus capacity in cubic feet per second (cfs) was formulated based on Manning's formula and a trapezoidal channel with 2:1 side slopes and a 0.002 % slope. The depth of the ditches surrounding the drainage areas were interpolated based on the peak discharges as given by HYDR 1130. (Refer to the data and calculations in Appendix H:2). This system was designed to segregate and minimize runoff that has been in contact with those portions of the landfill disposal area (Area I-B **and Area II-B**) which have not yet received final or interim cover.

Refer to Exhibits A:6, and A:8 which depict the major features of the on-site drainage system.

Runoff from the Phase II **borrow area (north side)** and Phase III areas will be allowed to naturally drain into the coulees to the north ~~and east~~ of the landfill site, refer to Exhibit A:5. These areas will not be used as disposal areas at this time and will be utilized only as borrow areas. Therefore, no runoff/runon control system is required.

Within the Phase I **and Phase II-B** areas, runoff shall be segregated by temporary diversion levees, berms and ditches. **Interim berms shall be utilized to divert surface drainage through the proposed expansion areas of the landfill (north and east sides).** Segregation of runoff shall be dependant on whether or not the runoff has come into contact with Type II wastes which have not been covered by interim compacted cover or final cover. Runoff over Type II wastes having interim compacted cover or final cover shall be collected by the perimeter drainage system and allowed to drain directly into the storm water drainage ditches.

Runoff which has come into contact with Type II wastes (not covered by interim compacted cover or final cover) shall be collected and pumped to the oxidation pond.

Runoff through the Type III disposal areas may either be pumped from the excavation to a stormwater discharge point or allowed to runoff into stormwater drainage ditches and discharged.

The oxidation pond is equipped with a levee system which surrounds the entire unit. The levee has a top elevation of 18.0 MSL (three feet above the 100-year base flood elevation - refer to Exhibit A:4) and provides adequate freeboard. Side slopes on the levee are 3:1, as indicated in Exhibit A:9, and the levee has a grass cover to minimize erosion.

§521.D.1.g. FOR A FACILITY LOCATED IN AN UNSTABLE AREA, A DEMONSTRATION OF FACILITY DESIGN AS PROVIDED IN LAC 33:VII.709.C.3.

The Vermilion Parish site is not located in a "*unstable area*" as defined in LAC 33:VII.115 and 709.C.3. It is not underlain by Karst Terrane, and is not subject to naturally-induced mass movements such as landslides or those due to geologic faults. The site is free from "poor foundation conditions" which might tend to impair landfill structural components. The foundation effects common to even good sites as this one have been evaluated as shown below; these evaluations showed that no such impairment will occur.

Liner. As shown in the Response to LAC 33:VII.709.C.3.a and Paragraph (4.4.B.) of the *Geoscience Report*, the settlements will cause neither cracking of the clay portion of the liner nor over stressing of the synthetic portion.

Leachate Collection System. The leachate system has been designed to accommodate these settlements and still maintain positive gradients for drainage.

Run On/Run Off. Settlements due to any increment of load will be substantially complete within 5 years or less after load application. The majority of the settlements will occur during the active life of the facility; less than 1/3 the total settlements will take place after closure. The remaining consolidation settlements have been taken into account in the final cover slopes. These settlements will have virtually no effect on the levee heights and so will not affect run-on.

Slope stability has been analyzed both for the excavations and for the waste mass. Both have adequate safety factors (>**1.5** ~~2~~). **(Refer to the Report of Geoscience Investigation, Permit Modification #8 - Appendix F:7.)**

§521.F. FACILITY PLANS AND SPECIFICATIONS. STANDARDS GOVERNING FACILITY PLANS AND SPECIFICATIONS ARE CONTAINED IN LAC 33:VII.711.B (TYPE I AND II LANDFILLS), LAC 33:VII.713.B (TYPE I AND II SURFACE IMPOUNDMENTS), LAC 33:VII.715.B (TYPE I AND II LANDFARMS), LAC 33:717.E (TYPE I-A AND II-A FACILITIES), LAC 33:VII.721.A (TYPE III CONSTRUCTION AND DEMOLITION DEBRIS AND WOODWASTE LANDFILLS), LAC 33:VII.723.A (TYPE III COMPOSTING FACILITIES) AND LAC 33:VII.725.A (TYPE III SEPARATION FACILITIES). STANDARDS FOR GROUNDWATER MONITORING ARE CONTAINED IN LAC 33:VII.709.E (TYPE I AND II FACILITIES).

§521.F.1. CERTIFICATION-THE PERSON WHO PREPARED THE PERMIT APPLICATION MUST PROVIDE THE FOLLOWING CERTIFICATION:

> "I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND I AM FAMILIAR WITH THE INFORMATION SUBMITTED IN THIS PERMIT APPLICATION AND THAT THE FACILITY AS DESCRIBED IN THIS PERMIT APPLICATION MEETS THE REQUIREMENTS OF THE SOLID WASTE RULES AND REGULATIONS. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR KNOWINGLY SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT."

Engineering certifications are presented in Appendix H:1.

§521.F.4.b. A DESCRIPTION OF THE LINER SYSTEM, WHICH SHALL INCLUDE: CALCULATIONS OF ANTICIPATED LEACHATE VOLUMES, RATIONALE FOR PARTICULAR DESIGNS OF SUCH SYSTEMS AND DRAWINGS; AND

Pursuant to §315.G.1.b. and §315.G.2.c.ii., landfill bottom construction in excavated areas which have not received waste by October 9, 1993 shall be constructed in accordance with these regulations. The area indicated on the Exhibits as the "Subtitle D" area will be constructed in accordance with these regulations. All and only Type II municipal wastes received after December 31, 1997 will be disposed of within this area. [Note that the oxidation pond, in accordance with §713.B.3.a, is not governed by the liner standards set forth in that section.]

The composite liner system to be installed along the **side** slopes of the "Subtitle D" area **and above grade along the adjoining slopes between the Subtitle D area and the Type III Disposal Area I-C (north side) and the adjoining slope between Subtitle D area and Pre-Subtitle D Disposal Area I-A (north and east sides), as depicted on Exhibits A:7a, A:8, A:8a, and A:8b,** consists of **a geocomposite drainage layer (geonet bonded to a geotextile) over a** 60 mil HDPE synthetic liner over a geosynthetic clay liner over the existing soil material. **Prior to placement of waste in these areas, a layer of approximately 6-inches of earthen material shall be placed over the geocomposite.** The bottom of the "Subtitle D" area consists of a 1 foot thick protective layer of sand (USCS SP) which protects the underlying 60 mil HDPE synthetic liner. Beneath the synthetic liner is a 3 foot thick recompacted clay liner except for the easternmost section in the Subtitle D cell. For the section that drains into the leachate collection trench at Station 15+25 of the Subtitle "D" cell I-B, the Solid Waste Division approved an alternate proposed liner system. In place of the 3' recompacted clay liner, the bottom liner system shall consist of two feet (2') of clay material with the top 6" recompacted, covered by a geosynthetic clay liner (GCL). The HELP model was utilized to determine that the GCL liner system is hydraulically equivalent to the 3' recompacted clay liner. Refer to Appendix H:2 for these results. All liner installation activities will be inspected and certified by a registered professional engineer as required in the QA/QC plan for liner construction. The liner system described herein conforms to the requirements of §711.B.5.d.ii, and as such is considered to be compatible with the leachate generated from municipal solid waste.

Any leachate generated by the waste shall be prevented from migrating out of the disposal area by this liner system. The potential for migration of leachate through the liner shall be minimized by the leachate collection system. The leachate collection system shall consist of 6" diameter pipes having 3/8" perforations and encased in an aggregate bedding consisting of 1" washed gravel. A filter cloth will completely surround the gravel pack to prevent fines from entering and plugging the collection system. The collection system will be maintained in a pumped-down condition. As determined from the HELP model (see results in Appendix H:2), the quantity of leachate estimated after final cover is installed is approximately 1000 gallons per month. Refer to §521.F.4.c for a description of the oxidation pond.

NOTE: The Pre-Subtitle D area was utilized for disposal of solid waste prior to October 9, 1993; and therefore does not meet nor is required to meet the "Subtitle D Liner" requirements, in accordance with §315.G.2.c.ii. However, ~~the~~ **all** Subtitle D Disposal Areas ~~I-B~~ must and shall comply with these regulations as described herein. [The Subtitle D detail on Exhibit A:6 illustrates how the liner shall

be anchored on the side slopes.] ~~The Pre-Subtitle D Disposal Area I-A is separated from the Subtitle D Disposal Area I-B by an 18' MSL berm. Thus, the two liner systems do not tie-in.~~

§521.F.4.c. A DESCRIPTION OF THE LEACHATE COLLECTION AND REMOVAL SYSTEM, WHICH SHALL INCLUDE CALCULATIONS OF ANTICIPATED LEACHATE VOLUMES, RATIONALE FOR PARTICULAR DESIGNS OF SUCH SYSTEMS AND DRAWINGS.

The Pre-Subtitle D Disposal Area I-A is already equipped with a leachate collection system. Refer to Exhibit A:7 for an illustration of this system. However, the Subtitle D Disposal Areas I-B **and II-B** shall be equipped with a leachate collection and removal system which conforms to the requirements set forth in §711.B.4. This leachate system insures that the leachate shall not be absorbed by the waste, and that the impact of leachate on the environment is minimized. Additionally, the leachate removal system pumps the leachate generated to the oxidation pond via ~~a 4"~~ force mains to allow for proper treatment in an environmentally sound manner.

The Pre-Subtitle D leachate collection system consists of 6" perforated PVC arranged in each Pre-Subtitle D Disposal Area I-A unit. A catch basin is located in a corner of each unit, where the leachate collected from the separate lines in the unit converge. From each catch basin, the leachate flows by gravity to the Pre-Subtitle D pump station and is pumped to the oxidation pond. However, this Pre-Subtitle D pump station shall be converted to a manhole which will collect leachate from each Disposal Area I-A unit. ~~The existing 4" force main which currently carries the Pre-Subtitle D leachate shall be plugged and abandoned.~~ The Pre-Subtitle D leachate collected in the ~~newly~~ converted manhole ~~shall~~ naturally flows full through an 8" solid HDPE line to Pump Station No. 1, located on the southeast corner of the Subtitle D cell, and shall be pumped to the adjacent force main collection riser and through the 4" force main to the oxidation pond.

As shown in Exhibit A:6 and A:7, the bottoms of ~~the~~ Subtitle D Disposal Area I-B **and II-B** ~~has~~ **have** a herringbone (sawtooth) configuration. Elevations shown on **these** ~~this~~ drawings represent the bottom of the waste disposal area. The cross section of the landfill bottom (showing the sawtooth) shall be referred to as the transverse direction. The direction running along the ridges and valleys formed by the sawtooth shall be referred to as the longitudinal direction.

In the transverse direction, opposing slopes of 2% (minimum) form the herringbone pattern which is repeated. ~~every 175 feet.~~ Leachate collection pipes will be placed in each valley as shown in Exhibits A:7, A:7a, and A:7b. This configuration will ensure that leachate will travel no further than 100 feet along the bottom to reach the leachate collection lines. Longitudinally, the entire bottom slopes at 1%. Leachate collection lines run in the longitudinal direction along the valleys formed by the herringbone pattern and consequently slope at 1% also. As stated previously, the elevations shown on Exhibit A:6 represent the bottom of the disposal area.

The leachate collection system is installed directly above the synthetic liner and consists of 6 inch diameter pipes with 3/8" perforations and is encased in an aggregate bedding. Filter cloth completely encircles the aggregate bedding (comprised of washed gravel) and prevents fines from entering the collection system. Collection lines are installed in each valley formed by the herringbone pattern and follow the longitudinal slope of the landfill bottom. Cleanout risers shall be provided for each collection line as shown in Exhibits A:7a and A:7b. (The average length of the collection lines is approximately 325 feet **in Area I-B and 525 feet in Area II-B**. ~~A jet machine (as furnished by a local Jet-A-Rooter company) has the capability of accessing up to lengths of 500 feet. The~~ **A jet**

machine can be inserted in the cleanout risers which are exposed to the ground surface and through the entire length of the leachate line. The jet machine is a high pressure water system which is able to unclog the perforated holes in a leachate system.) Leachate collected in the leachate lines shall be pumped into the adjacent force main collection riser to the leachate pump station.

Contaminated water (leachate) in the vicinity of the sloped areas will be managed by infiltrating into the waste mass in the existing Subtitle D area (Area I-B), which will then be pumped out of the leachate collection system, thence to the oxidation pond for treatment. A toe drain on the north and east sides of this area will also be provided as depicted on the Detail of Piggyback Liner Tie-In on Exhibit A:8. These lines will drain into closed manholes. Sump pumps will be used to draw down the leachate in the manholes and pump to the leachate pump stations numbers 3 and 4 via a 4-inch force main. All contaminated runoff and leachate will then be pumped from the leachate pump station to the oxidation pond for treatmnet. Stormwater runoff may also be collected in the perimeter ditch system at the northwest corner and the southeast corner of Area I-B, which is also collected in the leachate pump station and pumped to the oxidation pond, until such time that this unit of the landfill is closed.

~~Controls will be utilized to engage the leachate pumps such that~~ The **leachate** collection system **shall be** ~~is~~ maintained in a pumped down condition, or as per the regulations. Leachate gathered at the pump station will then be directed, via a force main, to the oxidation pond for treatment. **Additional leachate volumes anticipated from the vertical expansion of the existing Subtitle D area, as well as the sloped area on the north and east of the Subtitle D area I-B, which will be generated is less than 10-percent of the previously estimated leachate volumes calculated for this area. Attached in Appendix H:2 are the output files from the HELP model prior to and after the increased height and expanded area, as well as the calculations for the oxidation pond. An additional 3.4± acres will be potentially exposed to run-off.** ~~The HELP model predicts a leachate generation rate of approximately 1,000 gallons per month once final cover is installed. Refer to Appendix H:2 for the results from the model.~~

The HELP model was used for calculating leachate volumes, and the 25-year, 24-hour rainfall was used for estimating contaminated stormwater runoff. Based on these calculations, the treatment efficiency of the oxidation pond will only be reduced by approximately one day during wet weather, which is not considered to be significant. Additionally, the Louisiana Department of Transportation and Development's HYDR1130 program was utilized to calculate the peak discharge in cubic feet per second (cfs) using the SCS method. The peak discharges were computed for the two drainage areas in the existing Subtitle D cell, Area IB for pre-piggyback slope liner conditions and the post-piggyback slope liner conditions. The maximum of these computed peak discharges (95 cfs) was used to determine whether the existing perimeter ditches could accommodate these peak discharges. Based on a depth of flow of 2.25-feet with the existing ditch configuration, the ditches can handle up to 110 cfs peak discharge using the HYDR1140 program. Therefore, the existing perimeter ditch configuration can accomodate the additional anticipated contaminated stormwater runoff volumes from the piggyback slope liner.

The oxidation pond at the Vermilion Parish Solid Waste Plant is provided to treat the leachate generated within the disposal units. The oxidation pond is a 3.9 acre aerobic-anaerobic pond (facultative pond) with a depth ranging from three feet (3') to six feet (6'). Photosynthesis and

surface reaeration provide oxygen for aerobic stabilization in the upper layer. The stabilization of wastes in the middle layer is brought about by a combination of aerobic, anaerobic, and facultative bacteria. The bottom layer, which collects the settlement of solids, undergoes anaerobic digestion. Once the water level of the first cell reaches a certain level, the wastewater flows to the second cell and the above described process repeats. Refer to the calculations in Appendix H:2 for the oxidation pond. ~~For a 12-day detention time, the oxidation pond can treat over 317,500 gallons of leachate per day. The HELP model reveals only 1,000 gallons per month will be generated. However,~~ **O**perational experience indicates approximately 5,000-6,000 gallons per month are pumped to the oxidation pond at the present time. Therefore, the oxidation pond is more than adequate to treat the anticipated leachate volumes.

To determine the composition of the leachate, §711.D.4.b.vi requires annual collection and analysis of the raw leachate for the parameters in Table 2, Assessment Monitoring Parameters, of Appendix C:1 - Groundwater Monitoring Plan. ~~The Vermilion Parish Solid Waste Plant's previous permit did not require testing of the raw leachate for these parameters; however, arrangements are currently being made to annually test the raw leachate.~~ The results shall be kept on file at the landfill office for the life of the facility and three years after closure. The Vermilion Parish Solid Waste Plant shall submit the results of the initial leachate testing to the Department to fulfill this regulation requirement. The table on the following page lists **the** typical data on the composition of raw leachate **from this facility.** ~~a mature landfill, approximately 18 years (the Vermilion Parish Solid Waste Plant has been in operation since 1978).~~

Raw Leachate

Constituent	Value, mg/L
BOD_5	200
TOC	160
COD	500
Total Suspended Solids	400
Organic Nitrogen	120
Ammonia Nitrogen	40
Nitrate	10
Total Phosphorus	10
Ortho phosphorus	8
Alkalinity as $CaCO_3$	1000
pH	7.5
Total Hardness as $CaCO_3$	500
Calcium	400
Magnesium	200
Potassium	400
Sodium	200
Chloride	400
Sulfate	50
Total Iron	200

* Typical values selected from Tchobanoglous/Thiesen/Vigil - Intrgated Solid Waste Management, 1993.

§521.I.1.b. DETAILS ON PHASED IMPLEMENTATION IF ANY PROPOSED FACILITY IS TO BE CONSTRUCTED IN PHASES.

~~The transition of the current operation of the Vermilion Parish Solid Waste Plant into the requirements described in this permit application will entail the following:~~

~~Municipal Solid Waste shall be disposed of within the Phase I-A, Pre-Subtitle D disposal area until January 14, 1998. Thereafter,~~ Municipal Solid Waste shall be disposed of within ~~the Phase~~ **Area** I-B, Subtitle D disposal area. ~~At this time the Area I-A area will be covered with a 2' thick interim compacted cover.~~ The remaining permitted airspace within the Phase I-A **Pre-Subtitle D** area will be utilized as a Type III disposal area. Once Area I-A has reached the final contours shown on Exhibit A:8, final cover and the gas venting system will be installed in accordance with the permit. Type III construction/demolition debris and yard trash will also be disposed of within the Phase I-C disposal area, ~~and wood ash from the Vermilion Parish ACD will be disposed of within the Phase I-E disposal area~~.

For the slope liner tie-in in the Area I-B, Subtitle D disposal area over the pre-Subtitle D disposal areas, the piggyback liner system will be constructed in phases. The east and north liner systems will initially be constructed approximately mid-way in elevation to the proposed final contours, then the remainder of these side slopes will be lined as they approach final contours. It is estimated that the initial phase of construction will commence immediately upon approval of this permit modification, and the remaining phase will be constructed within one year from that date. The remaining slopes will be constructed as the cell reaches final contours.

§521.J. FACILITY CLOSURE. STANDARDS GOVERNING FACILITY CLOSURE ARE CONTAINED IN LAC 33:VII.711.E (TYPE I AND II LANDFILLS), LAC 33:VII.713.E (TYPE I AND II SURFACE IMPOUNDMENTS), LAC 33:VII.715.E (TYPE I AND II LANDFARMS), LAC 33:VII.717.I (TYPE I-A AND II-A FACILITIES), LAC 33:VII.721.D (CONSTRUCTION AND DEMOLITION DEBRIS AND WOODWASTE LANDFILLS), LAC 33:VII.723.D (TYPE III COMPOSTING FACILITIES) AND LAC 33:VII.725.D (TYPE III SEPARATION FACILITIES).

§521.J.1. THE CLOSURE PLAN FOR ALL FACILITIES MUST INCLUDE THE FOLLOWING:

§521.J.1.a. THE DATE OF FINAL CLOSURE;

Based on current projections, the Vermilion Parish Solid Waste Plant shall be in operation for the next 20 **years**. The Vermilion Parish Police Jury shall inform the Administrative Authority of the intent to close units of the landfill. This notification will be submitted at least 90 days before the intended closure date and shall include the date of intended closure.

At the time that the Vermilion Parish Police Jury notifies the Administrative Authority of the intent to close a unit of the landfill the Vermilion Parish Police Jury with an updated closure schedule and closure cost estimate.

It is anticipated that the existing Subtitle D Cell (Area I-B) will undergo final closure within a three (3) year time frame of the construction of the piggyback liner system (est. mid-2009).

§521.J.2.c. AN ESTIMATE OF THE MAXIMUM INVENTORY OF SOLID WASTE EVER ON-SITE OVER THE ACTIVE LIFE OF THE FACILITY; AND

It is estimated that the facility's total design capacity is approximately 3,000,000 cubic yards. Of that total, approximately ~~900,000~~ **1,000,000** cubic yards have been or will be utilized for the disposal of municipal solid waste (putrescible waste), **which includes the slope liner system for the Subtitle D Area I-B.**

§521.J.2.d. A SCHEDULE FOR COMPLETING ALL ACTIVITIES NECESSARY FOR CLOSURE.

A detailed schedule for the closure of this facility shall be presented at the time of notification of facility closure to LDEQ. Since the facility will be in operation for an additional 20 years, it is impossible to formulate a detailed closure schedule at this time.

It is estimated that final contours of the existing Subtitle D Cell will be achieved by mid-2009. Upon reaching final contours, installation of the final cover and cap will be initiated within 180 days, which is estimated to be at the end of 2009. The passive gas system shall then be installed within 90 days following the completion of the final cover and cap, by the end of the first quarter, 2010.

§521.L.3. EVIDENCE OF LIABILITY COVERAGE, INCLUDING:

§521.L.3.a. PERSONAL INJURY, EMPLOYEES AND THE PUBLIC (COVERAGE, CARRIERS AND ANY EXCLUSIONS OR LIMITATIONS);

§521.L.3.b. PROPERTY DAMAGE (COVERAGE AND CARRIER);

§521.L.3.c. ENVIRONMENTAL RISKS; AND

The Vermilion Parish Police Jury, owner and operator of the facility, no longer maintains general liability insurance; however, it does maintain workman's compensation coverage, as well as automobile coverage. The Jury is self-insured for all other claims, including environmental risks.

To fulfill the specific liability requirements, the Police Jury provides the attached "Letter of Credit" in accordance with LAC 33:VII.727.A.1.

Member FDIC

FIRST GUARANTY BANK

SOLID WASTE FACILITY IRREVOCABLE LETTER OF CREDIT

October 13, 2006

Secretary
Louisiana Department of Environmental Quality
Post Office Box 4303
Baton Rouge, Louisiana 70821-4303
Attention: Office of Management and Finance,
Financial Services Division

Dear Sir:

We hereby establish our Irrevocable Standby Letter of Credit No. 2770 at the request and for the account of the Vermilion Parish Police Jury, Courthouse Building, 100 N. State Street – Suite 200, Abbeville, Louisiana 70510 for its AI #148, Facility ID #D-113-0023, Type II and III Solid Waste Disposal Facility, Vermilion Parish Solid Waste Plant, Permit Number P-0030 at 8500 Birch Road, Abbeville, Louisiana, in favor of any governmental body, person, or other entity for any sum or sums up to the aggregate amount of U.S. dollars $1,000,000.00 upon presentation of:

1. A final judgment issued by a competent court of law in favor of a governmental body, person, or other entity and against Vermilion Parish Police Jury for sudden and accidental occurrences for claims arising out of injury to persons or property due to the operation of the solid waste site at the Vermilion Parish Solid Waste Plant at 8500 Birch Road, Abbeville, Louisiana as set forth in the LAC 33:VII.727.A.1.

2. A sight draft bearing reference to the Letter of Credit No. 2770 drawn by the governmental body, person, or other entity, in whose favor the judgment has been rendered as evidenced by documentary requirement in Paragraph 1.

The Letter of Credit is effective as of 10-13-2006 and will expire on 10-13-2007, but such expiration date will be automatically extended for a period of at least one year on the above expiration date 10-13-2007 and on each successive expiration date thereafter, unless, at least 120 days before the then-current expiration date, we notify both the administrative authority and Vermilion Parish Police Jury by certified mail that we have decided not to extend this Letter of Credit beyond the then-current expiration date. In the event we give such notification, any unused portion of this Letter of Credit shall be available upon presentation of your sight draft for 120 days after the date of receipt by both the Department of Environmental Quality and Vermilion Parish Police Jury as shown on the signed return receipts.

Whenever this Letter of Credit is drawn under and in compliance with the terms of this credit, we shall duly honor such draft upon presentation to us, and we shall deposit the amount of the draft directly into the standby trust fund of Vermilion Parish Police Jury in accordance with the administrative authority's instructions.

Except to the extent otherwise expressly agreed to, the Uniform Customs and Practice for Documentary Letters of Credit (1983), International Chamber of Commerce Publication No. 400, shall apply to this Letter of Credit.

We certify that the wording of this Letter of Credit is identical to the wording specified in LAC 33:VII.727.A.1.d.ii.(e), effective on the date shown immediately below.

First Guaranty Bank

By: _____
Bart J. Leader, Jr.
Senior Vice President and
Commercial Lending Division Head

By: _____
Michael R. Sharp
President and
Chief Executive Officer

10/13/2006
Effective Date

§521.L.4. EVIDENCE OF A FINANCIAL ASSURANCE MECHANISM FOR CLOSURE AND/OR POST-CLOSURE CARE.

The permit holder shall provide financial assurance for the closure and post-closure care cost (refer to Appendix G:2) by either of the following mechanisms, in accordance with LAC 33:VII.727.A:2.

- **Letter of Credit**
- **Local Government Financial Test**

Responses to §523
Part III: Additional Supplementary Information

§523. PART III ADDITIONAL SUPPLEMENTARY INFORMATION

THE FOLLOWING SUPPLEMENTARY INFORMATION IS REQUIRED FOR ALL SOLID WASTE PROCESSING AND DISPOSAL FACILITIES. ALL RESPONSES AND EXHIBITS MUST BE IDENTIFIED IN THE FOLLOWING SEQUENCE TO FACILITATE THE EVALUATION:

§523.A. A DISCUSSION DEMONSTRATING THAT THE POTENTIAL AND REAL ADVERSE ENVIRONMENTAL EFFECTS OF THE FACILITY HAVE BEEN AVOIDED TO THE MAXIMUM EXTENT POSSIBLE;

The Vermilion Parish Solid Waste Plant is an existing Type II and III solid waste disposal facility which was permitted on June 4, 1986 and has been in continuous operation since that time. To date, many improvements and upgrades have been incorporated into the facility in an effort to make the site safer and more environmentally friendly. The permit modification under consideration is a ~~mandatory permit modification, however, it will also bring the facility into conformance with Subtitle D requirements~~ **permit modification to expand the existing Subtitle D cell airspace by lining the side slopes above grade and to increase the overall height of the landfill. By lining the side slopes of the existing cell, the facility is maximizing the existing permitted Subtitle D acreage.**

The following elements of the environment will be affected by the facility:

AIR: Minor amounts of dust and noise will be generated due to the nature of the facility. However, these problems will only occur during normal working hours. All-weather roads will eliminate the majority of the dust that would be generated. In an effort to further prevent the down-stream spread of odors, the facility has recently installed a tree line to serve as a natural buffer on the south side of the facility. The facility currently has tree-lines on the northern and eastern side of the facility to prevent the spread of odors. Furthermore, the site is located in a rural area.

WATER: Surface water is prevented from coming into contact with the waste area by the levee system surrounding the disposal areas. Stormwater runoff which has come into contact with the waste areas and is considered contaminated is routed to the oxidation pond for proper treatment. The facility currently has a Louisiana Pollutant Discharge Elimination System (LPDES) permit for monitoring all discharges from the facility.

SOIL: The facility meets all Subtitle D requirements for the liner systems. Additionally, the facility has a groundwater monitoring program to detect leaching of wastes into the ground and groundwater.

Based on the factors now present it appears that the Vermilion Parish Solid Waste Plant, has, to the extent possible, minimized any potential or real adverse environmental effects.

§523.B. A COST-BENEFIT ANALYSIS DEMONSTRATING THAT THE SOCIAL AND ECONOMIC BENEFITS OF THE FACILITY OUTWEIGH THE ENVIRONMENTAL-IMPACT COSTS;

As mentioned previously, the Vermilion Parish Solid Waste Plant is an existing Type II and III facility that was **originally** permitted on June 4, 1986. The landfill is owned **and operated** by the Vermilion Parish **Police Jury** ~~Solid Waste Plant Commission~~ which is a public body comprised of elected officials ~~and public servants from the Vermilion Parish Police Jury and parish municipalities. The composition of this body guarantees that the residents of Vermilion Parish are aware of landfill activities~~. **The residents of Vermilion Parish pay a sales tax for their solid waste collection and disposal, in lieu of monthly rates. Therefore, the residents of Vermilion Parish are aware of landfill activities.**

Because of the above factors, there is a healthy public interest in the operation of the landfill and there is strong public support for the facility. Additionally, just as residents are aware of the relative safety of the facility, they are also aware of the positive economic impact that the facility has on Vermilion Parish.

The costs associated with the tie-in liner system is approximately $225,000. This system will provide an additional 100,000 cubic yards of airspace, or approximately 40,000 gate tons (140,000 gate yards). Based on the current out-of-Parish disposal rates ($9.85/cubic yard) at the Jefferson Davis Parish Sanitary Landfill, the nearest permitted Type II disposal facility, the costs for disposal <u>only</u> of 40,000 gate tons is approximately $1,379,000. The cost difference does not include the cost for transporting the waste from the Vermilion Parish Solid Waste Plant to the Jefferson Davis Parish Sanitary Landfill.

Since the Vermilion Parish Solid Waste Plant is an existing facility, the additional environmental impact costs associated with the tie-in liner system are minimal. Therefore, the social and economic benefits of the facility outweigh the environmental impact costs.

§523.C. A DISCUSSION AND DESCRIPTION OF POSSIBLE ALTERNATIVE PROJECTS WHICH WOULD OFFER MORE PROTECTION TO THE ENVIRONMENT WITHOUT UNDULY CURTAILING NONENVIRONMENTAL BENEFITS;

The favorable site conditions present at this existing facility make this an ideal site for a solid waste disposal facility. The combination of natural subsurface features and manmade protective features make this site especially safe. **This facility has been in successful operation for a number of years.** These factors, taken together limit or exclude any alternate projects which would offer greater environmental protection with or without consideration of nonenvironmental benefits.

Additionally, since this is an existing permitted facility, maximizing the existing airspace available in the Subtitle D disposal cells actually offers more protection to the environment as less horizontal expansion would be required for the disposal of municipal solid waste.

§523.D. A DISCUSSION OF POSSIBLE ALTERNATIVE FACILITIES WHICH WOULD OFFER MORE PROTECTION TO THE ENVIRONMENT WITHOUT UNDULY CURTAILING NONENVIRONMENTAL BENEFITS; AND

The costs associated with the tie-in liner system is approximately $225,000. This system will provide an additional 100,000 cubic yards of airspace, or approximately 40,000 gate tons (140,000 gate yards). Based on the current out-of-Parish disposal rates ($9.85/cubic yard) at the Jefferson Davis Parish Sanitary Landfill, the nearest permitted Type II disposal facility, the costs for disposal only of 40,000 gate tons is approximately $1,379,000. The cost difference does not even include the cost for transporting the waste from the Vermilion Parish Solid Waste Plant to the Jefferson Davis Parish Sanitary Landfill. Furthermore, the Jefferson Davis Parish Sanitary Landfill utilizes the same or similar technology for waste disposal.

The favorable site conditions present at this existing facility make this an ideal site for a solid waste disposal facility. The combination of natural subsurface features and manmade protective features make this site especially safe. **This facility has been in successful operation for a number of years.** These factors, taken together limit or exclude any alternate projects which would offer greater environmental protection with or without consideration of nonenvironmental benefits.

§523.E. A DISCUSSION AND DESCRIPTION OF THE MITIGATING MEASURES WHICH WOULD OFFER MORE PROTECTION TO THE ENVIRONMENT THAN THE FACILITY, AS PROPOSED, WITHOUT UNDULY CURTAILING NONENVIRONMENTAL BENEFITS.

As mentioned previously, the favorable site conditions present at this existing facility make this an ideal site for a solid waste disposal facility. The combination of natural subsurface features and manmade protective features make this site especially safe. ~~This mandatory permit modification will serve to upgrade the facility to Subtitle D standards. The proposed improvements will meet or exceed the Subtitle D requirements.~~ Additional mitigating measures would involve a great deal of cost and would offer little if any additional protection to the environment or human health.

Additionally, since this is an existing permitted facility, maximizing the existing airspace available in the Subtitle D disposal cells actually offers more protection to the environment as less horizontal expansion would be required for the disposal of municipal solid waste.

LAC 33:I.1701
Addendum to Permit Applications

Media Type (check one)
Hazardous Waste ☐ Air ☐
Solid Waste ☒ Water ☐
Radiation Licensing ☐

Agency Interest Number: 148
Is this a copy of a previously submitted form? Yes ☐ No ☒
If yes, indicate the original submittal date: ____
If yes, indicate the original permit number: ____

Department of Environmental Quality Permits Division P.O. Box 4313 Baton Rouge, LA 70821-4313 (225) 219-3181	**Addendum to Permit Applications per LAC 33:I.1701**	

Please Type Or Print	Company Name Vermilion Parish Police Jury	☒ Owner ☒ Operator	For Permits Division Use Only
	Parent Company (If Company Name given above is a division)		
	Plant name (if any) Vermilion Parish Solid Waste Plant		
	Nearest town Abbeville	Parish where located Vermilion	

1. Does the company or owner have federal or state environmental permits identical to, or of a similar nature to, the permit for which you are applying in other states? (This requirement applies to all individuals, partnerships, corporations, or other entities who own a controlling interest of 50% or more in your company, or who participate in the environmental management of the facility for an entity applying for the permit or an ownership interest in the permit.)

   ☒ Permits in Louisiana. List Permit Numbers: P-0030, Wastewater Discharge

   ☐ Permits in other states (list states): Permits LA0056031, LA0103691, LAG531098, LAG530999, LAG541010

2. Do you owe any outstanding fees or final penalties to the Department? No☒ Yes☐
   If yes, please explain. _____

3. Is your company a corporation or limited liability company? No☒ Yes☐ If yes, attach a copy of your company's Certificate of Registration and/or Certificate of Good Standing from the Secretary of State.

Certification:

I certify, under provisions in Louisiana and United States law which provide criminal penalties for false statements, that based on information and belief formed after reasonable inquiry, the statements and information contained in this Addendum to the Permit Application, including all attachments thereto are true, accurate, and complete.

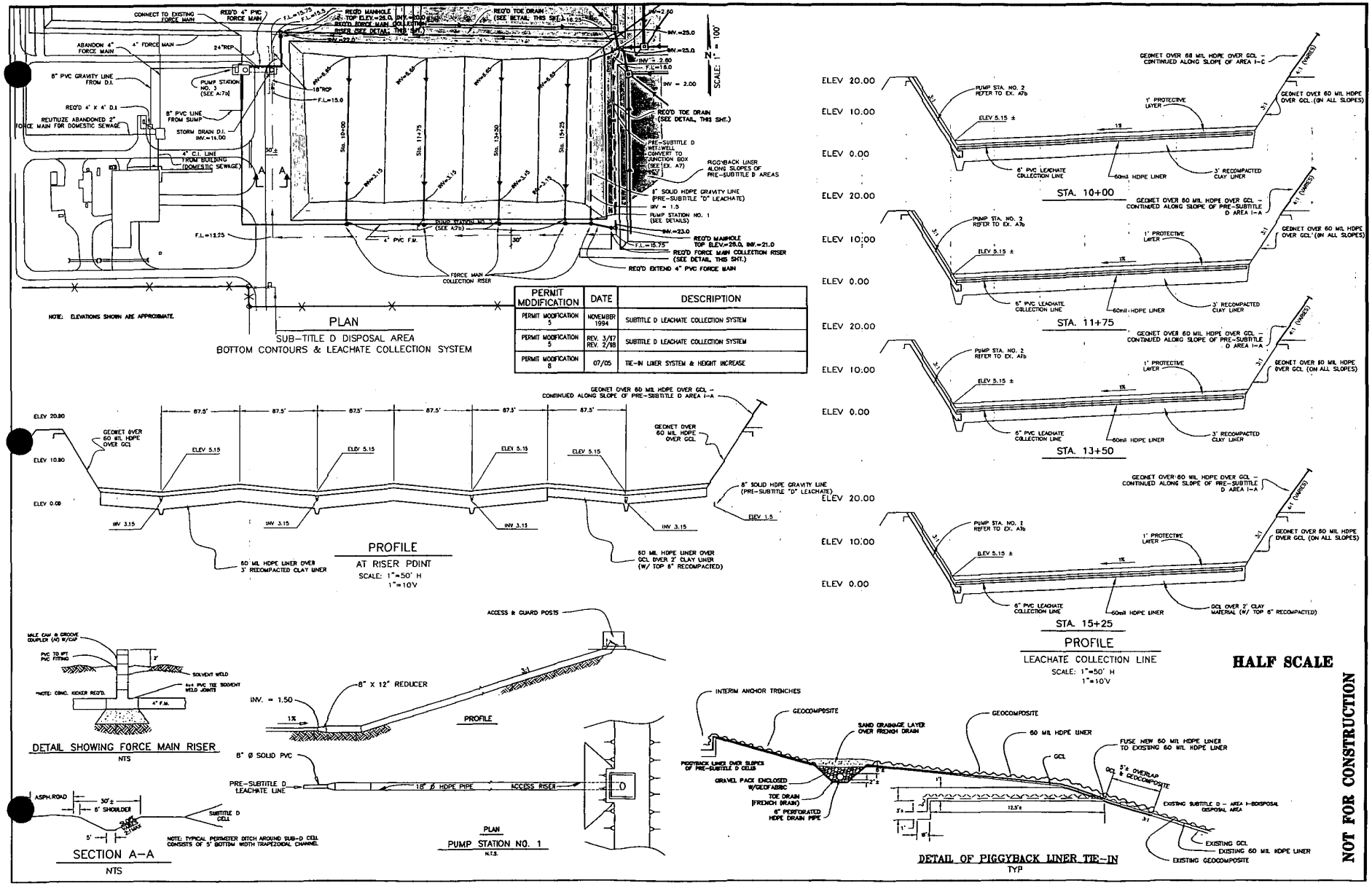
Responsible Official

Name Hubert Faulk	City Abbeville	State La	Zip 70510
Title President	Business phone (337) 898-4300		
Company Vermilion Parish Police Jury	Signature of responsible official(s) Hubert Faulk		
Suite, mail drop, or division Suite 200	Date 7/18/2005		
Street or P.O. Box 100 North State Street - Courthouse Building			

form_7037_r03
06/30/04

Appendix A

Drawings



PERMIT MODIFICATION	DATE	DESCRIPTION
PERMIT MODIFICATION 5	NOVEMBER 1994	SUBTITLE D LEACHATE COLLECTION SYSTEM
PERMIT MODIFICATION 5	REV. 3/97 REV. 2/98	SUBTITLE D LEACHATE COLLECTION SYSTEM
PERMIT MODIFICATION 8	07/05	TIE-IN LINER SYSTEM & HEIGHT INCREASE

STATE OF LOUISIANA
E.M. SELLERS
Reg. No. 8457
REGISTERED PROFESSIONAL ENGINEER IN CIVIL ENGINEERING

REVISIONS	
DATE	BY
11/96	DM
3/97	DM
7/97	DM
2/98	DM
10/04	DMS
07/05	DMS

SHEET DESCRIPTION
EXHIBIT A-7a

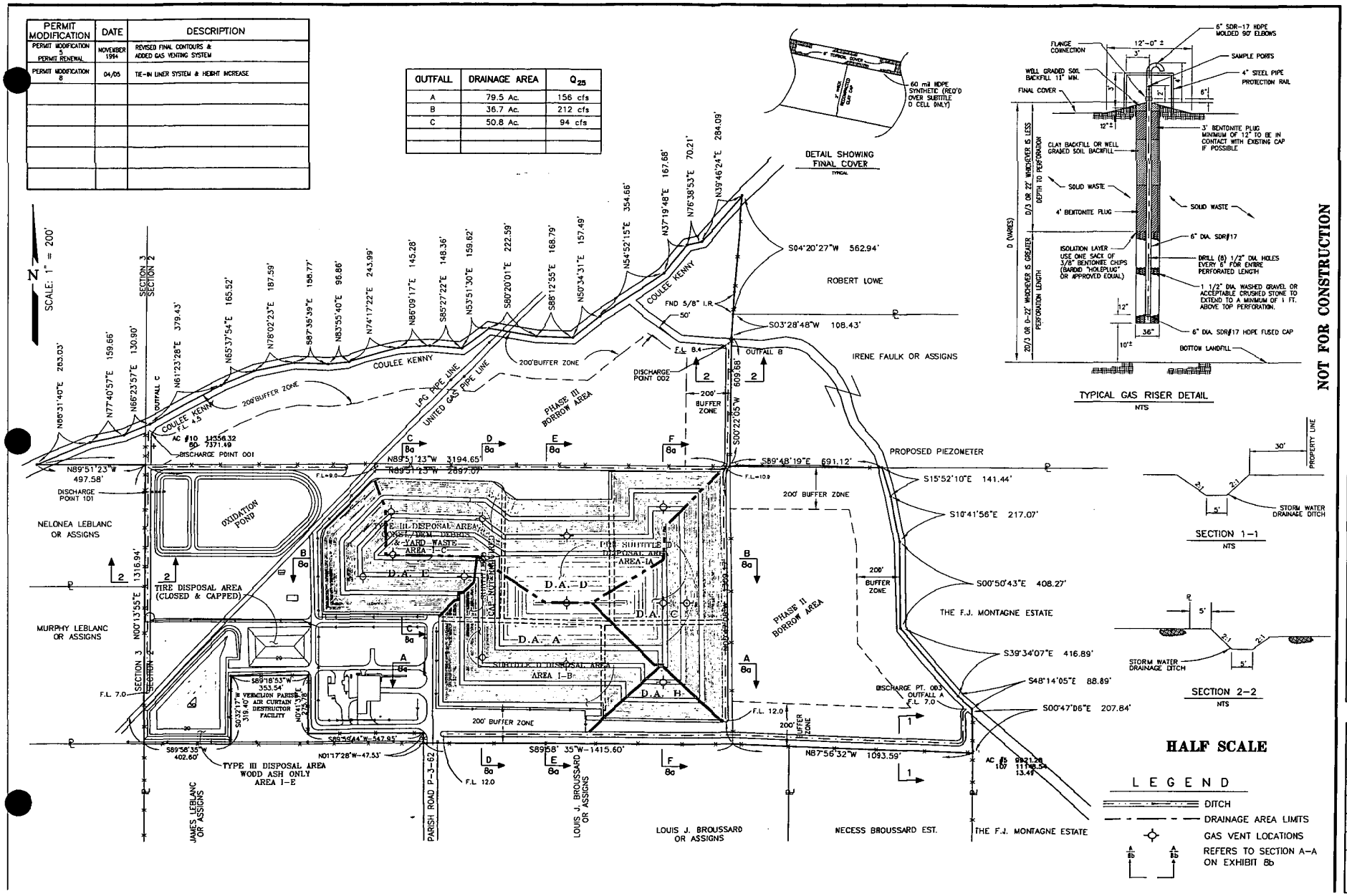
Sellers & Associates, Inc.
ENGINEERS PLANNERS SURVEYORS
Hammond - Ponchatoula - Amite - Baton Rouge

SUPPLEMENTAL SHEET
LEACHATE COLLECTION SYSTEM DETAILS
VERMILION PARISH SOLID WASTE PLANT

ENGINEER	WSC
DRAWN BY	JFT
DATE	1994
SCALE	1" = 100'
PROJECT NO.	5261-02
FILE NO.	V-13-16
ACAD. DWG. NO.	5263-27\PERMITS\PMB\A7A

PERMIT MODIFICATION	DATE	DESCRIPTION
PERMIT MODIFICATION 5 PERMIT RENEWAL	NOVEMBER 1994	REVISED FINAL CONTOURS & ADDED GAS VENTING SYSTEM
PERMIT MODIFICATION 8	04/05	TIE-IN LINER SYSTEM & HEIGHT INCREASE

OUTFALL	DRAINAGE AREA	Q_{25}
A	79.5 Ac.	156 cfs
B	36.7 Ac.	212 cfs
C	50.8 Ac.	94 cfs



STATE OF LOUISIANA
E.M. SELLERS
Reg. No. 8457
REGISTERED PROFESSIONAL ENGINEER IN CIVIL ENGINEERING

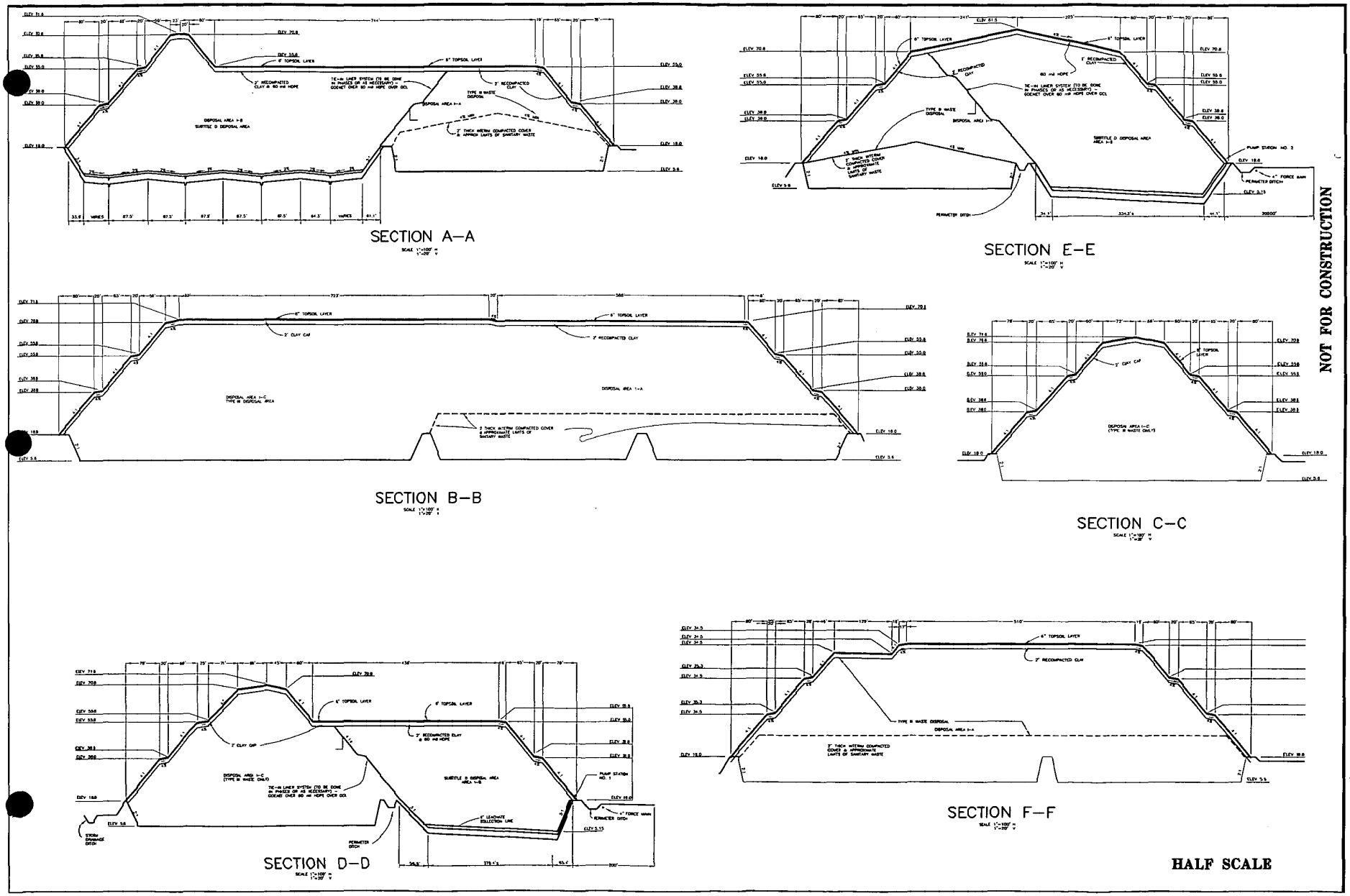
REVISIONS	
DATE	BY
11/96	DM

SHEET DESCRIPTION
EXHIBIT A-8

Sellers & Associates, Inc.
ENGINEERS SURVEYORS PLANNERS
Lafayette - Abbeville Louisiana

SITE PLAN SHOWING FINAL CONTOURS
VERMILION PARISH SOLID WASTE PLANT

ENGINEER	WSC
DRAWN BY	JFF
DATE	1994
SCALE	1" = 200'
PROJECT NO.	5263-02
FILE NO.	V-11-16
ACAD. DWG. NO.	DWG\EMS\5263\5263A8



STATE OF LOUISIANA
E.M. SELLERS
Reg. No. 8457
REGISTERED PROFESSIONAL ENGINEER IN CIVIL ENGINEERING

REVISIONS	
DATE	BY
11/96	DM

SHEET DESCRIPTION
EXHIBIT A:8a

Sellers & Associates, Inc.
ENGINEERS SURVEYORS PLANNERS
Lafayette – Abbeville Louisiana

SUPPLEMENTAL SHEET
CROSS SECTIONS
VERMILION PARISH SOLID WASTE PLANT

ENGINEER	WSC
DRAWN BY	GLW
DATE	1995
SCALE	1" = 100'
PROJECT NO.	5263-02
FILE NO.	V-13-16
ACAD. DWG. NO.	DWG\EMS\5263\5263ABA

Appendix B:4

Letters of Notification to the FAA and Airport Operator

FILE: VAPT 5263-27

U.S. Department
of Transportation
**Federal Aviation
Administration**

Federal Aviation Administration
Southwest Region
Airports Division

Fort Worth, Texas 76193-0600

MAR 1 3 2006

Ms. Dana Montet Simon, M.S., P.E.
Sellers and Associates, Inc
148 B Easy Street
Lafayette, LA 70506-3095

Dear Ms. Simon:

This is in response to your letter of July 15, 2005, about a permit modification to increase the height of the Vermilion Parish Solid Waste Plant. If approved, the final landfill contours increase the height from 67.7 MSL to 81.5 MSL.

The solid waste plant is approximately 4.045 miles from the Abbeville Chris Crust Memorial Airport. We reviewed the proposed modifications to determine if the landfill was compatible with the airport and in view of its potential to attract wildlife. We do not object to the proposed modifications on the following conditions:

1. The facility must be properly supervised to assure there is no increase in bird populations and that appropriate control procedures are followed.

2. Any increase in bird activity that might be hazardous to safe aircraft operations will result in prompt mitigation actions and/or closure of the landfill.

3. Coordination with the Federal Aviation Air Traffic Division, Airspace Evaluation section be conducted to ensure the final elevation of the landfill does not fall within the criteria of Part 77 of the Federal Aviation Regulations, "Objects Affecting Navigable Airspace."

4. The above conditions are clearly defined during the state licensing procedures.

We have assigned this proposed permit modification site No. 26-001LA. Please refer to this number on future correspondence. Thank you for coordinating this proposal with us. If you have any questions, call me at (817) 222-5656.

Sincerely,

Faye Nedderman
Executive Technical Assistant

RECEIVED

MAR 15 2006

SELLERS &
ASSOCIATES, INC.

LDEQ-EDMS Document 35926858, Page 47 of 154

cc: Louisiana Department of
Environmental Quality
602 N. Fifth Street Baton Rouge, LA 70802

Division of Aviation
Louisiana Department of
Transportation and Development
P.O. Box 94245
Baton Rouge, LA 70804-9245

Abbeville Chris Crusta Memorial Airport
P.O. Box 1170
Abbeville, LA 70511

Sellers & Associates, Inc.
ENGINEERS SURVEYORS
ELIZABETH S. GIROUARD, PRESIDENT
TODD A. VINCENT, VICE PRESIDENT

EUGENE M. SELLERS, PE., PLS.
WARREN P. BEEDLE, PE., PLS.
TODD A. VINCENT, M.S., PE., PLS.
ELIZABETH S. GIROUARD, C.E.
DANA MONTET SIMON, M.S., PE.
LARRY A. CRAMER, PE.
BRIAN M. RONKARTZ, PE.
A. DAVID SUIRE, PE.
JOSHUA P. STUTES, PE.
STEVE A. DRONET, E.I.
WILBERT J. GUIDRY, PLS.

CERTIFIED MAIL #7000 0520 0021 9539 8304

July 15, 2005

Mr. William E. Mitchell
Airport Certification Safety Inspector
FEDERAL AVIATION ADMINISTRATION
DOT/FAA ASW-621B
2601 Meacham Boulevard
Fort Worth, Texas 76137

Re: Vermilion Parish Police Jury
Vermilion Parish Solid Waste Plant
Permit Modification #8 - Height Increase
File Number 5263-27

Dear Mr. Mitchell:

The Louisiana Administrative Code (LAC 33:VII.709.A.2) requires that the FAA, along with any affected airports, be notified of landfills which dispose of putrescible solid waste within a 5-mile radius of public use airports.

On behalf of the Vermilion Parish Police Jury, please be advised that the Vermilion Parish Solid Waste Plant is located approximately 4.5 miles northwest of the Abbeville Municipal Airport as shown on the attached map. This solid waste disposal facility is an ***existing*** facility and was permitted on June 4, 1986. The facility is owned by the Vermilion Parish Police Jury, which is a public body. The facility is proposing a height increase in the overall final contours of the facility from 67.7-feet MSL to 81.5-feet MSL.

This letter serves to formally notify the Federal Aviation Administration pursuant to the above referenced regulations. By copy of this letter, we also notify the City of Abbeville (owner of the Abbeville Municipal Airport) as required in the regulations.

Should you have any questions or require any further information, please do not hesitate to contact our office.

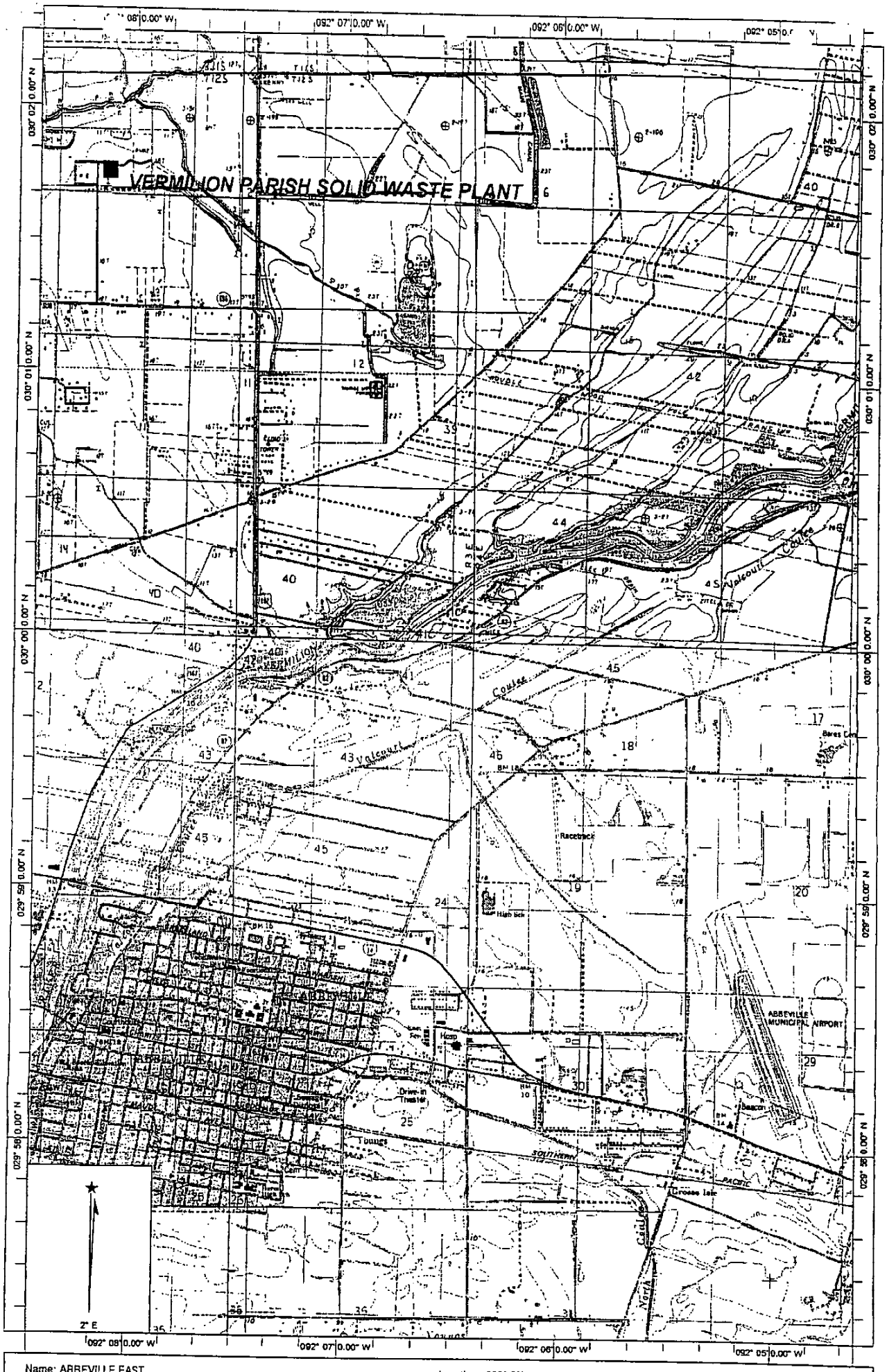
Sincerely,

SELLERS & ASSOCIATES, INC.

Dana Montet Simon

DANA MONTET SIMON, M.S., P.E.

N:\DATA\5263\5263-27\PERMITS\PM8 - TIE IN LINER\PM8-dms-lt05 airport.wpd
Enclosure
c: Ms. Beth Scardina, Environmental Scientist Manager - Solid & Hazardous Waste Permits Section
LDEQ, P.O. Box 4313, Baton Rouge, La. 70821-4313
City of Abbeville (CERTIFIED MAIL #7000 0520 0021 9539 8311) w/ attachment
LDEQ - Acadiana Regional Office
All Vermilion Parish Police Jurors
Mr. Rick Leblanc, Superintendent - VPSWP



Name: ABBEVILLE EAST
Date: 7/14/2005
Scale: 1 inch equals 2000 feet

Location: 029° 59' 45.59" N 092° 06' 31.34" W
Caption: VERMILION PARISH SOLID WASTE PLANT

U.S. Postal Service
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(Domestic Mail Only; No Insurance Coverage Provided)

7000 0520 0021 9539 8311

VPSWP - File #5263.27 - Abbeville Airport

Postage	$ 0.60
Certified Fee	2.30
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$ 2.90

Postmark Here

Recipient's Name (Please Print Clearly) (To be completed by mailer)
City of Abbeville
Street, Apt. No.; or PO Box No.
P.O. Box 1170
City, State, ZIP+4
Abbeville La. 70511-1170

PS Form 3800, February 2000 See Reverse for Instructions

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7000 0520 0021 9539 8304

VPSWP - File #5263.27 - FAA Notification

Postage	$ .60
Certified Fee	2.30
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$ 2.90

Postmark Here

Recipient's Name (Please Print Clearly) (To be completed by mailer)
Mr. William Mitchell, FAA
Street, Apt. No.; or PO Box No.
2601 Meacham Blvd.
City, State, ZIP+4
Fort Worth, TX 76137

PS Form 3800, February 2000 See Reverse for Instructions

UNITED STATES POSTAL SERVICE

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U.S. Department of Transportation
Federal Aviation Administration

Failure To Provide All Requested Information May Delay Processing of Your Notice

Notice of Proposed Construction or Alteration

FOR FAA USE ONLY
Aeronautical Study Number
- - -

1. Sponsor *(person, company, etc. proposing this action)* :
Attn. of: VERMILION PARISH POLICE JURY
Name: Clay Menard, Secretary/Treasurer
Address: Courthouse Building
100 N. State Street - Suite 200
City: Abbeville State: LA Zip: 70510
Telephone: (337) 898-4300 Fax: (337) 898-4310

2. Sponsor's Representative *(if other than #1)* :
Attn. of: SELLERS & ASSOCIATES, INC.
Name: Dana Montet Simon, M.S., P.E.
Address: 148 B Easy Street
City: Lafayette State: LA Zip: 70506
Telephone: (337) 232-0777 Fax: (337) 232-0851

3. Notice of: ☐ New Construction ☒ Alteration ☐ Existing

4. Duration: ☒ Permanent ☐ Temporary (months, days)

5. Work Schedule: Beginning 01/01/06 End 03/01/06

6. Type: ☐ Antenna Tower ☐ Crane ☐ Building ☐ Power Line
☒ Landfill ☐ Water Tank ☐ Other

7. Marking/Painting and/or Lighting Preferred:
☐ Red Lights and Paint ☐ Dual - Red and Medium Intensity White
☐ White - Medium Intensity ☐ Dual - Red and High Intensity White
☐ White - High Intensity ☒ Other N/A

8. FCC Antenna Structure Registration Number *(if applicable)*:
N/A

9. Latitude: 30 ° 01 ' 43 . 25 "

10. Longitude: 92 ° 08 ' 08 . 45 "

11. Datum: ☐ NAD 83 ☒ NAD 27 ☐ Other

12. Nearest: City: Abbeville State: LA

13. Nearest Public-use (not private-use) or Military Airport or Heliport:
Abbeville Municipal Airport

14. Distance from #13. to Structure: 4.5 miles

15. Direction from #13. to Structure: northwest

16. Site Elevation *(AMSL)*: 17 ft.

17. Total Structure Height *(AGL)*: 64.5 ft.

18. Overall height (#16. + #17.) *(AMSL)*: 81.5 ft.

19. Previous FAA Aeronautical Study Number (if applicable):
N/A - OE

20. Description of Location: (Attach a USGS 7.5 minute Quadrangle Map with the precise site marked and any certified survey.)
See attached.

21. Complete Description of Proposal:

As per Louisiana Administrative Code, LAC 33:VII.709.A.2, landfill which dispose of putrescible solid waste within a 5-mile radius of public use airports shall notify the FAA, as well as any affected airports.

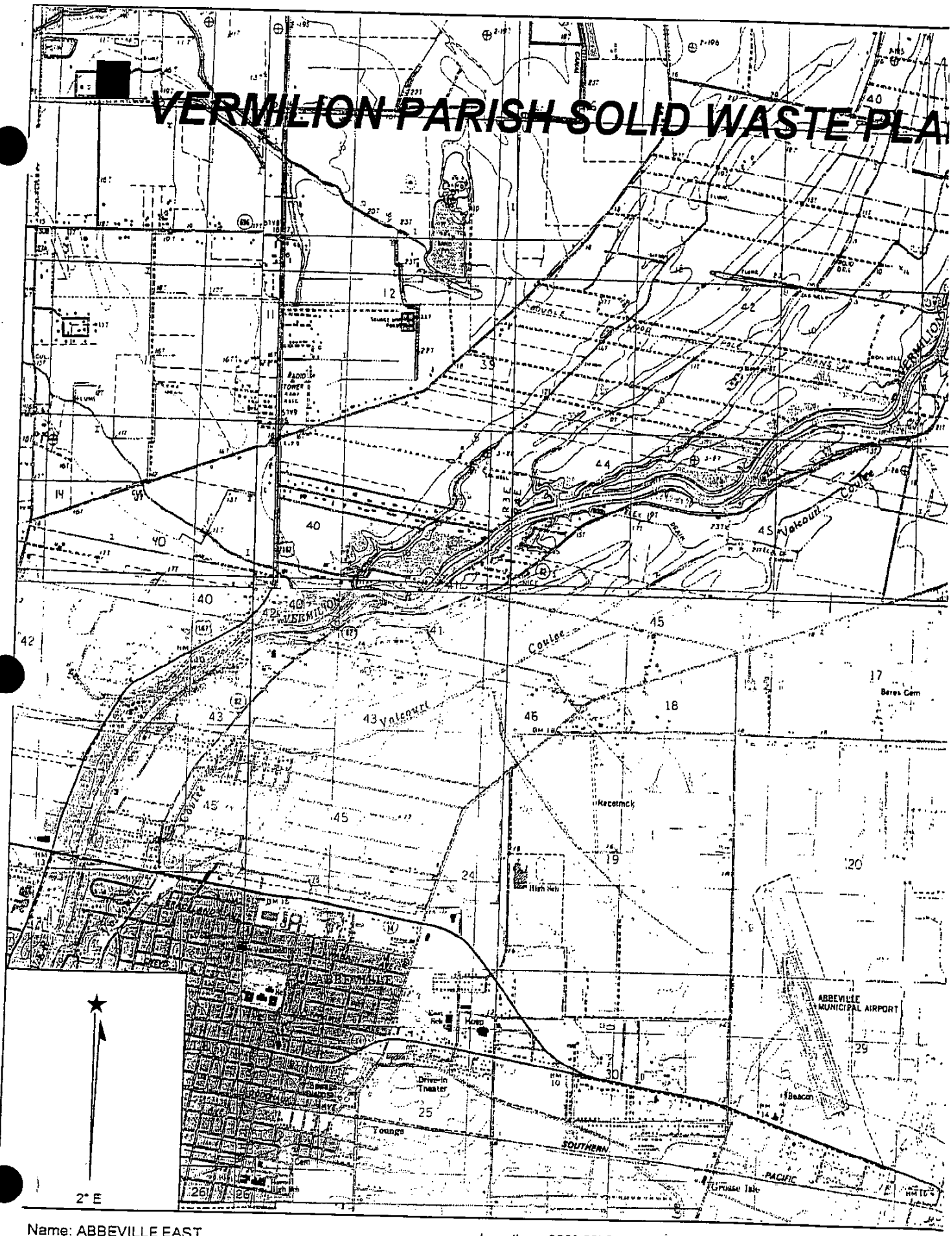
This landfill is an existing landfill which was permitted on June 4, 1986. The facility is owned and operated by the Vermilion Parish Police Jury, which is a public body. The facility is proposing a height increase in the overall final contours of the facility from 67.7-feet MSL to 81.5-feet MSL.

Frequency/Power (kW)	

Notice is required by 14 Code of Federal Regulations, part 77 pursuant to 49 U.S.C., Section 44718. Persons who knowingly and willingly violate the notice requirements of part 77 are subject to a civil penalty of $1,000 per day until the notice is received, pursuant to 49 U.S.C., section 46301 (a).

I hereby certify that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to mark and/or light the structure in accordance with established marking and lighting standards as necessary.

Date	Typed or Printed name and Title of Person Filing Notice	Signature
11/28/2005	Dana Montet Simon, M.S., P.E. SELLERS & ASSOCIATES, INC. - Parish Engineers for Vermilion Parish	Dana Montet Simon



Name: ABBEVILLE EAST
Date: 11/28/2005
Scale: 1 inch equals 2667 feet

Location: 029° 59' 51.65" N 092° 06' 26.9" W

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hp LaserJet *3015*

Sellers & Associates, Inc.
(337) 232-0851
Nov-28-2005 12:20PM

Fax Call Report

Job	Date	Time	Type	Identification	Duration	Pages	Result
201	11/28/2005	12:11:25PM	Send	18172225983	9:00	3	OK

F A C S I M I L E

TO: AIR TRAFFIC DIVISION DATE: 11/28/05
COMPANY: FAA
FAX NUMBER: 817-222-5983
FROM: Dana Simm
NO. OF PAGES INCLUDING THIS ONE: 3
SUBJECT: FORM 7460-01
FILE: WPS 5003-27

COMMENTS:

ORIGINAL TO FOLLOW BY MAIL.

Sellers & Associates, Inc.
ENGINEERS SURVEYORS PLANNERS

148 B Easy Street
Lafayette, LA 70506
Phone: (337) 232-0777
Fax: (337) 232-0851

7005 1160 0002 2733 6595

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Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$ 3.13

FAA
11/28/05
Postmark Here

Sent To: FAA - SW Regional Office, Air Traffic Div. ASW-520
Street, Apt. No.; or PO Box No.: 2601 Meacham Blvd.
City, State, ZIP+4: Fort Worth, TX 76137-0520

PS Form 3800, June 2002 See Reverse for Instructions

Appendix F:7

Geotechnical Investigation Performed by Soil Testing Engineers, Inc. for Permit Modification 8

REPORT OF GEOSCIENCE INVESTIGATION

VERMILION PARISH SOLID WASTE PLANT

PERMIT MODIFICATION No. 8
Vertical Expansion
Vermilion Parish, Louisiana

PREPARED FOR

SELLERS & ASSOCIATES, INC

VERMILION PARISH POLICE JURY

MAY 02, 2005

STE
Soil Testing Engineers, Inc.
Geotechnical, Environmental & Materials Consultants

Baton Rouge, LA • Biloxi, MS • New Orleans, LA

STE
Soil Testing Engineers, Inc.
316 HIGHLANDIA DRIVE (70810) • P.O. BOX 83710 (70884) • BATON ROUGE, LOUISIANA
PHONE (225) 752-4790 • FAX (225) 752-4878 • www.STEofLA.com

GORDON P. BOUTWELL, JR., Ph.D.
CHING N. TSAI, Ph.D.
CHAD M. POCHE, MS
CHARLES S. HEDGES, MS
KELLIE T. McNAMARA
BEYONG SEOCK LIM, Ph.D.
KEITH SPAMPNETO
RICARDO de ABREU, Ph.D.

REGISTERED PROFESSIONAL ENGINEERS

May 2, 2005

Vermilion Parish Police Jury
c/o Sellers & Associates, Inc.
148 B Easy Street
Lafayette, LA 70506

Attn: Ms. Dana M. Simon, M.S., P.E.

Re: Geoscience Services - Vermilion Parish Landfill
Modification 8 - Expansion Area 2-B
Abbeville, LA
STE File: 03-1063B

Ms. Simon:

We have completed this project, and the findings, together with our analyses and conclusions based on them, are included in the attached report. Slope stability analysis and settlement calculations were developed by Soil Testing Engineers, Inc. (STE) for this project.

We will be pleased to discuss any questions you may have concerning this project. It has been a pleasure to serve the Vermilion Parish Police Jury and Sellers & Associates, Inc. on this project and we look forward to working with you in the future.

Sincerely,
Soil Testing Engineers, Inc.

Ricardo Abreu

Dr. Ricardo C. de Abreu, P.E.
Senior Engineer

STATE OF LOUISIANA
RICARDO C. DE ABREU
License No. 31357
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

RCA/rca

P:\2003\03-1063B\Submittal Letter.wpd 03-1063B

STE
Soil Testing Engineers, Inc.

REPORT OF GEOSCIENCE INVESTIGATION

VERMILION PARISH SOLID WASTE PLANT
PERMIT MODIFICATION NO. 8
LANDFILL VERTICAL EXPANSION
VERMILION PARISH, LOUISIANA

This report contains the site evaluation and development conclusions regarding the geosciences issues for the vertical expansion of the Vermilion Parish Solid Waste Plant in Vermilion Parish, Louisiana. Findings, conclusions, and recommendations are covered in the main body of this report. Calculations are presented on Attachments A, B, and C.

I. INTRODUCTION

The Vermilion Parish Solid Waste Plant is an active landfill operating under the direction of the Vermilion Parish Police Jury. This facility currently is a permitted and operating Type II facility, defined by Louisiana Administration Code (LAC), Title 33 (*a facility used for disposing of residential or commercial solid waste*). The Parish wishes to pursue the vertical expansion of the landfill for Type II wastes to the maximum Elevation of +81.5 ft NGVD.

Soil Testing Engineers, Inc. (STE) was engaged by the Vermilion Parish Police Jury through their engineers, Sellers & Associates, Inc. (SAI) to perform the slope stability analysis and settlement calculations for this vertical expansion. The work included:

- Slope stability analysis for the new configuration;
- Settlement analysis of the foundation soils and verification of the impact of the expansion into the existing leachate collection system;
- Settlement analysis of the waste mass and verification of the impact of the expansion into the future hydraulic barrier between old and new waste; and
- Verification of the structural stability of the existing leachate collection pipes under the influence of the vertical expansion.

II – ENGINEERING CALCULATIONS

2.1. Slope Stability Analysis

The vertical expansion of the Vermilion Solid Waste Plant will raise the maximum elevation of the landfill to approximately +81.5 feet NGVD. A slope stability analysis was performed to calculate the factor of safety against a slope stability failure under short and long term conditions due to the vertical expansion and is presented on Attachment A of this report.

The minimum calculated safety factor for a circular failure surface is 1.97 for short-term conditions (undrained strength) and 2.97 for long-term conditions (drained strength). It should be noted that the undrained condition implies an instantaneous filling of landfill to the maximum height, a physical impossibility. Nevertheless, the safety factors in both cases meet or exceed the LDEQ-preferred value of 1.5. The soil and waste conditions, geometry, and critical potential failure surfaces graphically on Figure 1 of Attachment A.

2.2. Settlement Analysis

Settlement will occur in the natural soils below the waste mass, in the old waste under the vertical expansion areas, and ultimately, the new waste. Foundation settlement can distort the bottom LCS and liner from the original position. Under certain conditions, settlements can reduce the effectiveness of the liner/hydraulic barrier systems and impair leachate flow.

2.2.1. Natural Soil Settlement

The amount of settlement to be expected under the proposed waste mass configurations were determined in those areas that would be impacted most, i.e., beneath the liners and leachate collection systems. Calculations were made for the worst possible condition, which included the settlement beneath LCS and liner system for the existing cells as presented on Attachment B. Neither the settlement magnitude nor the differential settlements occurring between the intersecting points of the LCC will significantly alter or impair the flow of the system as designed. There is very little change in the slopes of the LCS system that will be produced by settlement of the in-place soil.

2.2.2. Waste Mass Settlement

Settlement occurring in the old waste can impact the performance of the hydraulic barrier between the Subtitle D areas and the non-Subtitle D areas. Significant differential settlement in the waste can also produce distress in the barrier resulting in material failure. The older waste below the hydraulic barriers will initially undergo elastic and, ultimately, secondary/degradation settlement. Estimates of the elastic or primary settlement were made using test results of large-scale compression tests with MSW conducted at the University of New Orleans. Degradation/secondary settlement was computed using the hyperbolic model and an ultimate strain value of 8 percent. Large settlement occurs with added load and further degradation. Maximum ultimate waste settlement was computed to be approximately 11 ft. at some locations. The tension produced in the stretching of the geomembrane was also reviewed and shows that the integrity of the hydraulic barrier will be maintained after the vertical expansion of the landfill. Calculations are presented on Attachment B.

LDEQ-EDMS Document 35926858, Page 62 of 154

STE
Soil Testing Engineers, Inc.

2.3. Structural Integrity of Existing Leachate Collection Pipes

The structural integrity of the existing leachate collection pipes was also verified for the maximum waste loads. The maximum thickness of waste that will overlie any piping is about 82 feet. Pipe deflections will not exceed the allowable values as presented in the calculations contained in Attachment C.

ATTACHMENT A
SLOPE STABILITY ANALYSIS

STE
Soil Testing Engineers, Inc.

Client: Vermilion Parish Police Jury / Sellers & Associates, Inc. **Page:** 1 of 2
PROJECT: Vermilion Landfill - Vertical Expansion **FILE NO.:** 03-1063B
Subject: Slope Stability Analyses **PREPARED BY:** RCA - **DATE:** 04-01-05
CHECKED BY: _____ - **DATE:** _____

OBJECTIVE: To calculate the factor of safety against a slope stability failure under short-term and long-term conditions for the vertical expansion of the Vermilion Landfill.

APPROACH: Create a model representing the final contour plan and use this model in conjunction with the computer software XSTABL to calculate the factor of safety.

REFERENCES:

1) "User's Guide: XSTABL Slope Stability Package - Version 5.2: Reference Manual", By Sunil Sharma, 1999.

2) Bowles, Joseph E., Physical & Geotechnical Properties of Soils, 1st Edition, McGraw-Hill, 1979, pp 378, Figure 13.21.

3) Contour map and cross sections of the landfill.

ASSUMPTIONS:

1) Maximum Landfill Elevation = +81.5 ft.

2) Soil parameters for the specific sections are listed on figures.

3) Bishop's Method was utilized for short-term and long-term stability circular surface analyses

CALCULATIONS

The following case was investigated:

The top of the final waste cell is to be at elevation +81.5 feet. It descends with an approximate 4% slope to approximate elevation +71 feet. From elevation +71 feet it descends with a 25% slope (4H:1V) and 20-ft wide berms (every ~20 ft in height) to meet the toe of the slope at the approximate elevation +11 feet. The bottom of the cell was assumed at the approximate elevation +5 ft. The minimum calculated safety factor for a circular failure surface is 1.97 for short-term conditions (undrained strength) and

2.97 for long-term conditions (drained strength). A minimum safety factor of 1.5 is commonly considered by LDEQ to represent a stable slope. The calculation for short-term conditions are conservative, since it does not include strength gain due to consolidation of the clay layer. Therefore, the section analyzed has an adequate factor of safety against slope failure.

** Computer printouts are attached

AREA I-A

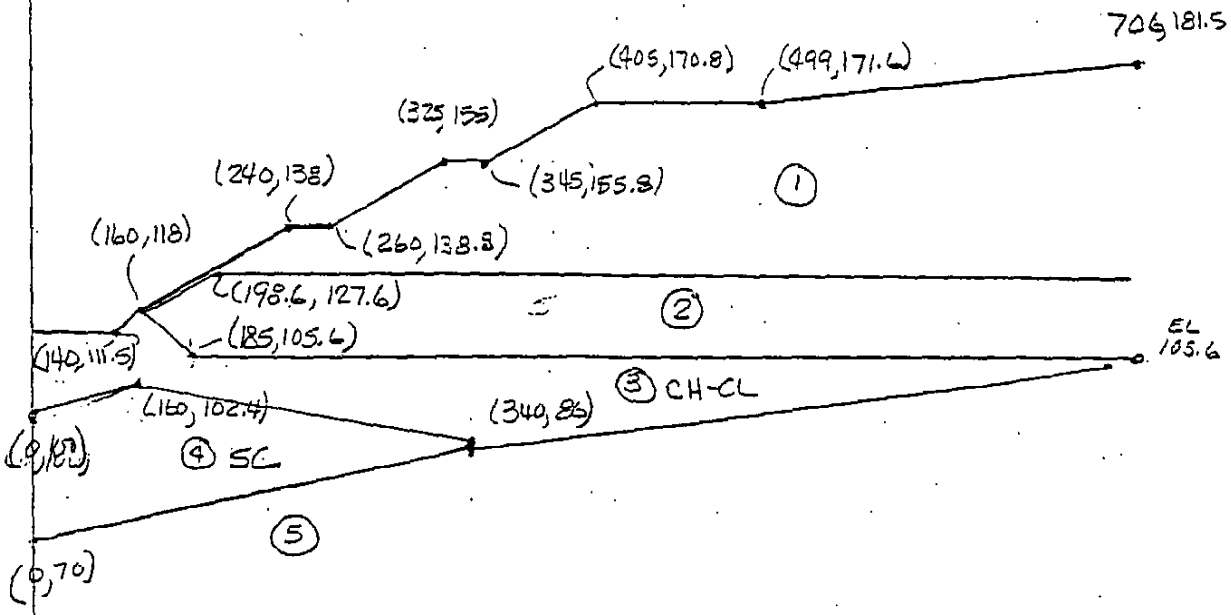
F.O.S = 2

Undrained

F.O.S = 1.97
X = 240.9
Y = 271.9
R = 190.16

DRAINED

F.O.S. = 2.97
X = 226.8
Y = 496.8
R = 390.3



SURFACE

X	Y
0	111.5
140	111.5
160	118
240	138
260	138.8
325	155
345	155.8
405	170.8
499	171.6
706	181.5

EXCAVATION

X	Y
160	118
185	105.6
700+	105.6

SANITARY WASTE

X	Y
199	127.6
700+	127.6

CH-CL/SC

X	Y
0	100
160	102.4
340	86

Phreatic Surface

X	Y
0	97
700	89

SC/SM-SP

X	Y
0	70
340	86

CH-CL/SM-SP

X	Y
340	86
750	100.5

LAYER	γ PCF	Undrain St C (PSF)	Undrain St Φ (deg)	DRAIN. STR C	DRAIN. STR Φ
1 WASTE	63	300	23	300	23
2 Sanitary waste	63	300	18	300	18
3 Insitu CLAY	120	1300	0	0	30°
4 Insitu SC	115	400	0	0	25°
5 Insitu Sand	115	0	30°	0	30°

AREA I-A

XSTABL File: VSECTFN2 10-25-04 15:07

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2000      *
*   Interactive Software Designs, Inc.  *
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*                                       *
*  Ver. 5.204                96 - 1822  *
*****************************************
```

F.O.S. = 2.0

Problem Description : Vermilion Parish Landfill Sect FF

SEGMENT BOUNDARY COORDINATES

19 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	111.5	140.0	111.5	3
2	140.0	111.5	160.0	118.0	3
3	160.0	118.0	198.6	127.6	2
4	198.6	127.6	240.0	138.0	1
5	240.0	138.0	260.0	138.8	1
6	260.0	138.8	324.8	155.0	1
7	324.8	155.0	344.8	155.8	1
8	344.8	155.8	404.8	170.8	1
9	404.8	170.8	498.8	171.6	1
10	498.8	171.6	706.7	181.5	1
11	706.7	181.5	933.8	171.6	1
12	933.8	171.6	955.0	170.8	1
13	955.0	170.8	1141.7	155.8	1
14	1141.7	155.8	1161.7	155.0	1
15	1161.7	155.0	1226.5	138.8	1
16	1226.5	138.8	1246.5	138.0	1
17	1246.5	138.0	1287.9	127.6	1
18	1287.9	127.6	1326.5	118.0	1
19	1326.5	118.0	1346.5	111.5	3

13 SUBSURFACE boundary segments

Segment	x-left	y-left	x-right	y-right	Soil Unit

No.	(ft)	(ft)	(ft)	(ft)	Below Segment
1	198.6	127.6	1287.9	127.6	2
2	160.0	118.0	184.8	105.6	3
3	184.8	105.6	839.8	105.6	3
4	839.8	105.6	864.6	118.0	3
5	864.6	118.0	884.6	118.0	3
6	884.6	118.0	909.4	105.6	3
7	909.4	105.6	1301.7	105.6	3
8	1301.7	105.6	1326.5	118.0	3
9	.0	100.0	160.0	102.4	4
10	160.0	102.4	340.0	86.0	4
11	.0	70.0	340.0	85.9	5
12	340.0	85.9	750.0	105.0	5
13	750.0	105.0	1345.0	100.5	5

ISOTROPIC Soil Parameters
---

5 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	63.0	63.0	300.0	23.00	.000	.0	1
2	63.0	63.0	300.0	18.00	.000	.0	1
3	120.0	120.0	1300.0	.00	.000	.0	1
4	115.0	115.0	400.0	.00	.000	.0	1
5	115.0	115.0	.0	30.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	97.00
2	1320.00	83.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

2500 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 50 points equally spaced
along the ground surface between x = 75.0 ft
and x = 200.0 ft

Each surface terminates between x = 350.0 ft
and x = 710.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

10.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := -5.0 degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 31 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	138.78	111.50
2	147.35	106.36
3	156.18	101.67
4	165.25	97.45
5	174.53	93.72
6	183.99	90.48
7	193.61	87.74
8	203.36	85.51
9	213.21	83.80
10	223.14	82.61

11	233.11	81.94
12	243.11	81.79
13	253.11	82.17
14	263.06	83.08
15	272.96	84.51
16	282.77	86.46
17	292.46	88.92
18	302.01	91.88
19	311.39	95.35
20	320.58	99.30
21	329.55	103.73
22	338.27	108.62
23	346.72	113.97
24	354.87	119.75
25	362.72	125.96
26	370.22	132.57
27	377.37	139.56
28	384.14	146.92
29	390.51	154.63
30	396.47	162.66
31	401.30	169.92

**** Simplified BISHOP FOS = 1.968 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Vermilion Parish Landfill Sect FF

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.968	240.85	271.93	190.16	138.78	401.30	3.980E+07
2.	1.988	249.11	396.39	313.46	118.37	467.23	9.252E+07
3.	2.010	227.82	370.14	287.16	103.06	434.76	7.702E+07
4.	2.011	229.89	328.88	245.49	115.82	417.75	5.954E+07
5.	2.017	228.64	286.10	203.82	123.47	394.93	4.316E+07
6.	2.021	244.98	369.48	285.16	123.47	449.84	7.895E+07
7.	2.034	240.05	461.50	379.69	92.86	485.08	1.240E+08
8.	2.039	271.39	337.33	254.31	148.98	463.96	7.203E+07
9.	2.048	207.41	371.83	290.92	77.55	417.80	7.543E+07
10.	2.060	205.33	348.61	268.15	80.10	406.00	6.535E+07

* * * END OF FILE * * *

North Slope
Area I-A
F.O.S = 2.96
long term

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```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2000      *
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*  Ver. 5.204                 96 - 1822 *
*****************************************
```

Problem Description : Vermilion Parish Landfill Sect FF

SEGMENT BOUNDARY COORDINATES

19 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	111.5	140.0	111.5	3
2	140.0	111.5	160.0	118.0	3
3	160.0	118.0	198.6	127.6	2
4	198.6	127.6	240.0	138.0	1
5	240.0	138.0	260.0	138.8	1
6	260.0	138.8	324.8	155.0	1
7	324.8	155.0	344.8	155.8	1
8	344.8	155.8	404.8	170.8	1
9	404.8	170.8	498.8	171.6	1
10	498.8	171.6	706.7	181.5	1
11	706.7	181.5	933.8	171.6	1
12	933.8	171.6	955.0	170.8	1
13	955.0	170.8	1141.7	155.8	1
14	1141.7	155.8	1161.7	155.0	1
15	1161.7	155.0	1226.5	138.8	1
16	1226.5	138.8	1246.5	138.0	1
17	1246.5	138.0	1287.9	127.6	1
18	1287.9	127.6	1326.5	118.0	1
19	1326.5	118.0	1346.5	111.5	3

13 SUBSURFACE boundary segments

Segment	x-left	y-left	x-right	y-right	Soil Unit

No.	(ft)	(ft)	(ft)	(ft)	Below Segment
1	198.6	127.6	1287.9	127.6	2
2	160.0	118.0	184.8	105.6	3
3	184.8	105.6	839.8	105.6	3
4	839.8	105.6	864.6	118.0	3
5	864.6	118.0	884.6	118.0	3
6	884.6	118.0	909.4	105.6	3
7	909.4	105.6	1301.7	105.6	3
8	1301.7	105.6	1326.5	118.0	3
9	.0	100.0	160.0	102.4	4
10	160.0	102.4	340.0	86.0	4
11	.0	70.0	340.0	85.9	5
12	340.0	85.9	750.0	105.0	5
13	750.0	105.0	1345.0	100.5	5

ISOTROPIC Soil Parameters
---

5 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	63.0	63.0	300.0	23.00	.000	.0	1
2	63.0	63.0	300.0	18.00	.000	.0	1
3	120.0	120.0	.0	30.00	.000	.0	1
4	115.0	115.0	.0	25.00	.000	.0	1
5	115.0	115.0	.0	30.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	97.00
2	1320.00	83.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

2500 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 50 points equally spaced along the ground surface between x = 75.0 ft
and x = 200.0 ft

Each surface terminates between x = 350.0 ft
and x = 710.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

10.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := -5.0 degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 32 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	148.98	114.42
2	158.80	112.55
3	168.67	110.93
4	178.58	109.57
5	188.52	108.46
6	198.48	107.60
7	208.46	107.01
8	218.46	106.66
9	228.46	106.58
10	238.45	106.75

11	248.45	107.17
12	258.42	107.85
13	268.38	108.79
14	278.31	109.98
15	288.20	111.43
16	298.06	113.13
17	307.86	115.08
18	317.62	117.28
19	327.31	119.73
20	336.94	122.43
21	346.50	125.37
22	355.98	128.56
23	365.37	131.99
24	374.67	135.66
25	383.88	139.56
26	392.98	143.70
27	401.98	148.08
28	410.85	152.68
29	419.61	157.51
30	428.24	162.56
31	436.74	167.83
32	441.75	171.11

**** Simplified BISHOP FOS = 2.967 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Vermilion Parish Landfill Sect FF

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.967	226.84	496.83	390.26	148.98	441.75	9.610E+07
2.	2.971	224.16	492.09	385.08	148.98	436.83	9.131E+07
3.	3.005	240.42	378.84	272.04	161.73	415.79	5.843E+07
4.	3.012	240.83	407.91	302.94	156.63	429.63	7.520E+07
5.	3.018	203.34	554.69	449.04	131.12	436.69	1.098E+08
6.	3.019	255.95	399.51	292.28	169.39	438.23	7.083E+07
7.	3.022	214.27	535.90	427.73	146.43	437.50	9.855E+07
8.	3.027	212.25	485.24	379.99	141.33	425.82	8.991E+07
9.	3.068	244.82	389.53	284.97	159.18	427.64	7.200E+07
10.	3.071	271.55	339.52	232.23	184.69	431.29	5.362E+07

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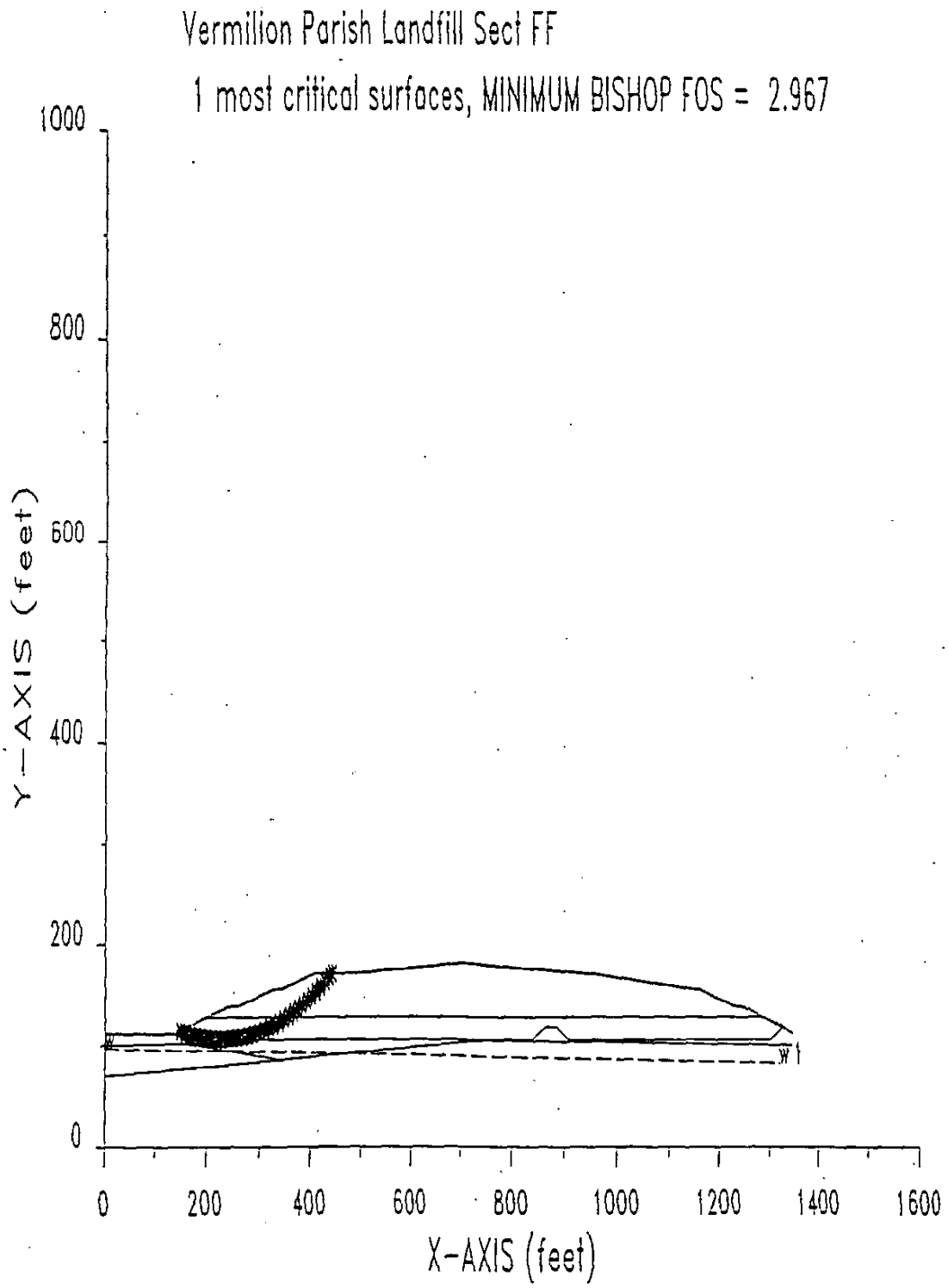

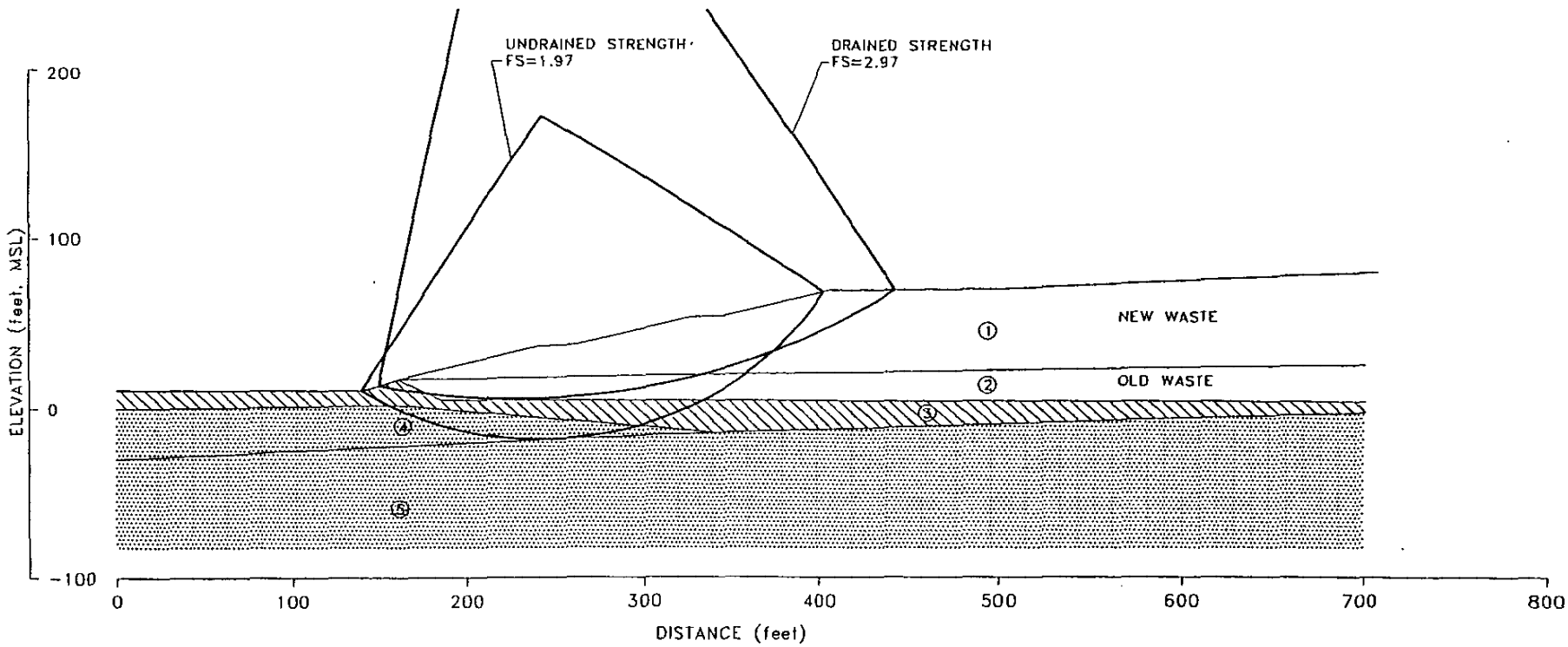

Layer No. - Description	γ (pcf)	Undrained Strength c (psf)	Undrained Strength ø (deg)	Drained Strength c (psf)	Drained Strength ø (deg)
1. New Waste	63	300	23	300	23
2. Old Waste	63	300	18	300	18
3. In-situ Clay	120	1300	0	0	30
4. In-situ Clayey Sand	115	400	0	0	25
5. In-situ Sand	115	0	30	0	30

0 60
(feet)
SCALE

MODIFICATION NO. 8
VERTICAL EXPANSION
VERMILION PARISH
SOLID WASTE PLANT
VERMILION PARISH, LOUISIANA
for
VERMILION PARISH POLICE JURY
ABBEVILLE, LOUISIANA

SELLERS & ASSOCIATES
ENGINEERS
LAFAYETTE, LOUISIANA

STE
Soil Testing Engineers, Inc.
Baton Rouge, LA Jefferson, LA Biloxi, MS

Project Engineer:	Drawn by:	Checked by:
R. de Abreu	BJ	
File No.: 03-1063B	Date: 3-31-05	Figure No.: 1

Title: AREA I-A
SLOPE STABILITY ANALYSIS

P:\2003\03-1063B\cadd\03106B-01 SECTION F-F SLOPE ANALYSIS.DWG Mar 31, 2005 - 11:55am

ATTACHMENT B
SETTLEMENT CALCULATIONS

Settlement of Foundation Soils
and
Leachate Collection System Drainage

STE Soil Testing Engineers, Inc.
316 Highlandia Drive • P. O. Box 83710
Baton Rouge, Louisiana 70884
Telephone (225) 752-4790
FAX (225) 752-4878

Project: Vermilion Landfill Client: Modification #8 Job #: 03-1063B
By: RCA Checked by: Date: 04/06/2005 Sheet 1 of

Settlement of Foundation Soils / LCS Drainage

Objective: To calculate the settlements of the foundation soils under the weight of proposed vertical expansion

Approach: Utilization of Terzaghi's one-dimensional consolidation theory to compute the ultimate settlement under the maximum landfill load in chosen points

- If $\sigma_f > \sigma_p > \sigma_o \Rightarrow \Delta h = H \cdot C_c \log\left(\frac{\sigma_f}{\sigma_p}\right) + H \cdot C_r \log\left(\frac{\sigma_p}{\sigma_o}\right)$ (1)
- If $\sigma_o < \sigma_f < \sigma_p \Rightarrow \Delta h = H \cdot C_r \log\left(\frac{\sigma_f}{\sigma_o}\right)$ (2)

where:
- Δh = settlement
- C_r = recompression ratio
- C_c = compression ratio
- H = thickness of compressible layer
- σ_o = initial effective stress
- σ_p = pre-consolidation pressure
- σ_f = final effective stress

Data
- Consolidation curve for soil (see attached)
  From test → $C_c = 0.26$ $C_r = 0.027$ $\sigma_p = 23$ ksf
- Max. avg clay thickness → ~20 ft (conserv.)
- Unit weight of waste = 63 pcf
- Unit weight of clay = 120 pcf

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By: RCA Checked by: Date: 04/06/2005 Sheet 2 of

- Thickness of Existing Waste = ~ 30 ft (conserv.)
- Thickness of New Waste = ~ 55 ft (conserv.)
- Water depth = 15 ft

Calculation of Max. Settlement

- Initial Stress Calculation (Middle Point of Clay Layer)

$\sigma_o = 10\,ft \times 120\,pcf + 30\,ft \times 63\,pcf = 3{,}090\,psf$

- Final Stress Calculation

$\sigma_f = 3{,}090\,psf + 55\,ft \times 63\,pcf = 6{,}555\,psf$

- Pre Consolidation Stress = 4,600 psf

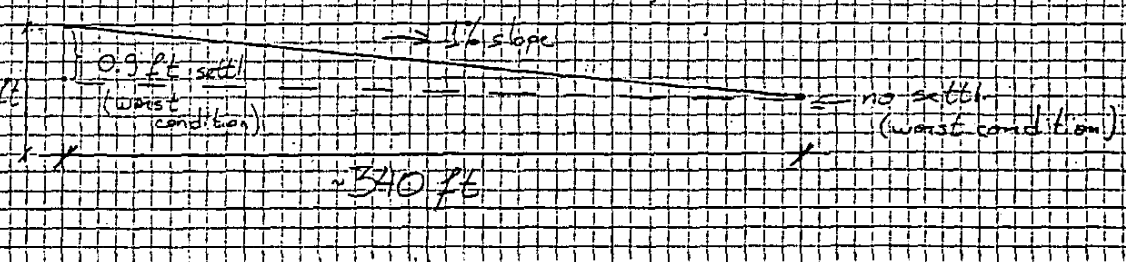
- Settlement Calculation (Eq. 1)

$$\Delta h = 20 \times 0.26 \times \log\left(\frac{6555}{4{,}600}\right) + 20 \times 0.027 \times \log\left(\frac{4{,}600}{3{,}090}\right)$$

$\Delta h = 0.89\,ft \Rightarrow \sim 11$ inches

LCS Slope Verification

- Area 1B (Subtitle D)



$$\text{Slope} = \frac{(3.4 - 0.9)}{340} = 0.0074 \rightarrow 0.74\% \text{ slope}$$

OK!

STE
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Project: Vermilion Landfill Client: Modification 8 Job #: 03-1063B

By: RCA Checked by: Date: 04/06/2005 Sheet 3 of

Conclusion: The settlement of the in-situ soils underlying the existing cells located at the vertical expansion of the landfill (Mod. 8) will not affect the leachate drainage of these cells.

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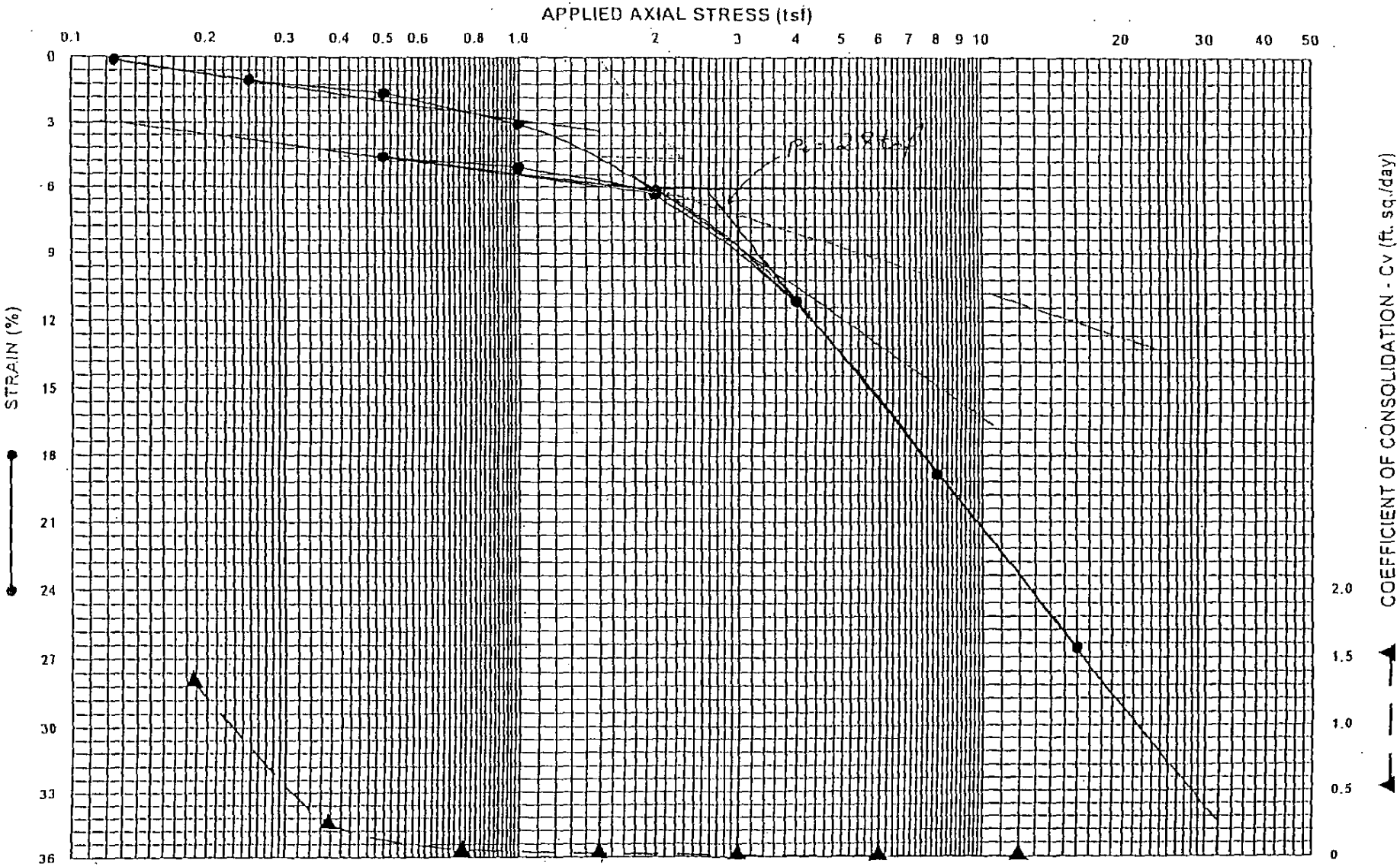

CONSOLIDATION TEST

SAMPLE IDENTIFICATION

BORING NO.: B03-5
DEPTH (feet): 30-32
MATERIAL: Gray CLAY (CH)

FILE NO.: 03-1063

STE
Soil Testing Engineers, Inc.

CLASSIFICATION DATA

INITIAL MOISTURE CONTENT (%) =	47.6	LL = 85
INITIAL DRY DENSITY (lbs./cu.ft.) =	71.6	PL = 31
FINAL MOISTURE CONTENT (%) =	32.3	PI = 54

FIGURE NO.:

03-1063a
10/09/03

Consolidation Test

$p_c = 2.8$ tsf (Casagrande) $\quad p_c = 2.3$ tsf (Pacheco Silva)

$$C'_c = \frac{\frac{\Delta h}{H_0}}{\log\left(\frac{\sigma_f}{\sigma_0}\right)} \Rightarrow C'_c = \frac{0.317 - 0.078}{\log\left(\frac{25}{3}\right)} = 0.260$$

$$C'_c = \frac{C_c}{1 + e_0} \Rightarrow C_c = C'_c \cdot (1 + e_0)$$

$$e_0 = \frac{G_s \times \gamma_w}{\gamma_d} - 1 \Rightarrow e_0 = \frac{2.7 \times 62.4}{72} - 1$$

$$e_0 = 1.34$$

$$C_c = 0.260 \cdot (1 + 1.34) \Rightarrow C_c = 0.608$$

$$C'_r = \frac{\frac{\Delta h}{H_0}}{\log\left(\frac{\sigma_f}{\sigma_0}\right)} \Rightarrow C'_r = \frac{0.06 - 0.03}{\log\left(\frac{1.58}{0.126}\right)} \Rightarrow C'_r = 0.027$$

$$C_r = C'_r (1 + e_0) \Rightarrow C_r = 0.027 \times (1 + 1.34) \Rightarrow C_r = 0.063$$

Settlement of Waste Mass
and
Verification of Hydraulic Barrier

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Project: Vermilion Landfill Client: Modification #8 Job #: 03-1063B
By: RCA Checked by: Date: 04/08/05 Sheet 1 of

Verification Hydraulic Barrier - Area 1A/1B (Section E-E)

Distortion due to differential settlement caused by bending and elongation can be evaluated by:

- Bending

$$\varepsilon_h = \frac{6TS}{B^2}$$

- Elongation

$$\varepsilon_e = \sqrt{2}\left[\left(2\,R/B\right)\sin^{-1}\left(\frac{B/2}{2R}\right) - 1\right]$$

$$R = \frac{B^2}{8S} + \frac{S}{2}$$

where:

T = Liner Thickness

S = Differential Settlement between points

B = Distance between points (or liner width)

R = Radius of bending

For geomembranes, the stress criteria is applied:

$$\sigma_{hT} = E\varepsilon_T < \sigma_B$$

$$\varepsilon_T = \varepsilon_h + \varepsilon_e$$

where:

E = modulus of elasticity for geomembrane (assumed as 100,000 psi)

σ_B = breaking stress of geomembrane (assumed as 2,000 psi)

σ_{hT} = tension stress

ε_T = total strain of geomembrane

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By: RCA Checked by: Date: 04/08/05 Sheet 2 of

Calculations

- for geomembranes (T/G^2) is very small, so can be neglected

$$\epsilon_T = \epsilon_e \Rightarrow \sigma_{h_T} = E\,\epsilon_e$$

$$\epsilon_e = \sqrt{2}\left[(2R/B)\sin^{-1}(B/2R) - 1\right]$$

$$R = \frac{B^2}{8S} + \frac{S}{2}$$

S = 11.2 ft (max diff. settlement possible)
B ≅ 250 ft (slope length)

$$R = \frac{250^2}{8 \times 11.2} + \frac{11.2}{2} = 703.1 \text{ ft}$$

$$\epsilon_e = \sqrt{2}\left[\left(\frac{2 \times 703.1}{250}\right) \times \sin^{-1}\left(\frac{250}{2 \times 703.1}\right) - 1\right]$$

$$\epsilon_e = 0.0076$$

$$\sigma_{h_T} = E \cdot \epsilon_e = 100{,}000 \times 0.0076 = 760 \text{ psi}$$

< Breaking Str (≈2000 psi)

OK!

Therefore integrity of hydraulic barrier due to vertical expansion (Mod 8) is verified and it is not a concern.

VERM. PARISH LP | 03-1063a | KLM . 11/1/04

Degradation Settlement:

HYPERBOLIC MODEL

$$S = \frac{S_u}{1 + \frac{S_u}{\rho t}}$$

Where S = Settlement @ time = t
S_u = Ult. settlement @ $t = \infty$
ρ = Time-Rate Parameter
t = time
Let T = Waste thick.

STRAIN

$$\frac{S}{T} = \epsilon = \frac{S_u/T}{1 + \frac{S_u/T}{t\rho/T}}$$

or

$$\epsilon = \frac{\epsilon_u}{1 + \frac{\epsilon_u}{\rho' t}}$$

ϵ = strain @ time = t
ϵ_u = ultimate strain
ρ' = modified Time-Rate Parameter

Typical Values ⇒ $\epsilon_u \sim 8\%$
(Ref. Tanji Analy.)

$t_{90} = 50$ yrs

$$\epsilon/\epsilon_u = \frac{1}{1 + \frac{\epsilon_u}{\rho' t}}$$

$$0.9 = \frac{1}{1 + \frac{0.08}{\rho' 50}}$$

$$1 + \frac{0.0016}{\rho'} = 1.1111$$

$$\rho' = 0.0144$$

The existing waste is estimated to have been in place for approximately

AREA'S I-A ±1977-present ~25 yrs use 12 yrs

AREA I-C ±1977-present ~25 yrs - const waste.

AREA I-B ±1995-present ~9 yrs use 4 yrs

Verm P. LF | KLM - 11/01/04

AREA I-A

YEAR 2005
$t \approx 12$

$$\epsilon = \frac{0.08}{1 + \frac{5.556}{t}} = 0.0547$$

Δt	YEAR	$\frac{\Delta t + 12}{2}$	$\epsilon = \frac{\epsilon_u}{1 + \epsilon_u/\Delta t}$	$\Delta\epsilon$ $\epsilon - 0.0547$
5	2010	17	0.0603	0.0056
10	2015	22	0.0639	0.0092
20	2025	32	0.0682	0.0135
30	2035	42	0.0707	0.0160
40	2045	52	0.0723	0.0176
50	2095	62	0.0734	0.0187
	∞	∞	0.0800	0.0253

AREA I-C - construction debris - negligible decomposition elastic settlement

AREA I-B

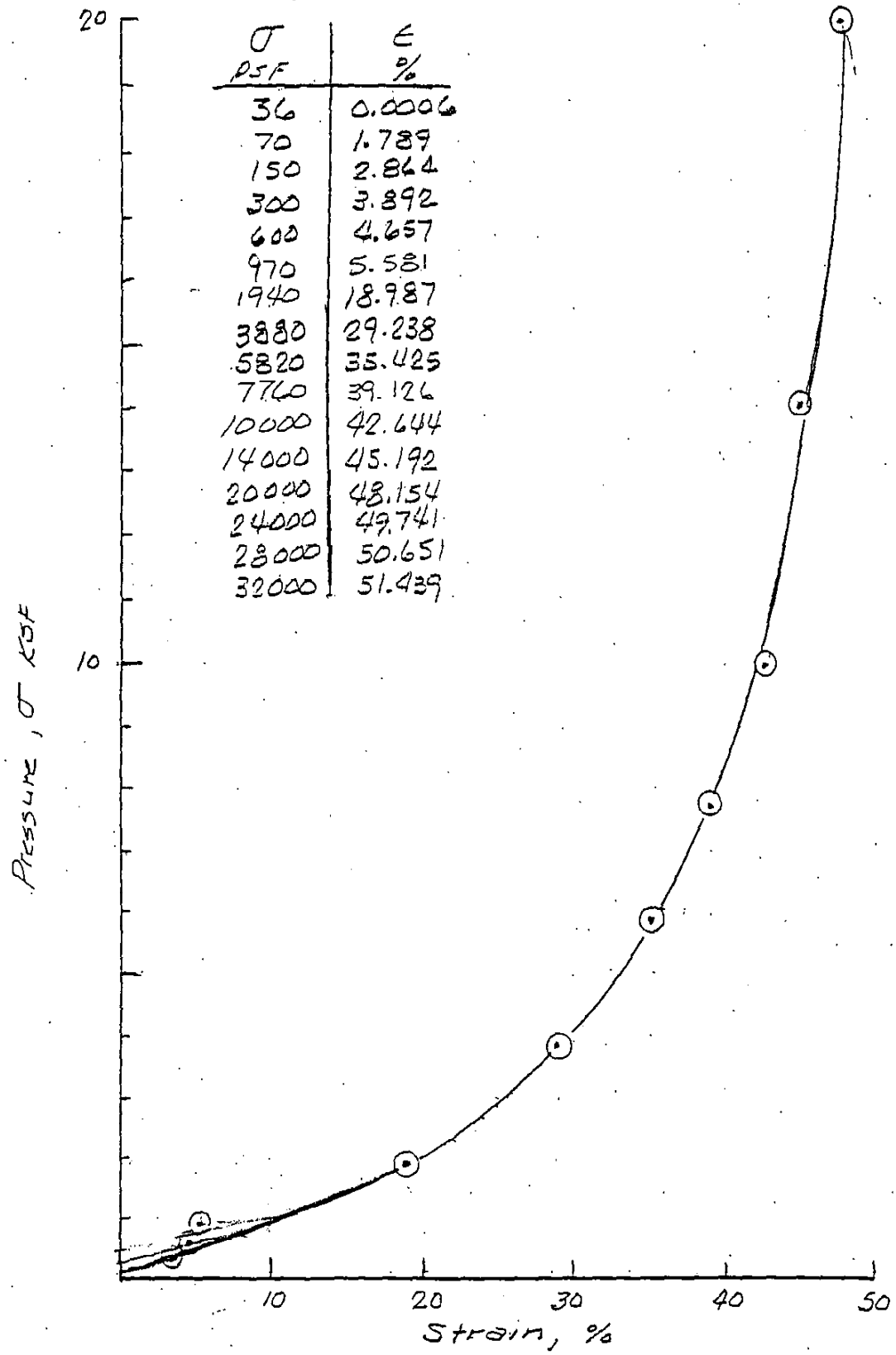
YEAR 2005
$t \approx 4$ yrs

$$\epsilon = \frac{0.08}{1 + \frac{5.556}{t}} = 0.0335$$

Δt	YEAR	$\bar{t}$	ϵ	$\Delta\epsilon$ $\epsilon - 0.0335$
5	2010	9	0.0495	0.0160
10	2015	14	0.0573	0.0238
20	2025	24	0.0650	0.0315
30	2035	34	0.0688	0.0353
40	2045	44	0.0710	0.0375
50	2055	54	0.0725	0.0390
	∞	∞	0.0800	0.0445

University of New Orleans
MSW Comp. Test # 7
γ_i = 55 pcf

σ psf	ε %
36	0.0006
70	1.789
150	2.864
300	3.892
600	4.657
970	5.581
1940	18.987
3880	29.238
5820	35.425
7760	39.126
10000	42.644
14000	45.192
20000	48.154
24000	49.741
28000	50.651
32000	51.439



22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
NATIONAL

Hydraulic Barrier between Area 1-A and Area 1-B X Section E-E (Sellars DWG Exhibit A:8b

Pt.		old T_o FT.	New T_N FT	Earth Cap T_{RCC} FT	adj T_N	$\Delta\sigma = \gamma T_N$ PSF (γ=63 pcf)	ϵ_o UNO	S_o FT	$\Delta S = .0092 T_o$, $\Delta t = 10$ YR: ΔS	S	$\Delta S = .0135 T_o$, $\Delta t = 20$ YR: ΔS	S FT	$\Delta S = .016 T_o$, $\Delta t = 30$ YR: ΔS	S	$\Delta S = .0253 T_o$, $\Delta t = \infty$: ΔS	S
1	CAP	68	–	2.5x2	5	315	0.04	2.7	0.63	3.33	.92	3.62	1.1	3.8	1.7	4.4
2		65	15	2.5x2	20	1260	0.13	8.5	0.60	9.1	.88	9.4	1.0	9.5	1.6	10.1
3		64	16	2.5x2	22	1386	0.15	9.6	0.59	10.2	.86	10.5	1.0	10.6	1.6	11.2
4		33	42	2.5x2	47	2961	0.25	8.3	0.30	8.6	.45	8.7	0.5	8.8	0.8	9.1
5		32	43	2.5x2	48	3024	0.26	8.3	0.29	8.59	.43	8.7	0.5	8.8	0.8	9.1
6	BERM	0	62	2.5x2	67	4221	—		–	–	–	–	—	—		

X-SECTION A-A

Pt		T_o FT	T_N FT	Earth Cap T_{RCC} FT	adj T_N	$\Delta\sigma = \gamma T_N$ PSF (γ=63 pcf)	ϵ_o UNO	$S_o = \epsilon_o T_o$ FT	$\Delta S = 0.0092 T_o$, $\Delta t = 10$ YRS: ΔS FT	S_{FT}	$\Delta S = .0135 T_o$, $\Delta t = 20$ YRS: ΔS	S_{FT}	$\Delta S = .016 T_o$, $\Delta t = 30$ YRS: ΔS	S FT	$\Delta S = .0253$, ∞: ΔS	S
1	CAP	65	–	2.5x2	5	315	.04	2.6	0.6	3.2	0.9	3.5	1.04	3.6	1.6	4.2
2		55	9.5	"	14.5	913.5	.09	5.0	0.5	5.5	0.7	5.7	0.9	5.9	1.4	6.4
3		54.5	10	"	15	945	.10	5.5	0.5	6.0	0.7	6.2	0.9	6.4	1.4	6.9
4		34	31	"	36	2268	.21	7.1	0.3	7.4	0.5	7.6	0.5	7.6	0.8	7.9
5		33	32	"	37	2331	.22	7.3	0.3	7.6	0.4	7.7	0.5	7.8	0.8	8.1
6	BERM	–	–													

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ATTACHMENT C
STRUCTURAL STABILITY OF EXISTING LEACHATE COLLECTION PIPES

STE Soil Testing Engineers, Inc.
316 Highlandia Drive • P. O. Box 83710
Baton Rouge, Louisiana 70884
Telephone (225) 752-4790
FAX (225) 752-4878

Project: Vermilion Landfill Client: Modification 8 Job #: 03-1063B

By: RCA Checked by: Date: 04/07/05 Sheet 1 of

Leachate Collection Pipes - Structural Stability

Objective: Verify the structural stability of existing leachate collection pipes under the maximum waste loads

Data: It is assumed, conservatively, that the existing 6" Diam PVC pipes will have a maximum loading equivalent to the thickness of a 82 ft waste column

Load Calculation:

Loads can be calculated using the prism load, which is the weight of a vertical prism of waste and other materials above the pipes

$W_c = \gamma \cdot H \cdot B_c$

where

W_c = load, lb/ft

B_c = outside diameter of the pipe, ft (6.625 in)

H = layer height above pipe, ft (82 ft)

γ = unit weight of material above pipe, pcf (assumed as 63 pcf)

$W_c = 2,852$ lb/ft

Pipe Stiffness Calculation:

Pipe Stiffness can be calculated by the following equation:

Pipe Stiffness ≥ $PS = \frac{4.47E}{(DR-1)^3}$ (psi)

Where:

E = modulus of Elasticity (for PVC - E = 400,000 psi)

DR = dimension factor (23.7 for 6" PVC sch 40 pipes)

$\therefore PS = 152.9$ psi

STE Soil Testing Engineers, Inc.
316 Highlandia Drive • P. O. Box 83710
Baton Rouge, Louisiana 70884
Telephone (225) 752-4790
FAX (225) 752-4878

Project: Vermilion Landfill Client: Modification 8 Job #: 03-1063B
By: RCA Checked by: Date: 04/07/05 Sheet 2 of

Deflection Calculation:

Pipe deflection can be calculated by the following equation

$$\Delta_y = \frac{0.67\,W_c}{PS + 0.41\,E}$$

where

Δ_y = Deflection

E = Modulus of Soil Reaction for trench material

= 2,000 psi (70% relative dens. by Ignaul free of fines)

$$\Delta_y = \frac{0.67 \times 2{,}852/12}{152.9 + 0.41 \times 2000} = 0.164\text{ in}$$

Allowable Deflection Calculation

Allowable deflection cannot exceed 7.5% of outside diameter of the pipe (B_c)

$$\therefore \Delta_{y_{allow}} = 7.5\% \times 6.625\text{ in} = 0.50\text{ in}$$

$$\Rightarrow \Delta_y < \Delta_{y_{allow}} \quad \underline{\text{OK!}}$$

Conclusion

Vertical Expansion (MOD 8) of Vermilion Landfill will not affect the structural integrity of the existing leachate collection pipes, since the calculated deflection is lower than the allowable deflection.

Appendix G:2

Closure & Post-Closure Care Cost Estimate

APPENDIX G:2
CLOSURE COST ESTIMATE

DESCRIPTION	QUANTITY	UNIT COST	EXTENSION
Load, Overhaul & Placement of 6" Cover Material	66,550 cu.yd.	$9.00/cu. yd.	$ 599,000
Spread, Compact & Test Clay Cap	222,000 cu. yd.	$65/Mcu. yd.	$ 144,300
HDPE Liner (60 mil)	680,000 sq.ft.	$1.00/sq. ft.	$ 680,000
Seeding & Fertilizing	55 acres	$3,500/acre	$ 192,500
5-acre Oxidation Pond (one-time discharge, sampling & disposing of sludge)	LUMP	$50,000	$ 50,000
Gas Venting System	13 vents	$600/vent	$ 7,800
Closure Certification	36 hours	$84/hour	$ 3,024
Miscellaneous Expenses	LUMP	$100,000	$ 100,000
SUBTOTAL			$ 1,776,624
CONTINGENCY (15%)			$ 266,494
TOTAL CLOSURE COST			**$ 2,043,118**

The costs utilized above are in present dollars. Determine future dollars for closure cost based on an inflation rate of 1.5% and an assumed 25 year remaining life of the landfill:

$$F = 2{,}043{,}118\left(\frac{F}{P}, 1.5\%, 25\right)$$

$$\underline{F = 2{,}964{,}453}$$

APPENDIX G:2
30-YEAR POST-CLOSURE CARE COST ESTIMATE

DESCRIPTION	QUANTITY	FREQ.	UNIT COST	EXT.
Site Maintenance	LUMP	annually for 30 years	$10,000/year	$ 300,000
Oxidation Pond Monitoring/Sampling	1 discharge pt. 1 discharge pt. 1 discharge pt. 1 discharge pt. 1 discharge pt.	weekly for 30 years bi-monthly for 30 years monthly for 30 years quarterly for 30 years semi-annually for 30 years	$4,160/year $2,040/year $180/year $120/year $1,357/year	$ 235,710
Groundwater Monitoring	11 wells	semi-annually for 30 years	$5,000/event	$ 300,000
Gas Monitoring	5 hours/event	quarterly for 30 years	$84/hour/event	$ 50,400
Miscellaneous Expenses	LUMP	annually for 30 years	$5,000/year	$ 150,000
TOTAL CLOSURE COST			**$34,537/year**	**$ 1,036,110**

The costs utilized above are in present dollars. Determine future dollars for post-closure care cost based on an inflation rate of 1.5% during the life of the post-closure care and an assumed 25 year remaining life of the landfill:

$$F = 34{,}537\left(\frac{F}{A}, 1.5\%, 30\right)$$
$$F = 1{,}296{,}473$$

$$F = 1{,}296{,}473\left(\frac{F}{P}, 1.5\%, 25\right)$$
$$\underline{F = 1{,}881{,}111}$$

Appendix H:1

Engineering Certification

APPENDIX H:1

Vermilion Parish Solid Waste Plant

Engineering Certification

Permit Modification 8
Tie-In Liner System & Height Increase

I certify under penalty of law that I have personally examined and I am familiar with the information submitted in this permit application and that the facility as described in this permit application meets the requirements of the Solid Waste Rules and Regulations. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment.

Certification to Civil Engineering aspects of the Permit Modification.

Eugene M. Sellers, P.E.
Registered Professional Engineer
Louisiana License Number 6457

April 18, 2007
Date

Appendix H:2

Engineering Calculations

Sellers & Associates, Inc.
ENGINEERS SURVEYORS PLANNERS

PROJECT	VPSWP - PERMIT MODIFICATION #8 - ADDITIONAL VOLUMES OF CONTAMINATED STORMWATER RUNOFF & OXIDATION POND CALCULATIONS				
JOB NO.	5263-27	SHEET	1	OF	3
CALCULATED BY	DMS	DATE	11/29/2005		
CHECKED BY		DATE			

THE PURPOSE OF THE CALCULATIONS PRESENTED HERETO ARE TO DOCUMENT THE ANTICIPATED ADDITIONAL CONTAMINATED STORMWATER RUNOFF VOLUMES FROM THE PIGGYBACK SLOPED AREA. (PERMIT MODIFICATION #8 PROPOSES TO PIGGYBACK THE PRE-SUBTITLE D SLOPES WITH LINER TO INCREASE THE SUBTITLE D AIRSPACE BY UTILIZING THIS WEDGE.)

PRE-PERMIT MODIFICATION #8

- **LEACHATE GENERATION**

  - THE HELP MODEL V.3 WAS UTILIZED TO ESTIMATE LEACHATE VOLUMES GENERATED/COLLECTED FROM THE LATERAL DRAINAGE LAYER (LEACHATE COLLECTION SYSTEM). PEAK DAILY VALUES WERE USED FOR A CONSERVATIVE ESTIMATE.

  - THE FOLLOWING SCENARIOS WERE USED TO CONSIDER AREAS OF THE FACILITY WHICH MAY NOT HAVE RECEIVED FINAL COVER. THESE AREAS INCLUDE THE ACTIVE WORKING FACE, AREAS THAT CONTAIN ONLY DAILY COVER, AND ALL AREAS THAT CONTAIN INTERIM COVER. THE SCENARIOS WERE CHOSEN SUCH THAT PHASE 1A (Pre-Subtitle D) IS ASSUMED TO HAVE RECEIVED FINAL COVER, AND CONSERVATIVE ESTIMATES OF ACREAGE WHICH HAVE NOT RECEIVED DAILY COVER AND INTERIM COVER WERE UTILIZED FOR PHASE 1B (Subtitle D). (OUTPUT FROM THE HELP MODEL FOR EACH SCENARIO IS ATTACHED.) IT IS ALSO ASSUMED THAT NO PART OF PHASE 1B WILL HAVE RECEIVED FINAL COVER FOR A WORSE-CASE SCENARIO.

HELP ESTIMATES PRIOR TO PERMIT MODIFICATION #8

AREA DESCRIPTION	*ACREAGE*	*COVER MATERIAL*	*ASSUMED AVG. WASTE DEPTH*	*PEAK DAILY VALUE OF LEACHATE COLLECTED (CU.FT.)*
Phase 1A	19	Final (6" topsoil over 2' clay)	350"	47.45
Phase 1B - Active Face	2	none	400"	1,126.32
Phase 1B - Daily Cover	2.75	Daily (6" earthen material)	360"	1,830.37
Phase 1B - Interim Cover	3	Interim (1' clay)	400"	1,771.47
		ESTIMATED LEACHATE QUANTITY, CU.FT./DAY		4,775.61
		ESTIMATED LEACHATE QUANTITY, GAL/DAY		35,721.56

- **CONTAMINATED STORMWATER RUNOFF**

  - CONTAMINATED STORMWATER QUANTITIES (TO BE ROUTED TO OXIDATION POND FOR TREATMENT) WERE ESTIMATED USING THE 25-YEAR, 24-HOUR STORM EVENT, AS OPPOSED TO THE VALUES DERIVED FROM THE HELP MODEL, FOR A MORE CONSERVATIVE ESTIMATE. RUNOFF FROM AREAS WHICH HAVE NOT RECEIVED FINAL OR INTERIM COMPACTED COVER IS CONSIDERED CONTAMINATED STORMWATER RUNOFF. BASED ON THE ABOVE SCENARIOS, ASSUME 7.75 ACRES WILL BE THE MAXIMUM AREA FROM WHICH CONTAMINATED STORMWATER WILL BE COLLECTED AND ROUTED TO THE OXIDATION POND.

  - RUNOFF CURVE NUMBER
    - USE AMC-II ➜ AVG. ANTECEDENT MOISTURE CONDITION
    - CN=85

  - 24-HOUR RAINFALL (INCHES) FOR 25-YEAR RETURN INTERVAL FOR VERMILION PARISH = 10" (REFER TO ATTACHED FIGURE), BUT

Sellers & Associates, Inc.
ENGINEERS SURVEYORS PLANNERS

PROJECT	VPSWP - PERMIT MODIFICATION #8 - ADDITIONAL VOLUMES OF CONTAMINATED STORMWATER RUNOFF & OXIDATION POND CALCULATIONS				
JOB NO.	5263-27	SHEET	2	OF	3
CALCULATED BY	DMS	DATE	11/29/2005		
CHECKED BY		DATE			

USE 12".

- COMPUTE RUNOFF:

  $R = [P-0.2(1000/CN-10)]^2 / [P+0.8(1000/CN-10)]$

  $R = [12in-0.2(1000/85-10)]^2 / [12in+0.8(1000/85-10)]$

  R = 10.11 INCHES

- COMPUTE VOLUME PER DAY:

  VOLUME = (10.11"/12in/ft)(7.75 acres)(43,560 ft^2/acre)(7.48 gal/ft^3) = 2.1 MGD

- **OXIDATION POND**

  - TOTAL VOLUME OF POND = 7 MILLION GALLONS
  - CALCULATE DETENTION TIME FOR LEACHATE ONLY (DRY WEATHER):

    $T_{detention}$ = (TOTAL VOL.)/Q = (7 MILLION GALLONS) / (0.036 MGD) = **195 DAYS (MINIMUM)**

  - CALCULATE DETENTION TIME FOR LEACHATE & CONTAMINATED STORMWATER (25 YEAR/24 HOUR STORM EVENT):

    $T_{detention}$ = (TOTAL VOL.)/Q = (7 MILLION GALLONS) / (2.1 MGD + 0.036 MGD) = **3.3 DAYS (MINIMUM)**

POST-PERMIT MODIFICATION #8

- **LEACHATE GENERATION**

HELP ESTIMATES POST - PERMIT MODIFICATION #8 (W/ADDITIONAL CONTAMINATED RUNOFF VOLUMES)

AREA DESCRIPTION	*ACREAGE*	*COVER MATERIAL*	*ASSUMED AVG. WASTE DEPTH*	*PEAK DAILY VALUE OF LEACHATE COLLECTED (CU.FT.)*
Phase 1A	19	Final (6" topsoil over 2' clay)	350"	47.45
Phase 1B - Active Face	2	none	400"	1,126.31
Phase 1B - Daily Cover	6.13	Daily (6" earthen material)	432"	3,919.76
Phase 1B - Interim Cover	3	Interim (1' clay)	400"	1,771.47
			ESTIMATED LEACHATE QUANTITY, CU.FT./DAY	*6,864.99*
			ESTIMATED LEACHATE QUANTITY, GAL/DAY	*51,350.13*

Sellers & Associates, Inc.
ENGINEERS SURVEYORS PLANNERS

PROJECT	VPSWP - PERMIT MODIFICATION #8 - ADDITIONAL VOLUMES OF CONTAMINATED STORMWATER RUNOFF & OXIDATION POND CALCULATIONS				
JOB NO.	5263-27	SHEET	3	OF	3
CALCULATED BY	DMS	DATE	11/29/2005		
CHECKED BY		DATE			

- **CONTAMINATED STORMWATER RUNOFF**

  - CONTAMINATED STORMWATER QUANTITIES (TO BE ROUTED TO OXIDATION POND FOR TREATMENT) WERE ESTIMATED USING THE 25-YEAR, 24-HOUR STORM EVENT, AS OPPOSED TO THE VALUES DERIVED FROM THE HELP MODEL, FOR A MORE CONSERVATIVE ESTIMATE. RUNOFF FROM AREAS WHICH HAVE NOT RECEIVED FINAL OR INTERIM COMPACTED COVER IS CONSIDERED CONTAMINATED STORMWATER RUNOFF. BASED ON THE ABOVE SCENARIOS, ASSUME 11.13 ACRES WILL BE THE MAXIMUM AREA FROM WHICH CONTAMINATED STORMWATER WILL BE COLLECTED AND ROUTED TO THE OXIDATION POND.

  - RUNOFF CURVE NUMBER
    - USE AMC-II → AVG. ANTECEDENT MOISTURE CONDITION
    - CN=85

  - 24-HOUR RAINFALL (INCHES) FOR 25-YEAR RETURN INTERVAL FOR VERMILION PARISH = 10" (REFER TO ATTACHED FIGURE), BUT USE 12".

  - COMPUTE RUNOFF:

    $R = [P-0.2(1000/CN-10)]^2 / [P+0.8(1000/CN-10)]$

    $R = [12in-0.2(1000/85-10)]^2 / [12in+0.8(1000/85-10)]$

    R = 10.11 INCHES

  - COMPUTE VOLUME PER DAY:

    VOLUME = (10.11"/12in/ft)(11.13 acres)(43,560 ft^2/acre)(7.48 gal/ft^3) = 3.06 MGD

- **OXIDATION POND**

  - TOTAL VOLUME OF POND = 7 MILLION GALLONS

  - CALCULATE DETENTION TIME FOR LEACHATE ONLY (DRY WEATHER):

    $T_{detention}$ = (TOTAL VOL.)/Q = (7 MILLION GALLONS) / (0.051 MGD) = **137 DAYS (MINIMUM)**

  - CALCULATE DETENTION TIME FOR LEACHATE & CONTAMINATED STORMWATER (25 YEAR/24 HOUR STORM EVENT):

    $T_{detention}$ = (TOTAL VOL.)/Q = (7 MILLION GALLONS) / (3.06 MGD + 0.051 MGD) = **2.25 DAYS (MINIMUM)**

THEREFORE, THE ADDITIONAL VOLUMES OF CONTAMINATED STORMWATER RUNOFF ANTICIPATED FROM THE PIGGYBACK LINER IN THE EXISTING SUBTITLE D CELL WILL NOT HAVE A SIGNIFICANT AFFECT ON THE HANDLING CAPABILITIES OF THE FACILITY.

Phase 1A - HELPv3.07 Model

VERMILION PARISH SOLID WASTE PLANT

Final Cap System:	6 inch topsoil 24 inches clay
Average Waste Depth:	30' = 350"
Bottom Liner System:	NONE However, a barrier layer of clay was used in the model to provide for leachate collection in the Pre-Subtitle D cells, as opposed to an in-situ clay material which does allows percolation through this type of material.
Acreage:	19 acres

```
            TYPE 3 - BARRIER SOIL LINER
            MATERIAL TEXTURE NUMBER  16
THICKNESS                    =     24.00   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

                    LAYER  3
                    --------

         TYPE 1 - VERTICAL PERCOLATION LAYER
            MATERIAL TEXTURE NUMBER  18
THICKNESS                    =    350.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC

                    LAYER  4
                    --------

          TYPE 2 - LATERAL DRAINAGE LAYER
            MATERIAL TEXTURE NUMBER   2
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.4370 VOL/VOL
FIELD CAPACITY               =      0.0620 VOL/VOL
WILTING POINT                =      0.0240 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0644 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.579999993000E-02 CM/SEC
SLOPE                        =      2.00   PERCENT
DRAINAGE LENGTH              =    100.0    FEET

                    LAYER  5
                    --------

            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

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



```
D
*****************************************************************************
*****************************************************************************
**                                                                         **
**                                                                         **
**              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\VPSWP\DATA4.D4
TEMPERATURE DATA FILE:        C:\HELP3\VPSWP\DATA7.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\VPSWP\DATA13.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\VPSWP\DATA11.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\VPSWP\DATA10.D10
OUTPUT DATA FILE:             C:\HELP3\VPSWP\VPSWPOUT.OUT

TIME:  13:50     DATE:  10/25/2004

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

     TITLE:  VERMILION PARISH SOLID WASTE PLANT - AREA 1A

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

     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   8
THICKNESS                    =      6.00   INCHES
POROSITY                     =      0.4630 VOL/VOL
FIELD CAPACITY               =      0.2320 VOL/VOL
WILTING POINT                =      0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4578 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.369999994000E-03 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
       FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

                    LAYER  2
                    --------
```

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR LAKE CHARLES LOUISIANA
AND STATION LATITUDE = 30.10 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	4.71	4.38	4.29	4.25	4.71	3.04
	7.87	5.25	4.07	2.76	3.67	4.43
STD. DEVIATIONS	2.14	2.77	2.76	2.91	2.61	1.45
	2.92	2.63	2.09	1.98	2.09	2.08
RUNOFF						
TOTALS	3.111	2.511	1.568	1.344	0.966	0.140
	1.664	0.820	0.456	0.695	1.547	3.065
STD. DEVIATIONS	2.062	2.516	2.171	1.795	1.508	0.436
	2.031	1.155	1.153	1.159	1.845	2.027
EVAPOTRANSPIRATION						
TOTALS	1.528	2.069	3.081	3.376	3.743	3.017
	5.548	4.471	3.543	2.024	1.153	0.977
STD. DEVIATIONS	0.130	0.160	0.683	1.150	1.568	1.163
	0.923	1.227	1.246	0.615	0.342	0.146
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.1280	0.1143	0.1157	0.0766	0.0539	0.0283
	0.0736	0.0578	0.0626	0.0712	0.0879	0.1261
STD. DEVIATIONS	0.0022	0.0036	0.0155	0.0302	0.0309	0.0256
	0.0270	0.0349	0.0348	0.0384	0.0436	0.0148
LATERAL DRAINAGE COLLECTED FROM LAYER 4						
TOTALS	0.0158	0.0164	0.0173	0.0095	0.0020	0.0005
	0.0017	0.0019	0.0018	0.0025	0.0047	0.0108
STD. DEVIATIONS	0.0031	0.0017	0.0026	0.0052	0.0025	0.0007
	0.0014	0.0020	0.0022	0.0025	0.0040	0.0045
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.1057	0.0963	0.1045	0.0874	0.0569	0.0293
	0.0673	0.0577	0.0603	0.0669	0.0754	0.1034
STD. DEVIATIONS	0.0000	0.0015	0.0060	0.0203	0.0298	0.0247

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A
FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.%
AND A SLOPE LENGTH OF 450. FEET.

SCS RUNOFF CURVE NUMBER	=	79.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	19.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.747	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.778	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	131.339	INCHES
TOTAL INITIAL WATER	=	131.339	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10 DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	32
END OF GROWING SEASON (JULIAN DATE)	=	361
EVAPORATIVE ZONE DEPTH	=	6.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BATON ROUGE LOUISIANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.97	4.59	5.59	4.82	3.11
7.07	5.05	4.42	2.63	3.95	4.99

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	8.09	557967.312
RUNOFF	6.789	468224.8440
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.004252	293.25406
AVERAGE HEAD ON TOP OF LAYER 2	6.000	
DRAINAGE COLLECTED FROM LAYER 4	0.00069	47.45385
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.003411	235.28493
AVERAGE HEAD ON TOP OF LAYER 5	0.105	
MAXIMUM HEAD ON TOP OF LAYER 5	0.202	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	3.3 FEET	
SNOW WATER	1.61	111063.4220

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4630

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1160

*** 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	2.7503	0.4584
2	10.2480	0.4270
3	102.2000	0.2920
4	0.7764	0.0647
5	15.3720	0.4270
SNOW WATER	0.000	

	0.0236	0.0303	0.0306	0.0323	0.0364	0.0108

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	5.1267	4.5717	3.2343	1.6934	1.3428	0.5558
	1.9900	1.3400	1.4857	1.6671	2.9477	5.2064
STD. DEVIATIONS	0.5061	0.6947	1.1839	1.1139	1.0190	0.7025
	1.0988	1.1179	1.1731	1.4895	1.9146	1.1152

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.0774	0.0883	0.0847	0.0480	0.0097	0.0028
	0.0086	0.0093	0.0092	0.0121	0.0237	0.0528
STD. DEVIATIONS	0.0155	0.0092	0.0130	0.0263	0.0124	0.0038
	0.0069	0.0097	0.0110	0.0122	0.0203	0.0219

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

	INCHES		CU. FEET	PERCENT
PRECIPITATION	53.41	(7.432)	3683871.5	100.00
RUNOFF	17.886	(5.9913)	1233628.25	33.487
EVAPOTRANSPIRATION	34.530	(3.2876)	2381545.00	64.648
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.99595	(0.10966)	68690.641	1.86463
AVERAGE HEAD ON TOP OF LAYER 2	2.597	(0.373)		
LATERAL DRAINAGE COLLECTED FROM LAYER 4	0.08477	(0.01038)	5846.791	0.15871
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.91104	(0.09664)	62834.375	1.70566
AVERAGE HEAD ON TOP OF LAYER 5	0.036	(0.004)		
CHANGE IN WATER STORAGE	0.000	(0.2446)	16.87	0.000

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VPSWPOUT.OUT

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Phase 1B, Active Face - HELPv3.07 Model

VERMILION PARISH SOLID WASTE PLANT

Final Cap System:	None
Average Waste Depth:	33' = 400"
Bottom Liner System:	12 inch sand drainage 60 mil HDPE liner 36 inches recompacted clay
Acreage:	2 acres

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0
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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\VPSWP\DATA4.D4

 TEMPERATURE DATA FILE:       C:\HELP3\VPSWP\DATA7.D7

 SOLAR RADIATION DATA FILE:   C:\HELP3\VPSWP\DATA13.D13

 EVAPOTRANSPIRATION DATA:     C:\HELP3\VPSWP\DATA11.D11

 SOIL AND DESIGN DATA FILE:   C:\HELP3\VPSWP\DATA10.D10

 OUTPUT DATA FILE:            C:\HELP3\VPSWP\VPSWPOUT.OUT

 TIME:  13:54     DATE:  10/25/2004

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     TITLE:  VERMILION PARISH SOLID WASTE PLANT - AREA 1B, ACTIVE FACE

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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  18
   THICKNESS                  =     400.00   INCHES
   POROSITY                   =      0.6710 VOL/VOL
   FIELD CAPACITY             =      0.2920 VOL/VOL
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```
   WILTING POINT              =      0.0770 VOL/VOL
   INITIAL SOIL WATER CONTENT =      0.2967 VOL/VOL
   EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
       FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

                                LAYER  2
                                --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
                        MATERIAL TEXTURE NUMBER   2
   THICKNESS                  =      12.00   INCHES
   POROSITY                   =      0.4370 VOL/VOL
   FIELD CAPACITY             =      0.0620 VOL/VOL
   WILTING POINT              =      0.0240 VOL/VOL
   INITIAL SOIL WATER CONTENT =      0.2636 VOL/VOL
   EFFECTIVE SAT. HYD. COND.  =  0.579999993000E-02 CM/SEC
   SLOPE                      =       2.00   PERCENT
   DRAINAGE LENGTH            =      100.0   FEET

                                LAYER  3
                                --------

                     TYPE 4 - FLEXIBLE MEMBRANE LINER
                        MATERIAL TEXTURE NUMBER  35
   THICKNESS                  =       0.06   INCHES
   POROSITY                   =      0.0000 VOL/VOL
   FIELD CAPACITY             =      0.0000 VOL/VOL
   WILTING POINT              =      0.0000 VOL/VOL
   INITIAL SOIL WATER CONTENT =      0.0000 VOL/VOL
   EFFECTIVE SAT. HYD. COND.  =  0.199999996000E-12 CM/SEC
   FML PINHOLE DENSITY        =       1.00   HOLES/ACRE
   FML INSTALLATION DEFECTS   =      10.00   HOLES/ACRE
   FML PLACEMENT QUALITY      =  3 - GOOD

                                LAYER  4
                                --------

                     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

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

   NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

   SCS RUNOFF CURVE NUMBER            =    78.40
   FRACTION OF AREA ALLOWING RUNOFF   =    100.0   PERCENT
   AREA PROJECTED ON HORIZONTAL PLANE =    2.000   ACRES
   EVAPORATIVE ZONE DEPTH             =      6.0   INCHES
   INITIAL WATER IN EVAPORATIVE ZONE  =    1.608   INCHES
   UPPER LIMIT OF EVAPORATIVE STORAGE =    4.026   INCHES
   LOWER LIMIT OF EVAPORATIVE STORAGE =    0.462   INCHES
   INITIAL SNOW WATER                 =    0.000   INCHES
```

INITIAL WATER IN LAYER MATERIALS	=	137.221	INCHES
TOTAL INITIAL WATER	=	137.221	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10 DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	32
END OF GROWING SEASON (JULIAN DATE)	=	361
EVAPORATIVE ZONE DEPTH	=	6.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BATON ROUGE LOUISIANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.97	4.59	5.59	4.82	3.11
7.07	5.05	4.42	2.63	3.95	4.99

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR LAKE CHARLES LOUISIANA

AND STATION LATITUDE = 30.10 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	4.71	4.38	4.29	4.25	4.71	3.04
	7.87	5.25	4.07	2.76	3.67	4.43
STD. DEVIATIONS	2.14	2.77	2.76	2.91	2.61	1.45
	2.92	2.63	2.09	1.98	2.09	2.08
RUNOFF						
TOTALS	0.105	0.143	0.095	0.161	0.168	0.005
	0.188	0.066	0.081	0.062	0.076	0.056
STD. DEVIATIONS	0.134	0.294	0.193	0.316	0.574	0.011
	0.302	0.117	0.286	0.157	0.149	0.116
EVAPOTRANSPIRATION						
TOTALS	1.607	2.042	2.647	2.609	3.108	2.646
	5.043	3.882	3.099	1.770	1.202	1.072
STD. DEVIATIONS	0.130	0.260	0.785	1.085	1.262	0.993
	0.930	1.112	1.129	0.704	0.377	0.163
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	1.4907	1.7258	2.2083	2.2801	2.3391	2.1802
	1.8625	1.7608	1.6432	1.4920	1.2090	1.2156
STD. DEVIATIONS	0.5132	0.5381	0.7015	0.8268	0.9329	0.8638
	0.8469	0.6740	0.5934	0.6575	0.5588	0.5306
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0011	0.0013	0.0016	0.0017	0.0017	0.0016
	0.0014	0.0013	0.0012	0.0011	0.0009	0.0009
STD. DEVIATIONS	0.0003	0.0004	0.0005	0.0006	0.0007	0.0006
	0.0006	0.0004	0.0004	0.0004	0.0004	0.0004

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	7.0480	8.8613	10.4512	11.1859	11.1417	10.6674
	8.7828	8.2472	7.9073	6.9939	5.9468	5.8008
STD. DEVIATIONS	2.2472	2.7312	3.7390	4.4825	4.7317	4.4685
	3.9865	3.0429	2.6490	2.8451	2.5605	2.3459

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*
     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS  1 THROUGH   30
-----------------------------------------------------------------------------
                                  INCHES            CU. FEET       PERCENT
---------
  PRECIPITATION                 53.41    (   7.432)    387776.0      100.00

  RUNOFF                         1.207   (  0.9373)      8759.35       2.259

  EVAPOTRANSPIRATION            30.727   (  2.8507)    223078.70     57.528

  LATERAL DRAINAGE COLLECTED    21.40720 (  5.47898)   155416.250   40.07888
    FROM LAYER  2

  PERCOLATION/LEAKAGE THROUGH    0.01591 (  0.00392)      115.491
0.02978
    LAYER  4

  AVERAGE HEAD ON TOP            8.586 (    2.281)
    OF LAYER  3

  CHANGE IN WATER STORAGE        0.056   (  5.7007)       406.16       0.105

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          PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
     ------------------------------------------------------------------
                                          (INCHES)      (CU. FT.)
                                          ---------     ----------
       PRECIPITATION                       8.09         58733.402

       RUNOFF                              3.164        22972.1699

       DRAINAGE COLLECTED FROM LAYER  2    0.15514       1126.31860

       PERCOLATION/LEAKAGE THROUGH LAYER  4  0.000131       0.95056

       AVERAGE HEAD ON TOP OF LAYER  3    27.621

       MAXIMUM HEAD ON TOP OF LAYER  3    32.472

       LOCATION OF MAXIMUM HEAD IN LAYER  2
             (DISTANCE FROM DRAIN)        63.4 FEET

       SNOW WATER                          1.61         11690.8867

       MAXIMUM VEG. SOIL WATER (VOL/VOL)              0.5412

       MINIMUM VEG. SOIL WATER (VOL/VOL)              0.0770

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

             Reference:  Maximum Saturated Depth over Landfill Liner
                         by Bruce M. McEnroe, University of Kansas
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0
*****************************************************************************
                 FINAL WATER STORAGE AT END OF YEAR   30
     ------------------------------------------------------------------
                 LAYER        (INCHES)       (VOL/VOL)
                 -----        --------       ---------
                   1          119.2049        0.2980

                   2            4.3221        0.3602

                   3            0.0000        0.0000

                   4           15.3720        0.4270

               SNOW WATER       0.000

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


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Phase 1B, Daily Cover - HELPv3.07 Model

VERMILION PARISH SOLID WASTE PLANT

PRE PERMIT MODIFICATION #8
(PRIOR TO ADDITIONAL CONTAMINATED STORMWATER RUNOFF)

Final Cap System:	6" Topsoil
Average Waste Depth:	30' = 360"
Bottom Liner System:	12 inch sand drainage 60 mil HDPE liner 36 inches recompacted clay
Acreage:	2.75 acres

0

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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\DATA4.D4

 TEMPERATURE DATA FILE:        C:\HELP3\DATA7.D7

 SOLAR RADIATION DATA FILE:    C:\HELP3\DATA13.D13

 EVAPOTRANSPIRATION DATA:      C:\HELP3\DATA11.D11

 SOIL AND DESIGN DATA FILE:    C:\HELP3\DATA10.D10

 OUTPUT DATA FILE:             C:\HELP3\VPSWPOUT.OUT


 TIME:   9:56     DATE:  11/29/2005


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

     TITLE:  VPSWP - AREA 18, DAILY COVER (PRE-PERMIT MOD #8)

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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   8
     THICKNESS                  =      6.00   INCHES
     POROSITY                   =    0.4630 VOL/VOL
     FIELD CAPACITY             =    0.2320 VOL/VOL
```



```
     WILTING POINT              =    0.1160 VOL/VOL
     INITIAL SOIL WATER CONTENT =    0.2079 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.369999994000E-03 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
         FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                  LAYER  2
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER  18
     THICKNESS                  =    360.00   INCHES
     POROSITY                   =    0.6710 VOL/VOL
     FIELD CAPACITY             =    0.2920 VOL/VOL
     WILTING POINT              =    0.0770 VOL/VOL
     INITIAL SOIL WATER CONTENT =    0.3213 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.100000005000E-02 CM/SEC


                                  LAYER  3
                                  --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
                        MATERIAL TEXTURE NUMBER   1
     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 =    0.2210 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.999999978000E-02 CM/SEC
     SLOPE                      =     2.00   PERCENT
     DRAINAGE LENGTH            =    100.0   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      = 3 - GOOD


                                  LAYER  5
                                  --------

                     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
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 200. FEET.

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	2.750	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.247	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.778	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	134.945	INCHES
TOTAL INITIAL WATER	=	134.945	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	32	
END OF GROWING SEASON (JULIAN DATE)	=	361	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00	%

NOTE: PRECIPITATION DATA FOR LAKE CHARLES LOUISIANA

WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA

AND STATION LATITUDE = 30.10 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	6.39	2.10	2.46	3.63	4.49	5.60
	3.84	5.91	4.58	3.39	5.54	4.32
STD. DEVIATIONS	3.90	1.12	0.67	2.98	4.43	1.69
	2.20	3.64	1.17	2.12	1.48	2.76
RUNOFF						
TOTALS	0.410	0.015	0.006	0.334	0.304	0.478
	0.038	0.997	0.247	0.160	0.319	0.068
STD. DEVIATIONS	0.434	0.033	0.013	0.498	0.456	0.547
	0.053	1.417	0.335	0.159	0.371	0.111
EVAPOTRANSPIRATION						
TOTALS	1.607	1.736	1.613	1.710	2.208	3.001
	3.184	2.796	2.682	1.330	1.474	1.155
STD. DEVIATIONS	0.181	0.426	0.492	0.988	1.464	0.776
	1.502	1.385	0.528	0.950	0.329	0.200
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	2.2095	2.8470	3.5150	2.9000	2.2190	1.8323
	2.3649	1.8588	1.4663	1.8605	1.5795	1.7016
STD. DEVIATIONS	0.3526	1.1807	1.8077	1.6033	1.4931	1.1795
	0.9499	0.7914	0.6065	0.8575	0.6549	0.4130
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0010	0.0012	0.0015	0.0012	0.0010	0.0008
	0.0011	0.0009	0.0007	0.0009	0.0007	0.0008
STD. DEVIATIONS	0.0001	0.0004	0.0008	0.0007	0.0006	0.0005
	0.0003	0.0003	0.0003	0.0004	0.0003	0.0002

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4					
AVERAGES	6.1926	8.5268	9.7786	8.2071	6.0437 5.2147

	6.5133	5.1937	4.2956	5.2297	4.6002
4.8198					
STD. DEVIATIONS	0.9399	3.4071	5.4108	4.5732	3.8626
3.2110					
	2.3364	2.0993	1.7596	2.3989	1.8686
1.1321					

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

	INCHES		CU. FEET	PERCENT
PRECIPITATION	52.23	(11.130)	521405.8	100.00
RUNOFF	3.376	(2.0854)	33696.31	6.463
EVAPOTRANSPIRATION	24.496	(4.0692)	244527.27	46.898
LATERAL DRAINAGE COLLECTED FROM LAYER 3	26.35443	(10.18120)	263083.062	50.45649
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.01177	(0.00417)	117.528	0.02254
AVERAGE HEAD ON TOP OF LAYER 4	6.218	(2.367)		
CHANGE IN WATER STORAGE	-2.005	(5.7025)	-20018.24	-3.839

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	5.88	58697.102
RUNOFF	3.071	30652.4766
DRAINAGE COLLECTED FROM LAYER 3	0.18336	1830.37207
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000086	0.85670
AVERAGE HEAD ON TOP OF LAYER 4	17.689	
MAXIMUM HEAD ON TOP OF LAYER 4	20.727	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	54.5 FEET	
SNOW WATER	1.83	18271.1211

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4580
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1160

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

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

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	1.5505	0.2584
2	105.1495	0.2921
3	2.8466	0.2372
4	0.0000	0.0000
5	15.3720	0.4270
SNOW WATER	0.000	

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Phase 1B, Interim Cover - HELPv3.07 Model

VERMILION PARISH SOLID WASTE PLANT

Final Cap System:	12" Clay
Average Waste Depth:	33' = 400"
Bottom Liner System:	12 inch sand drainage 60 mil HDPE liner 36 inches recompacted clay
Acreage:	3 acres

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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\VPSWP\DATA4.D4

 TEMPERATURE DATA FILE:       C:\HELP3\VPSWP\DATA7.D7

 SOLAR RADIATION DATA FILE:   C:\HELP3\VPSWP\DATA13.D13

 EVAPOTRANSPIRATION DATA:     C:\HELP3\VPSWP\DATA11.D11

 SOIL AND DESIGN DATA FILE:   C:\HELP3\VPSWP\DATA10.D10

 OUTPUT DATA FILE:            C:\HELP3\VPSWP\VPSWPOUT.OUT


 TIME:  14:13     DATE:  10/25/2004


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     TITLE:  VERMILION PARISH SOLID WASTE PLANT, AREA 1B - INTERIM COVER

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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   8
          THICKNESS                  =       6.00   INCHES
          POROSITY                   =     0.4630 VOL/VOL
          FIELD CAPACITY             =     0.2320 VOL/VOL
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          WILTING POINT              =     0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT =     0.2563 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  = 0.369999994000E-03 CM/SEC
     NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
              FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                  LAYER  2
                                  --------

                  TYPE 3 - BARRIER SOIL LINER
                      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 =     0.4630 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  = 0.369999994000E-03 CM/SEC


                                  LAYER  3
                                  --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  18
          THICKNESS                  =     400.00   INCHES
          POROSITY                   =     0.6710 VOL/VOL
          FIELD CAPACITY             =     0.2920 VOL/VOL
          WILTING POINT              =     0.0770 VOL/VOL
          INITIAL SOIL WATER CONTENT =     0.2964 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  = 0.100000005000E-02 CM/SEC


                                  LAYER  4
                                  --------

                  TYPE 2 - LATERAL DRAINAGE LAYER
                      MATERIAL TEXTURE NUMBER   2
          THICKNESS                  =      12.00   INCHES
          POROSITY                   =     0.4370 VOL/VOL
          FIELD CAPACITY             =     0.0620 VOL/VOL
          WILTING POINT              =     0.0240 VOL/VOL
          INITIAL SOIL WATER CONTENT =     0.3079 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  = 0.579999993000E-02 CM/SEC
          SLOPE                      =      2.00   PERCENT
          DRAINAGE LENGTH            =     100.0   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
          FML INSTALLATION DEFECTS   =     10.00   HOLES/ACRE
          FML PLACEMENT QUALITY      = 3 - GOOD
```

LAYER 6

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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 200. FEET.

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	3.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.538	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.778	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	144.717	INCHES
TOTAL INITIAL WATER	=	144.717	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	32	
END OF GROWING SEASON (JULIAN DATE)	=	361	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR BATON ROUGE LOUISIANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.97	4.59	5.59	4.82	3.11
7.07	5.05	4.42	2.63	3.95	4.99

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA

AND STATION LATITUDE = 30.10 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	4.71	4.38	4.29	4.25	4.71	3.04
	7.87	5.25	4.07	2.76	3.67	4.43
STD. DEVIATIONS	2.14	2.77	2.76	2.91	2.61	1.45
	2.92	2.63	2.09	1.98	2.09	2.08
RUNOFF						
TOTALS	0.188	0.230	0.150	0.241	0.240	0.014
	0.306	0.118	0.130	0.088	0.128	0.098
STD. DEVIATIONS	0.228	0.446	0.282	0.414	0.636	0.032
	0.464	0.184	0.411	0.196	0.237	0.162
EVAPOTRANSPIRATION						
TOTALS	1.622	1.893	2.267	2.109	2.607	2.391
	4.500	3.444	2.655	1.546	1.230	1.166
STD. DEVIATIONS	0.206	0.380	0.779	0.973	1.064	0.925
	0.850	1.016	1.004	0.682	0.420	0.185
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	2.9496	2.3983	1.9205	2.1474	1.8589	0.6323
	2.9247	1.6886	1.2813	1.1618	2.0127	3.0786
STD. DEVIATIONS	1.8782	2.0537	1.9889	1.8327	1.3828	0.7116
	1.9045	1.5602	1.0822	1.2447	1.7159	1.7831
LATERAL DRAINAGE COLLECTED FROM LAYER 4						
TOTALS	1.6472	1.7991	2.2270	2.2890	2.3995	2.3396

```
                          2.1819   2.0713   1.9932   1.9127   1.6119
1.4979

    STD. DEVIATIONS       0.5287   0.5429   0.6707   0.7841   0.8438
0.7954
                          0.8139   0.6359   0.5888   0.6890   0.6108
0.5549

  PERCOLATION/LEAKAGE THROUGH LAYER  6
  ---------------------------------------
    TOTALS                0.0012   0.0013   0.0016   0.0017   0.0017
0.0017
                          0.0016   0.0015   0.0014   0.0014   0.0012
0.0011

    STD. DEVIATIONS       0.0003   0.0004   0.0005   0.0006   0.0006
0.0006
                          0.0006   0.0004   0.0004   0.0004   0.0004
0.0004

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-
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-----------------------------------------------------------------------
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  DAILY AVERAGE HEAD ON TOP OF LAYER  2
  ---------------------------------------
    AVERAGES              0.0699   0.0685   0.0513   0.0595   0.0412
0.0133
                          0.0807   0.0437   0.0337   0.0260   0.0547
0.0699

    STD. DEVIATIONS       0.0516   0.0709   0.0592   0.0589   0.0335
0.0168
                          0.0623   0.0459   0.0351   0.0374   0.0525
0.0451

  DAILY AVERAGE HEAD ON TOP OF LAYER  5
  ---------------------------------------
    AVERAGES              7.7393   9.2269  10.5198  11.1412  11.3376
11.4209
                         10.2429   9.6138   9.4588   8.8629   7.7728
7.0578

    STD. DEVIATIONS       2.3223   2.8082   3.6022   4.2791   4.2976
4.1807
                          3.9166   2.9154   2.6402   2.9808   2.7567
2.4008

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*
     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-----------------------------------------------------------------------
-
                                   INCHES            CU. FEET       PERCENT
---------
  PRECIPITATION                  53.41    (   7.432)     581663.9     100.00
```



```
  RUNOFF                          1.931    (  1.2256)      21029.94      3.615

  EVAPOTRANSPIRATION             27.429    (  2.5792)     298706.87     51.354

  PERCOLATION/LEAKAGE THROUGH    24.05472  (  5.66195)    261955.937
45.03562
    LAYER  2

  AVERAGE HEAD ON TOP             0.051 (     0.013)
    OF LAYER  2

  LATERAL DRAINAGE COLLECTED     23.97021  (  5.61707)    261035.641   44.87740
    FROM LAYER  4

  PERCOLATION/LEAKAGE THROUGH     0.01756 (  0.00404)       191.237
0.03288
    LAYER  6

  AVERAGE HEAD ON TOP             9.533 (     2.365)
    OF LAYER  5

  CHANGE IN WATER STORAGE         0.064    (  5.7820)        700.26      0.120

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                PEAK DAILY VALUES FOR YEARS    1 THROUGH    30
    ---------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                                ---------     ----------
      PRECIPITATION                              8.09         88100.102

      RUNOFF                                     3.455        37620.8359

      PERCOLATION/LEAKAGE THROUGH LAYER  2       2.774564     30215.00200

      AVERAGE HEAD ON TOP OF LAYER  2            2.056

      DRAINAGE COLLECTED FROM LAYER  4           0.16267       1771.47192

      PERCOLATION/LEAKAGE THROUGH LAYER  6       0.000137         1.48778

      AVERAGE HEAD ON TOP OF LAYER  5           28.863

      MAXIMUM HEAD ON TOP OF LAYER  5            34.140

      LOCATION OF MAXIMUM HEAD IN LAYER  4
            (DISTANCE FROM DRAIN)               64.4 FEET

      SNOW WATER                                 1.61         17536.3301

      MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.4630

      MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1160

       ***  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	1.4588	0.2431
2	5.5560	0.4630
3	119.5662	0.2989
4	4.6934	0.3911
5	0.0000	0.0000
6	15.3720	0.4270
SNOW WATER	0.000	

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Phase 1B, Daily Cover - HELPv3.07 Model

VERMILION PARISH SOLID WASTE PLANT

POST PERMIT MODIFICATION #8
(W/ADDITIONAL CONTAMINATED STORMWATER RUNOFF)

Final Cap System:	6" Topsoil
Average Waste Depth:	36' = 432"
Bottom Liner System:	12 inch sand drainage 60 mil HDPE liner 36 inches recompacted clay
Acreage:	6.13 acres

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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\DATA4.D4
 TEMPERATURE DATA FILE:       C:\HELP3\DATA7.D7
 SOLAR RADIATION DATA FILE:   C:\HELP3\DATA13.D13
 EVAPOTRANSPIRATION DATA:     C:\HELP3\DATA11.D11
 SOIL AND DESIGN DATA FILE:   C:\HELP3\DATA10.D10
 OUTPUT DATA FILE:            C:\HELP3\VPSWPOUT.OUT

 TIME:  10: 0     DATE:  11/29/2005

******************************************************************************
     TITLE:  VPSWP - AREA 1B, DAILY COVER (POST- PERMIT MOD #8)
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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   8
     THICKNESS                  =      6.00   INCHES
     POROSITY                   =    0.4630 VOL/VOL
     FIELD CAPACITY             =    0.2320 VOL/VOL
```



```
     WILTING POINT              =    0.1160 VOL/VOL
     INITIAL SOIL WATER CONTENT =    0.2079 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.369999994000E-03 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
          FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

                              LAYER  2
                              --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                  MATERIAL TEXTURE NUMBER  18
     THICKNESS                  =    432.00   INCHES
     POROSITY                   =    0.6710 VOL/VOL
     FIELD CAPACITY             =    0.2920 VOL/VOL
     WILTING POINT              =    0.0770 VOL/VOL
     INITIAL SOIL WATER CONTENT =    0.3174 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.100000005000E-02 CM/SEC

                              LAYER  3
                              --------

              TYPE 2 - LATERAL DRAINAGE LAYER
                  MATERIAL TEXTURE NUMBER   1
     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 =    0.2020 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.999999978000E-02 CM/SEC
     SLOPE                      =     2.00   PERCENT
     DRAINAGE LENGTH            =    100.0   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      = 3 - GOOD

                              LAYER  5
                              --------

              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
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 200. FEET.

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	6.130	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.247	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.778	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	156.163	INCHES
TOTAL INITIAL WATER	=	156.163	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10 DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	32
END OF GROWING SEASON (JULIAN DATE)	=	361
EVAPORATIVE ZONE DEPTH	=	6.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00 %

NOTE: PRECIPITATION DATA FOR LAKE CHARLES LOUISIANA WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA

AND STATION LATITUDE = 30.10 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	6.39	2.10	2.46	3.63	4.49	5.60
	3.84	5.91	4.58	3.39	5.54	4.32
STD. DEVIATIONS	3.90	1.12	0.67	2.98	4.43	1.69
	2.20	3.64	1.17	2.12	1.48	2.76
RUNOFF						
TOTALS	0.410	0.015	0.006	0.334	0.304	0.478
	0.038	0.997	0.247	0.160	0.319	0.068
STD. DEVIATIONS	0.434	0.033	0.013	0.498	0.456	0.547
	0.053	1.417	0.335	0.159	0.371	0.111
EVAPOTRANSPIRATION						
TOTALS	1.607	1.736	1.613	1.710	2.208	3.001
	3.184	2.796	2.682	1.330	1.474	1.155
STD. DEVIATIONS	0.181	0.426	0.492	0.988	1.464	0.776
	1.502	1.385	0.528	0.950	0.329	0.200
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	2.0230	2.5462	3.3967	2.9415	2.3311	1.8968
	2.4171	2.0119	1.5988	1.9255	1.6268	1.6699
STD. DEVIATIONS	0.2575	0.9215	1.7250	1.5414	1.4569	1.1870
	0.9995	1.0304	0.7273	0.9025	0.6340	0.3948
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0009	0.0011	0.0015	0.0013	0.0010	0.0008
	0.0011	0.0009	0.0007	0.0009	0.0008	0.0008
STD. DEVIATIONS	0.0001	0.0003	0.0007	0.0006	0.0006	0.0005
	0.0004	0.0004	0.0003	0.0004	0.0003	0.0002

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4						
AVERAGES	5.7099	7.5996	9.3172	8.2118	6.3150	5.3890

	6.6368	5.5655	4.6627	5.3957	4.7399
4.7336					
STD. DEVIATIONS	0.6960	2.5760	4.9132	4.2531	3.7348
3.2213					
	2.4371	2.6523	2.0924	2.5117	1.8146
1.0885					

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

	INCHES		CU. FEET	PERCENT
PRECIPITATION	52.23	(11.130)	1162261.0	100.00
RUNOFF	3.376	(2.0854)	75112.15	6.463
EVAPOTRANSPIRATION	24.496	(4.0692)	545073.50	46.898
LATERAL DRAINAGE COLLECTED FROM LAYER 3	26.38512	(10.17806)	587119.000	50.51525
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.01174	(0.00410)	261.283	0.02248
AVERAGE HEAD ON TOP OF LAYER 4	6.190	(2.314)		
CHANGE IN WATER STORAGE	-2.036	(5.7800)	-45304.77	-3.898

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PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	5.88	130841.180
RUNOFF	3.071	68327.1641
DRAINAGE COLLECTED FROM LAYER 3	0.17615	3919.75854
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000080	1.77570
AVERAGE HEAD ON TOP OF LAYER 4	16.369	
MAXIMUM HEAD ON TOP OF LAYER 4	19.237	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	53.0 FEET	
SNOW WATER	1.83	40727.9922

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4580
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1160

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

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

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FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	1.5505	0.2584
2	126.2192	0.2922
3	2.8418	0.2368
4	0.0000	0.0000
5	15.3720	0.4270
SNOW WATER	0.000	

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LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT HYDR1130-071498
HYDRAULICS SECTION
DESIGNER: DMS DATE: 11-29-2005
REMARKS: VPSWP - SUBTITLE D CELL - PRE-PERMIT MODIFICATION #8

STATE PROJECT NUMBER 5263-27

SCS PEAK DISCHARGE

STATION	100+00.00
DRAINAGE AREA (ACRES)	5.00
HYDRAULIC LENGTH (FEET)	362.00
CURVE NUMBER	80.00
RAINFALL (INCHES)	12.00
SLOPE (PERCENT)	4.00
PEAK ADJUSTMENT FACTOR	1.00
PEAK DISCHARGE (CFS)	61.

SCS PEAK DISCHARGE

STATION	200+00
DRAINAGE AREA (ACRES)	2.73
HYDRAULIC LENGTH (FEET)	337.00
CURVE NUMBER	80.00
RAINFALL (INCHES)	12.00
SLOPE (PERCENT)	4.00
PEAK ADJUSTMENT FACTOR	1.00
PEAK DISCHARGE (CFS)	34.

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LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT HYDR1130-071498
HYDRAULICS SECTION
DESIGNER: DMS DATE: 11-29-2005
REMARKS: VPSWP - SUBTITLE D CELL - POST-PERMIT MODIFICATION #8

STATE PROJECT NUMBER 5263-27

SCS PEAK DISCHARGE

STATION	100+00.00
DRAINAGE AREA (ACRES)	7.83
HYDRAULIC LENGTH (FEET)	470.00
CURVE NUMBER	80.00
RAINFALL (INCHES)	12.00
SLOPE (PERCENT)	4.00
PEAK ADJUSTMENT FACTOR	1.00
PEAK DISCHARGE (CFS)	95.

SCS PEAK DISCHARGE

STATION	200+00
DRAINAGE AREA (ACRES)	3.30
HYDRAULIC LENGTH (FEET)	400.00
CURVE NUMBER	80.00
RAINFALL (INCHES)	12.00
SLOPE (PERCENT)	4.00
PEAK ADJUSTMENT FACTOR	1.00
PEAK DISCHARGE (CFS)	40.

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LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT HYDR1140-071498
HYDRAULICS SECTION

DESIGNER: DMS DATE: 11-29-2005
REMARKS: VPSWP - PERMIT MODIFICATION #8

STATE PROJECT NUMBER 5263-27

OPEN CHANNEL DESIGN

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STATION	100+00.00
DESIGN DISCHARGE (C.F.S.)	109.86
WIDTH OF CHANNEL BOTTOM (FT.)	5.00
DEPTH OF FLOW (FT.)	2.25
SIDE SLOPE RATIO, LEFT (FT.:1)	2.0
SIDE SLOPE RATIO, RIGHT (FT.:1)	2.0
ROUGHNESS COEFFICIENT	.020
SLOPE OF CHANNEL BOTTOM (FT./FT.)	.00300

****

THEREFORE, THE PROPOSED STORMWATER PERIMETER DITCHES CAN HANDLE PRE-PERMIT MODIFICATION (PRIOR TO PIGGYBACK SLOPE LINER) PEAK DISCHARGES (i.e, 109.86cfs > 61cfs and 34cfs),AS WELL AS POST-PERMIT MODIFICATION (POST PIGGYBACK SLOPE LINER) PEAK DISCHARGES (i.e, 95cfs and 40cfs).

Sellers & Associates, Inc.
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(337) 232-0777 • Fax (337) 232-0851

JOB NO. 5263-27 - PM. #8 SHEET 1 OF 4
CALCULATED BY DMS DATE 1/25/06
CHECKED BY WPB DATE 1/25/06
SCALE

VERMILION PARISH SOLID WASTE PLANT - REVISED CALCULATIONS - STORMWATER RUNOFF

- ASSUMPTIONS:
  - RUNOFF FROM AREAS WHICH HAVE NOT RECEIVED FINAL OR INTERIM COVER IS CONSIDERED CONTAMINATED STORMWATER RUNOFF + REQUIRES TREATMENT.
  - USE TR-55, URBAN HYDROLOGY FOR SMALL WATERSHEDS (PUBLISHED BY NRCS); SCS METHOD
  - ASSUME SOIL CONDITIONS AS FOLLOWS:
    - AMC-II (AVG. ANTECEDENT MOISTURE CONDITION)
    - SOIL GROUP "D"
    - TYPE III
    - CN ≈ 87

- PRE-PERMIT MODIFICATION #8
  - ASSUME 7.75 ACRES WILL BE THE MAXIMUM AREA FROM WHICH CONTAMINATED STORMWATER RUNOFF WILL BE COLLECTED.

- (EQ. 2-4) $S = \frac{1000}{CN} - 10 = \frac{1000}{87} - 10 = 1.494$

  (POTENTIAL MAX. RETENTION AFTER RUNOFF BEGINS, in.)

- (EQ. 2-3) $Q = \frac{(P - 0.2S)^2}{P + 0.8S}$ (RUNOFF, in.)

  WHERE: P = 10" (25-YEAR, 24 HOUR STORM)
  HOWEVER, USE P = 12" (LAC 33:VI.711.A.3, DESIGN STANDARD)
  ASSUME: Ia (initial abstraction) = 0.2 S

$$Q_{10"} = \frac{[10 - (0.2)(1.494)]^2}{10 + 0.8(1.494)} = 8.407"$$

$$Q_{12} = \frac{[12 - (0.2)(1.494)]^2}{12 + 0.8(1.494)} = \underline{\underline{10.376"}}$$ ← USE THIS Q

- (EQ. 3-1) $T_t = \frac{L}{3600\,V}$ (TRAVEL TIME)

  $T_1 = L / 3600\,V_1$ WHERE; V_1 = 8 ft/sec (FROM FIG. 3-1, FOR UNPAVED SHEET FLOW @ 0.25 SLOPE)
  L = 275'

  $T_1 = 275' / (3600)(8\ ft/sec) = 0.01$ hr.

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JOB NO. 526327-PM#8 SHEET 2 OF 4
CALCULATED BY DMS DATE 1/25/06
CHECKED BY WPB DATE 1/25/06
SCALE

$T_2 = L_2 / 3600\, V_2$ WHERE: $V_2 = 1.4$ ft/sec

$$V = \frac{1.49\, r^{2/3} s^{1/2}}{n}$$

(ASSUME $n = 0.04$
$s = 0.1\%$
$r = 18\ ft^2 / 13.9' = 1.3'$

$$V = \frac{1.49 (1.3)^{2/3} (0.001)^{1/2}}{(0.04)} = 1.4 \text{ ft/sec}$$

$$T_2 = 1200' / 3600 (1.4 \text{ ft/sec}) = 0.24 \text{ hr}$$

$$T_c = T_1 + T_2 = 0.01 \text{ hr} + 0.24 \text{ hr} = 0.25 \text{ hr.}$$

- (EQ. 4-1) GRAPHICAL PEAK DISCHARGE METHOD

$$q_p = q_u A_m Q F_p$$

WHERE: q_u, peak discharge (cfs), FROM EXHIBIT 4-III FOR TYPE III RAINFALL DISTRIBUTION:

$T_c = 0.25$ hr.

$I_a/P = \underline{0.299}$ (FROM TABLE 4-1)

$\Rightarrow q_u = 450$ csm/in

$$q_p = (450 \text{ csm/in}) \left[7.75 \text{ ACRES} \left(\frac{43{,}560 \text{ ft}^2}{\text{ACRE}}\right) \left(\frac{1 \text{ mi}^2}{(5280)^2 \text{ ft}^2}\right) \right] [10.376''] (1)$$

$q_p = \underline{56.54 \text{ cfs}}$

- RUNOFF VOLUME (EQ. 4-1)

$$V_R = 53.33 Q (A_m)$$

$$= 53.33 (10.376'') \left[7.75 \text{ ACRES} \left(\frac{43560 \text{ ft}^2}{\text{ACRE}}\right) \times \frac{1 \text{ mi}^2}{(5{,}280')^2} \right]$$

$$= 6.7 \text{ ACRE-FT} \times \frac{43{,}560 \text{ FT}^2}{\text{ACRE}} \times \frac{7.48 \text{ GAL}}{\text{FT}^3} = \underline{2.2 \text{ MIL. GAL.}}$$

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JOB NO. 526327-PM#8 SHEET 3 OF 4
CALCULATED BY DMS DATE 1/25/06
CHECKED BY WPB DATE 1/25/06
SCALE

- OXIDATION POND - 7 MIL. GAL TOTAL VOLUME
  - DETENTION TIME FOR LEACHATE & CONT. STORMWATER

$$T_{detention} = \frac{7\text{ MIL GAL.}}{(0.036\text{ MGD} + 2.2\text{ MGD})} = 3.1 \text{ DAYS (MINIMUM)}$$

- POST-PERMIT MODIFICATION #8

  - ASSUME 11.13 ACRES WILL BE THE MAXIMUM AREA FROM WHICH CONTAMINATED STORMWATER RUNOFF WILL BE COLLECTED.

  - (EQ. 2-4) $S = \frac{1000}{CN} - 10 = \frac{1000}{87} - 10 = 1.494$

  - (EQ. 2-3) $Q = \frac{(P - 0.25)^2}{P + 0.85} = \frac{[12 - (0.2)(1.494)]^2}{12 + 0.8(1.494)} = \underline{10.376''}$ (FOR DESIGN RAINFALL = 12")

  - (EQ. 3-1) $T_1 = L_1/3600 V_1$: WHERE: $V_1 = 8$ ft/sec (FROM FIG 3-1, FOR UNPAVED SHEET FLOW @ 0.25 SLOPE)

    $L_1 = 600'$

    $T_1 = 600'/3600(8 \text{ ft/sec}) = \underline{0.0208 \text{ hr}}$

    $T_2 = L_2/3600 V_2$. WHERE: $V_2 = \frac{1.49 r^{2/3} S^{1/2}}{n}$

    (ASSUME: $n = 0.04$, $S = 0.1\%$, $r = 1.3'$)

    $V_2 = \frac{1.49(1.3)^{2/3}(0.001)^{1/2}}{0.04} = 1.4 \frac{ft}{sec}$

    $T_2 = 2260'/3600(1.4) = \underline{0.45 \text{ hr}}$.

    $T_c = T_1 + T_2 = 0.0208 \text{ hr} + 0.45 \text{ hr} = \underline{\underline{0.47 \text{ HR}}}$

  - (EQ. 4-1) $q_p = q_u A_m Q F_p$ WHERE: $q_u = 360$ csm/in

    $q_p = (360 \text{ csm/in})[11.13 \text{ ACRE}(43{,}560 \text{ FT}^2/\text{ACRE})(1 \text{ mi}^2/(5{,}280')^2)]$
    $(10.376'')(1)$

    $q_p = \underline{65 \text{ cfs}}$

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JOB NO. 526327-PM#8 SHEET 4 OF 4
CALCULATED BY DMS DATE 1/25/06
CHECKED BY WPB DATE 1/25/06
SCALE

- RUNOFF VOLUME (EQ. 6-1)

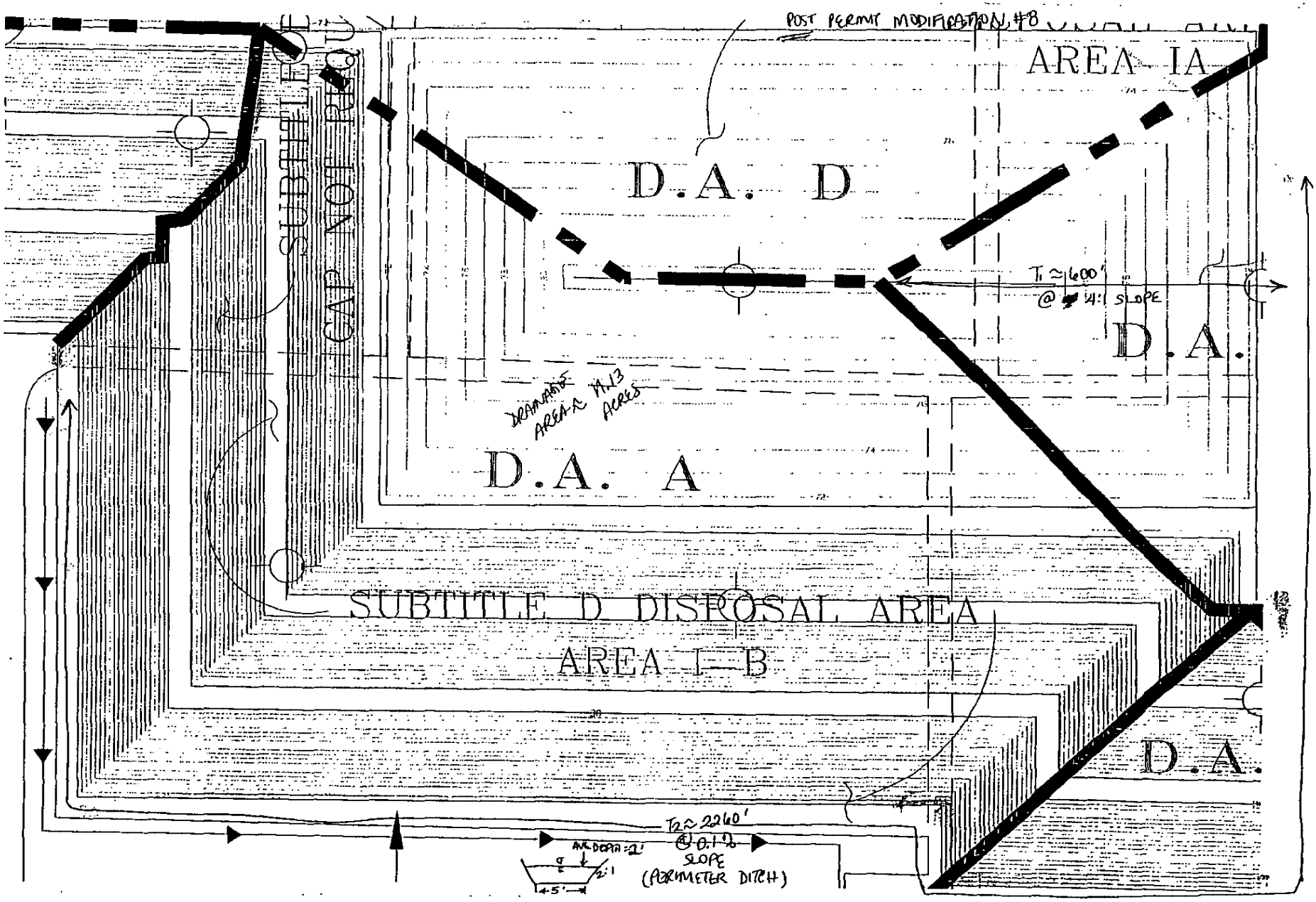
$$V_R = 53.33\ Q\ A_m$$

$$V_R = 53.33\ (10.376'')\left[11.13\ \text{ACRES} \times \frac{(43{,}560\ ft^2)}{acre} \times \frac{1\ mi^2}{(5280'\ J^2}\right]$$

$$V_R = 9.62\ \text{ACRE}\cdot\text{FT} \times \frac{43{,}560\ FT^2}{\text{ACRE}} \times \frac{7.48\ \text{GAL}}{FT^3} = 3.14\ \text{MIL GAL}$$

- OXIDATION POND - 7 MIL GAL TOTAL VOLUME
  - DETENTION TIME FOR LEACHATE & CONTAMINATED STORMWATER

$$T_{detention} = \frac{7\ \text{MIL GAL.}}{(0.051\ \text{MGD} + 3.14\ \text{MGD})} = 2.2\ \text{DAYS (MINIMUM)}$$



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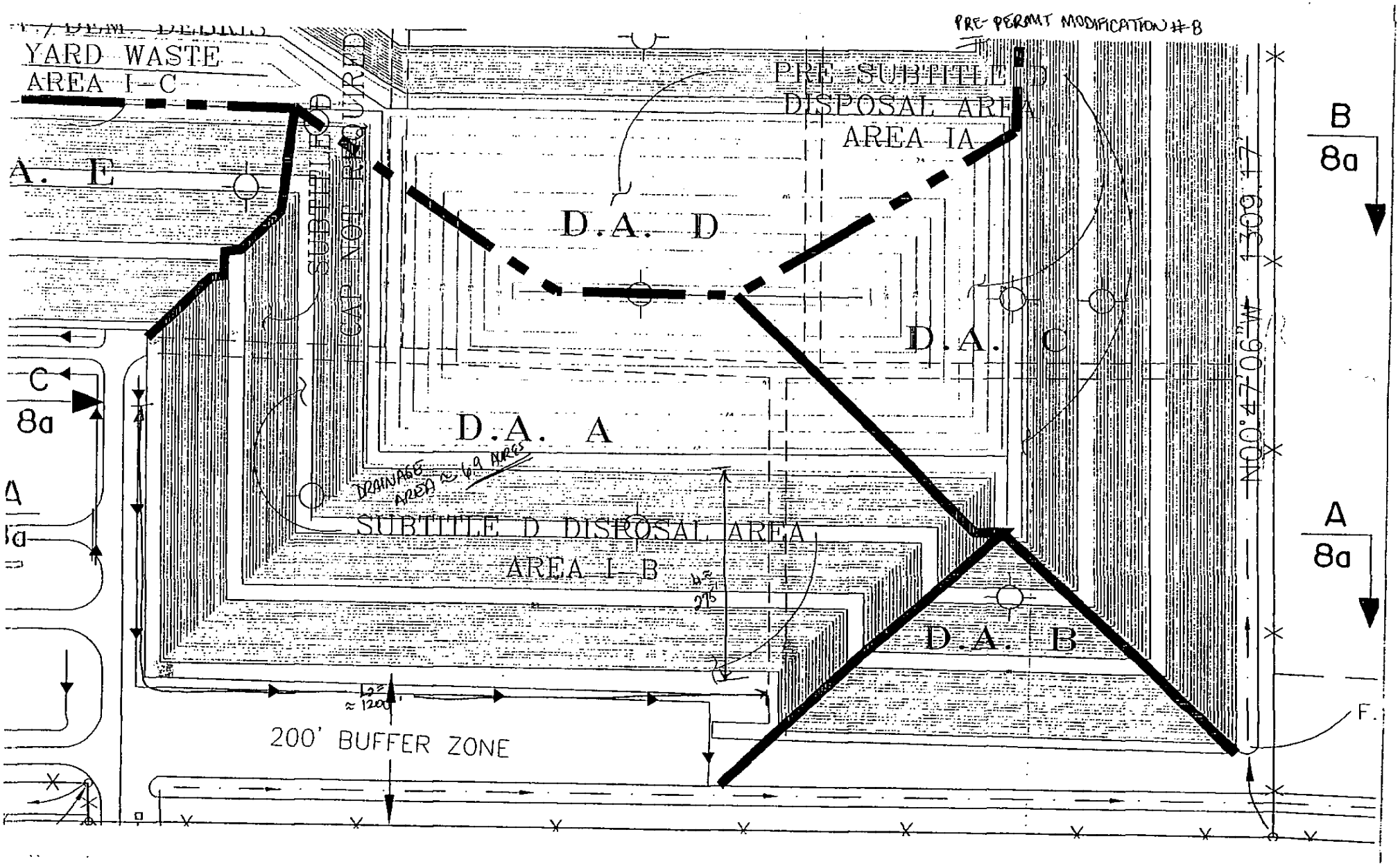

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                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\DATA4.D4
TEMPERATURE DATA FILE:        C:\HELP3\DATA7.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\DATA13.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\DATA11.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\DATA10.D10
OUTPUT DATA FILE:             C:\HELP3\VPSWPOUT.OUT


TIME:  15:42      DATE:   7/20/2005


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

     TITLE:  VERMILION PARISH SOLID WASTE PLANT - AREA 1B SUBTITLE D
           EXISTING SUBTITLE D CELL - EXISTING PERMITTED HEIGHT
                  ---- NO COVER.

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


     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   8
        THICKNESS                  =      6.00   INCHES
        POROSITY                   =    0.4630 VOL/VOL
        FIELD CAPACITY             =    0.2320 VOL/VOL
        WILTING POINT              =    0.1160 VOL/VOL
        INITIAL SOIL WATER CONTENT =    0.2656 VOL/VOL
        EFFECTIVE SAT. HYD. COND.  = 0.369999994000E-03 CM/SEC
```

```
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
         FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                  LAYER  2
                                  --------

                 TYPE 1 - VERTICAL PERCOLATION LAYER
                     MATERIAL TEXTURE NUMBER  18
        THICKNESS                  =    600.00   INCHES
        POROSITY                   =    0.6710 VOL/VOL
        FIELD CAPACITY             =    0.2920 VOL/VOL
        WILTING POINT              =    0.0770 VOL/VOL
        INITIAL SOIL WATER CONTENT =    0.2949 VOL/VOL
        EFFECTIVE SAT. HYD. COND.  = 0.100000005000E-02 CM/SEC


                                  LAYER  3
                                  --------

                 TYPE 2 - LATERAL DRAINAGE LAYER
                     MATERIAL TEXTURE NUMBER   1
        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 =    0.1929 VOL/VOL
        EFFECTIVE SAT. HYD. COND.  = 0.999999978000E-02 CM/SEC
        SLOPE                      =     2.00   PERCENT
        DRAINAGE LENGTH            =    100.0   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      = 3 - GOOD


                                  LAYER  5
```

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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 450. FEET.

SCS RUNOFF CURVE NUMBER	=	79.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	8.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.594	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.778	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	196.246	INCHES
TOTAL INITIAL WATER	=	196.246	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	32	
END OF GROWING SEASON (JULIAN DATE)	=	361	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR BATON ROUGE LOUISIANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.97	4.59	5.59	4.82	3.11
7.07	5.05	4.42	2.63	3.95	4.99

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA AND STATION LATITUDE = 30.10 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	4.71	4.38	4.29	4.25	4.71	3.04
	7.87	5.25	4.07	2.76	3.67	4.43
STD. DEVIATIONS	2.14	2.77	2.76	2.91	2.61	1.45
	2.92	2.63	2.09	1.98	2.09	2.08
RUNOFF						
TOTALS	0.156	0.188	0.127	0.213	0.218	0.010
	0.262	0.100	0.108	0.075	0.110	0.084
STD. DEVIATIONS	0.191	0.352	0.250	0.384	0.635	0.024
	0.412	0.161	0.357	0.174	0.214	0.147
EVAPOTRANSPIRATION						

TOTALS	1.617	1.893	2.281	2.138	2.632	2.400
	4.542	3.475	2.681	1.550	1.227	1.160
STD. DEVIATIONS	0.207	0.379	0.778	0.985	1.080	0.921
	0.855	1.030	1.015	0.684	0.417	0.185

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	1.6325	1.7940	2.2615	2.2718	2.3807	2.3569
	2.2399	2.0825	2.0279	1.9048	1.6582	1.4730
STD. DEVIATIONS	0.5047	0.4887	0.7181	0.8518	0.9053	0.8472
	0.8679	0.5741	0.6300	0.7129	0.7771	0.5987

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0008	0.0008	0.0010	0.0010	0.0011	0.0010
	0.0010	0.0010	0.0009	0.0009	0.0008	0.0007
STD. DEVIATIONS	0.0002	0.0002	0.0003	0.0003	0.0004	0.0003
	0.0004	0.0002	0.0003	0.0003	0.0003	0.0003

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	4.6224	5.5424	6.2785	6.4744	6.5563	6.7001
	6.1977	5.8323	5.8610	5.3367	4.8015	4.1709
STD. DEVIATIONS	1.4090	1.4626	1.8243	2.2841	2.3997	2.3014
	2.3229	1.5392	1.7625	1.9311	2.1909	1.6738

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

	INCHES		CU. FEET	PERCENT
PRECIPITATION	53.41	(7.432)	1551103.9	100.00
RUNOFF	1.652	(1.1428)	47976.32	3.093
EVAPOTRANSPIRATION	27.595	(2.6041)	801359.69	51.664
LATERAL DRAINAGE COLLECTED FROM LAYER 3	24.08351	(5.69178)	699385.250	45.08952
PERCOLATION/LEAKAGE THROUGH	0.01092	(0.00228)	317.233	0.02045

LAYER 5

AVERAGE HEAD ON TOP OF LAYER 4	5.698	(1.277)		
CHANGE IN WATER STORAGE	0.071	(5.9359)	2065.42	0.133

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	8.09	234933.609
RUNOFF	3.282	95309.1094
DRAINAGE COLLECTED FROM LAYER 3	0.15790	4585.38379
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000064	1.84722
AVERAGE HEAD ON TOP OF LAYER 4	12.838	
MAXIMUM HEAD ON TOP OF LAYER 4	15.282	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	48.4 FEET	
SNOW WATER	1.61	46763.5469

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4630

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1160

*** 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	1.4161	0.2360
2	178.6832	0.2978
3	2.9084	0.2424
4	0.0000	0.0000
5	15.3720	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:\HELP3\DATA4.D4
TEMPERATURE DATA FILE:        C:\HELP3\DATA7.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\DATA13.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\DATA11.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\DATA10.D10
OUTPUT DATA FILE:             C:\HELP3\VPSWPOUT.OUT


TIME:  15:38      DATE:   7/20/2005


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     TITLE:  VERMILION PARISH SOLID WASTE PLANT - AREA 1B SUBTITLE D exp
                     VERTICAL EXPANSION & LINING OF SLOPES
                          ---   NO FINAL COVER ---

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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   8
        THICKNESS                  =      6.00    INCHES
        POROSITY                   =      0.4630 VOL/VOL
        FIELD CAPACITY             =      0.2320 VOL/VOL
        WILTING POINT              =      0.1160 VOL/VOL
        INITIAL SOIL WATER CONTENT =      0.2656 VOL/VOL
        EFFECTIVE SAT. HYD. COND.  =  0.369999994000E-03 CM/SEC
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     NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
            FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                  LAYER  2
                                  --------

                 TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  18
        THICKNESS                  =    760.00    INCHES
        POROSITY                   =      0.6710 VOL/VOL
        FIELD CAPACITY             =      0.2920 VOL/VOL
        WILTING POINT              =      0.0770 VOL/VOL
        INITIAL SOIL WATER CONTENT =      0.2943 VOL/VOL
        EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC


                                  LAYER  3
                                  --------

                 TYPE 2 - LATERAL DRAINAGE LAYER
                      MATERIAL TEXTURE NUMBER   1
        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 =      0.1939 VOL/VOL
        EFFECTIVE SAT. HYD. COND.  =  0.999999978000E-03 CM/SEC
        SLOPE                      =      2.00    PERCENT
        DRAINAGE LENGTH            =    100.0     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      =  3 - GOOD


                                  LAYER  5
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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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 450. FEET.

SCS RUNOFF CURVE NUMBER	=	79.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	8.780	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.594	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.778	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	242.980	INCHES
TOTAL INITIAL WATER	=	242.980	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	32	
END OF GROWING SEASON (JULIAN DATE)	=	361	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR BATON ROUGE LOUISIANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.97	4.59	5.59	4.82	3.11
7.07	5.05	4.42	2.63	3.95	4.99

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR LAKE CHARLES LOUISIANA AND STATION LATITUDE = 30.10 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	4.71	4.38	4.29	4.25	4.71	3.04
	7.87	5.25	4.07	2.76	3.67	4.43
STD. DEVIATIONS	2.14	2.77	2.76	2.91	2.61	1.45
	2.92	2.63	2.09	1.98	2.09	2.08
RUNOFF						
TOTALS	0.156	0.188	0.127	0.213	0.218	0.010
	0.262	0.100	0.108	0.075	0.110	0.084
STD. DEVIATIONS	0.191	0.352	0.250	0.384	0.635	0.024
	0.412	0.161	0.357	0.174	0.214	0.147
EVAPOTRANSPIRATION						

TOTALS	1.617	1.893	2.281	2.138	2.632	2.400
	4.542	3.475	2.681	1.550	1.227	1.160
STD. DEVIATIONS	0.207	0.379	0.778	0.985	1.080	0.921
	0.855	1.030	1.015	0.684	0.417	0.185

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	1.6301	1.7452	2.1872	2.1985	2.3243	2.3269
	2.2539	2.1233	2.0779	1.9714	1.7244	1.5133
STD. DEVIATIONS	0.4865	0.4184	0.6177	0.7764	0.8602	0.8156
	0.8421	0.5831	0.6218	0.6954	0.8007	0.6025

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0008	0.0008	0.0010	0.0010	0.0010	0.0010
	0.0010	0.0010	0.0009	0.0009	0.0008	0.0007
STD. DEVIATIONS	0.0002	0.0002	0.0002	0.0003	0.0004	0.0003
	0.0003	0.0002	0.0003	0.0003	0.0003	0.0003

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	4.6184	5.4087	6.1023	6.2955	6.4235	6.6296
	6.2406	5.9411	6.0017	5.5193	4.9838	4.2824
STD. DEVIATIONS	1.3612	1.2671	1.6022	2.1054	2.2969	2.2236
	2.2578	1.5666	1.7350	1.8854	2.2490	1.6812

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

	INCHES		CU. FEET	PERCENT
PRECIPITATION	53.41	(7.432)	1702336.4	100.00
RUNOFF	1.652	(1.1428)	52654.02	3.093
EVAPOTRANSPIRATION	27.595	(2.6041)	879492.19	51.664
LATERAL DRAINAGE COLLECTED FROM LAYER 3	24.07636	(5.52526)	767347.312	45.07613
PERCOLATION/LEAKAGE THROUGH	0.01094	(0.00223)	348.698	0.02048

LAYER 5

AVERAGE HEAD ON TOP OF LAYER 4	5.704	(1.246)		
CHANGE IN WATER STORAGE	0.078	(6.0496)	2494.28	0.147

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	8.09	257839.625
RUNOFF	3.282	104601.7420
DRAINAGE COLLECTED FROM LAYER 3	0.14652	4669.71582
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000058	1.84181
AVERAGE HEAD ON TOP OF LAYER 4	11.577	
MAXIMUM HEAD ON TOP OF LAYER 4	13.850	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	46.4 FEET	
SNOW WATER	1.61	51322.9883

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4630

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1160

*** 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	1.4161	0.2360
2	225.6650	0.2969
3	2.8747	0.2396
4	0.0000	0.0000
5	15.3720	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:\HELP3\DATA4.D4
TEMPERATURE DATA FILE:        C:\HELP3\DATA7.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\DATA13.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\DATA11.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\DATA10.D10
OUTPUT DATA FILE:             C:\HELP3\VPSWPOUT.OUT


TIME:  15:10      DATE:   7/20/2005


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     TITLE:  VERMILION PARISH SOLID WASTE PLANT - AREA 1B SUBTITLE D
             VERTICAL EXPANSION & LINING OF EXISTING AREA

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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   8
          THICKNESS                  =      6.00   INCHES
          POROSITY                   =      0.4630 VOL/VOL
          FIELD CAPACITY             =      0.2320 VOL/VOL
          WILTING POINT              =      0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.4601 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  = 0.369999994000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
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                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                  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   =     10.00   HOLES/ACRE
          FML PLACEMENT QUALITY      = 3 - GOOD


                                  LAYER  3
                                  --------

                     TYPE 3 - BARRIER SOIL LINER
                         MATERIAL TEXTURE NUMBER  16
          THICKNESS                  =     24.00   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


                                  LAYER  4
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  18
          THICKNESS                  =    760.00   INCHES
          POROSITY                   =      0.6710 VOL/VOL
          FIELD CAPACITY             =      0.2920 VOL/VOL
          WILTING POINT              =      0.0770 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.2920 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  = 0.100000005000E-02 CM/SEC


                                  LAYER  5
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                     TYPE 2 - LATERAL DRAINAGE LAYER
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MATERIAL TEXTURE NUMBER 1

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	=	0.0451	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999978000E-02	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	100.0	FEET

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	=	3 - GOOD	

LAYER 7

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

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 450. FEET.

SCS RUNOFF CURVE NUMBER	=	79.10	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	8.780	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.761	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.770	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.696	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	250.842	INCHES
TOTAL INITIAL WATER	=	250.842	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
LAKE CHARLES LOUISIANA

STATION LATITUDE	=	30.10	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	32	
END OF GROWING SEASON (JULIAN DATE)	=	361	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	80.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	78.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BATON ROUGE LOUISIANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.97	4.59	5.59	4.82	3.11
7.07	5.05	4.43	2.63	3.95	4.99

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR LAKE CHARLES LOUISIANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
51.50	54.30	60.70	68.40	74.90	80.40
82.30	81.60	78.20	69.30	59.70	53.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR LAKE CHARLES LOUISIANA
AND STATION LATITUDE = 30.10 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.61	1230555.120	100.00
RUNOFF	5.838	186068.016	15.12
EVAPOTRANSPIRATION	32.760	1044099.810	84.85
PERC./LEAKAGE THROUGH LAYER 3	0.005115	163.015	0.01
AVG. HEAD ON TOP OF LAYER 2	2.5769		
DRAINAGE COLLECTED FROM LAYER 5	0.0051	162.427	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.246	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0012		
CHANGE IN WATER STORAGE	0.007	224.679	0.02
SOIL WATER AT START OF YEAR	250.842	7994670.500	
SOIL WATER AT END OF YEAR	250.849	7994895.500	
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	0.0000	-0.076	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	57.73	1839935.750	100.00
RUNOFF	23.029	733965.062	39.89
EVAPOTRANSPIRATION	34.686	1105483.500	60.08
PERC./LEAKAGE THROUGH LAYER 3	0.005025	160.162	0.01
AVG. HEAD ON TOP OF LAYER 2	2.5246		
DRAINAGE COLLECTED FROM LAYER 5	0.0052	165.731	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.249	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	0.010	320.970	0.02
SOIL WATER AT START OF YEAR	250.849	7994895.500	
SOIL WATER AT END OF YEAR	250.859	7995216.500	
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	0.0000	0.220	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	67.66	2156418.250	100.00
RUNOFF	31.707	1010549.870	46.86
EVAPOTRANSPIRATION	36.120	1151195.370	53.38
PERC./LEAKAGE THROUGH LAYER 3	0.006490	206.857	0.01
AVG. HEAD ON TOP OF LAYER 2	3.2869		
DRAINAGE COLLECTED FROM LAYER 5	0.0062	198.994	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000009	0.281	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0015		
CHANGE IN WATER STORAGE	-0.173	-5525.556	-0.26
SOIL WATER AT START OF YEAR	250.859	7995216.500	
SOIL WATER AT END OF YEAR	250.685	7989691.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.735	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	49.12	1565523.250	100.00
RUNOFF	14.431	459920.906	29.38
EVAPOTRANSPIRATION	34.530	1100517.500	70.30
PERC./LEAKAGE THROUGH LAYER 3	0.005548	176.820	0.01
AVG. HEAD ON TOP OF LAYER 2	2.8100		
DRAINAGE COLLECTED FROM LAYER 5	0.0056	178.047	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.260	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0014		
CHANGE IN WATER STORAGE	0.154	4906.472	0.31
SOIL WATER AT START OF YEAR	250.685	7989691.000	
SOIL WATER AT END OF YEAR	250.839	7994597.500	
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	0.0000	-0.041	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.67	1296209.870	100.00
RUNOFF	10.541	335967.625	25.92
EVAPOTRANSPIRATION	30.188	962125.375	74.23
PERC./LEAKAGE THROUGH LAYER 3	0.004401	140.261	0.01
AVG. HEAD ON TOP OF LAYER 2	2.1979		
DRAINAGE COLLECTED FROM LAYER 5	0.0045	144.606	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000007	0.229	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0011		
CHANGE IN WATER STORAGE	-0.064	-2027.950	-0.16
SOIL WATER AT START OF YEAR	250.839	7994597.500	
SOIL WATER AT END OF YEAR	250.776	7992569.500	
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	0.0000	-0.064	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.53	1643333.250	100.00
RUNOFF	16.131	514116.219	31.30
EVAPOTRANSPIRATION	35.400	1128262.370	68.70
PERC./LEAKAGE THROUGH LAYER 3	0.005445	173.529	0.01
AVG. HEAD ON TOP OF LAYER 2	2.7497		
DRAINAGE COLLECTED FROM LAYER 5	0.0053	168.270	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.252	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	-0.007	-213.980	-0.01
SOIL WATER AT START OF YEAR	250.776	7992569.500	
SOIL WATER AT END OF YEAR	250.769	7992355.500	

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	0.0000	0.109	0.00

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	48.77	1554367.750	100.00
RUNOFF	16.243	517682.937	33.31
EVAPOTRANSPIRATION	32.433	1033691.250	66.50
PERC./LEAKAGE THROUGH LAYER 3	0.003959	126.184	0.01
AVG. HEAD ON TOP OF LAYER 2	2.0052		
DRAINAGE COLLECTED FROM LAYER 5	0.0047	149.425	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000007	0.232	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0011		
CHANGE IN WATER STORAGE	0.089	2843.993	0.18
SOIL WATER AT START OF YEAR	250.769	7992355.500	
SOIL WATER AT END OF YEAR	250.858	7995199.500	
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	0.0000	-0.053	0.00

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	61.93	1973795.870	100.00
RUNOFF	23.232	740426.750	37.51
EVAPOTRANSPIRATION	38.936	1240950.370	62.87
PERC./LEAKAGE THROUGH LAYER 3	0.005935	189.146	0.01
AVG. HEAD ON TOP OF LAYER 2	2.9845		
DRAINAGE COLLECTED FROM LAYER 5	0.0052	166.088	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.251	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	-0.243	-7747.547	-0.39
SOIL WATER AT START OF YEAR	250.858	7995199.500	
SOIL WATER AT END OF YEAR	250.615	7987452.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.079	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	59.06	1882325.120	100.00
RUNOFF	18.596	592675.562	31.49
EVAPOTRANSPIRATION	40.291	1284118.500	68.22
PERC./LEAKAGE THROUGH LAYER 3	0.005141	163.848	0.01
AVG. HEAD ON TOP OF LAYER 2	2.5936		
DRAINAGE COLLECTED FROM LAYER 5	0.0053	169.597	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.253	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	0.168	5360.694	0.28

SOIL WATER AT START OF YEAR	250.615	7987452.000	
SOIL WATER AT END OF YEAR	250.783	7992812.500	
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	0.0000	0.483	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.93	1655081.870	100.00
RUNOFF	19.242	613258.625	37.05
EVAPOTRANSPIRATION	32.690	1041860.750	62.95
PERC./LEAKAGE THROUGH LAYER 3	0.005226	166.571	0.01
AVG. HEAD ON TOP OF LAYER 2	2.6346		
DRAINAGE COLLECTED FROM LAYER 5	0.0051	161.202	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.245	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0012		
CHANGE IN WATER STORAGE	-0.006	-199.391	-0.01
SOIL WATER AT START OF YEAR	250.783	7992812.500	
SOIL WATER AT END OF YEAR	250.777	7992613.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.375	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	47.53	1514847.370	100.00
RUNOFF	16.341	520822.000	34.38
EVAPOTRANSPIRATION	31.137	992384.250	65.51
PERC./LEAKAGE THROUGH LAYER 3	0.004520	144.060	0.01
AVG. HEAD ON TOP OF LAYER 2	2.2927		
DRAINAGE COLLECTED FROM LAYER 5	0.0046	145.884	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000007	0.229	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0011		
CHANGE IN WATER STORAGE	0.047	1495.431	0.10
SOIL WATER AT START OF YEAR	250.777	7992613.000	
SOIL WATER AT END OF YEAR	250.824	7994108.500	
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	0.0000	-0.400	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.41	1638508.370	100.00
RUNOFF	20.844	664313.250	40.54
EVAPOTRANSPIRATION	30.600	975269.187	59.52
PERC./LEAKAGE THROUGH LAYER 3	0.004685	149.304	0.01
AVG. HEAD ON TOP OF LAYER 2	2.3631		
DRAINAGE COLLECTED FROM LAYER 5	0.0048	151.849	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000007	0.236	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0012		

CHANGE IN WATER STORAGE	-0.038	-1225.524	-0.07
SOIL WATER AT START OF YEAR	250.824	7994108.500	
SOIL WATER AT END OF YEAR	250.785	7992883.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.658	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.95	1432620.000	100.00
RUNOFF	10.677	340297.875	23.75
EVAPOTRANSPIRATION	34.315	1093670.870	76.34
PERC./LEAKAGE THROUGH LAYER 3	0.005784	184.352	0.01
AVG. HEAD ON TOP OF LAYER 2	2.9312		
DRAINAGE COLLECTED FROM LAYER 5	0.0055	176.241	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.259	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	-0.048	-1526.069	-0.11
SOIL WATER AT START OF YEAR	250.785	7992883.000	
SOIL WATER AT END OF YEAR	250.738	7991357.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.793	0.00

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	54.87	1748783.750	100.00
RUNOFF	24.620	784664.750	44.87
EVAPOTRANSPIRATION	30.157	961161.000	54.96
PERC./LEAKAGE THROUGH LAYER 3	0.004848	154.516	0.01
AVG. HEAD ON TOP OF LAYER 2	2.4281		
DRAINAGE COLLECTED FROM LAYER 5	0.0049	157.432	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.242	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0012		
CHANGE IN WATER STORAGE	0.088	2799.738	0.16
SOIL WATER AT START OF YEAR	250.738	7991357.000	
SOIL WATER AT END OF YEAR	250.825	7994156.500	
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	0.0000	0.563	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	56.62	1804558.370	100.00
RUNOFF	21.264	677708.937	37.56
EVAPOTRANSPIRATION	35.779	1140334.120	63.19
PERC./LEAKAGE THROUGH LAYER 3	0.005064	161.404	0.01
AVG. HEAD ON TOP OF LAYER 2	2.5467		
DRAINAGE COLLECTED FROM LAYER 5	0.0053	169.959	0.01

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PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.253	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	-0.428	-13654.863	-0.76
SOIL WATER AT START OF YEAR	250.825	7994156.500	
SOIL WATER AT END OF YEAR	250.397	7980502.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.122	0.00

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	49.70	1584008.620	100.00
RUNOFF	16.830	536395.125	33.86
EVAPOTRANSPIRATION	32.842	1046735.750	66.08
PERC./LEAKAGE THROUGH LAYER 3	0.004778	152.271	0.01
AVG. HEAD ON TOP OF LAYER 2	2.4096		
DRAINAGE COLLECTED FROM LAYER 5	0.0046	146.040	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000007	0.230	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0011		
CHANGE IN WATER STORAGE	0.023	730.937	0.05
SOIL WATER AT START OF YEAR	250.397	7980502.000	
SOIL WATER AT END OF YEAR	250.420	7981233.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.537	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.21	1409034.750	100.00
RUNOFF	15.363	489634.062	34.75
EVAPOTRANSPIRATION	28.589	911183.875	64.67
PERC./LEAKAGE THROUGH LAYER 3	0.003980	126.835	0.01
AVG. HEAD ON TOP OF LAYER 2	2.0143		
DRAINAGE COLLECTED FROM LAYER 5	0.0041	130.241	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000007	0.214	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0010		
CHANGE IN WATER STORAGE	0.254	8086.511	0.57
SOIL WATER AT START OF YEAR	250.420	7981233.000	
SOIL WATER AT END OF YEAR	250.674	7989319.500	
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	0.0000	-0.182	0.00

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	62.31	1985906.750	100.00
RUNOFF	24.866	792499.125	39.91
EVAPOTRANSPIRATION	37.363	1190807.750	59.96
PERC./LEAKAGE THROUGH LAYER 3	0.006218	198.192	0.01
AVG. HEAD ON TOP OF LAYER 2	3.1465		

DRAINAGE COLLECTED FROM LAYER 5	0.0059	188.547	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000009	0.272	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0014		
CHANGE IN WATER STORAGE	0.076	2410.681	0.12
SOIL WATER AT START OF YEAR	250.674	7989319.500	
SOIL WATER AT END OF YEAR	250.749	7991730.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.359	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	47.95	1528233.620	100.00
RUNOFF	15.472	493118.625	32.27
EVAPOTRANSPIRATION	32.759	1044075.940	68.32
PERC./LEAKAGE THROUGH LAYER 3	0.004618	147.175	0.01
AVG. HEAD ON TOP OF LAYER 2	2.3118		
DRAINAGE COLLECTED FROM LAYER 5	0.0051	163.830	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.247	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0012		
CHANGE IN WATER STORAGE	-0.286	-9125.289	-0.60
SOIL WATER AT START OF YEAR	250.749	7991730.000	
SOIL WATER AT END OF YEAR	250.463	7982604.500	
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	0.0000	0.208	0.00

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	62.46	1990687.750	100.00
RUNOFF	28.593	911292.312	45.78
EVAPOTRANSPIRATION	33.466	1066604.250	53.58
PERC./LEAKAGE THROUGH LAYER 3	0.005909	188.314	0.01
AVG. HEAD ON TOP OF LAYER 2	2.9841		
DRAINAGE COLLECTED FROM LAYER 5	0.0054	170.528	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.254	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	0.396	12620.463	0.63
SOIL WATER AT START OF YEAR	250.463	7982604.500	
SOIL WATER AT END OF YEAR	250.859	7995225.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.038	0.00

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ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT
PRECIPITATION	55.43	1766631.500	100.00
RUNOFF	19.677	627143.187	35.50
EVAPOTRANSPIRATION	35.897	1144091.500	64.76

PERC./LEAKAGE THROUGH LAYER 3	0.005382	171.532	0.01
AVG. HEAD ON TOP OF LAYER 2	2.7179		
DRAINAGE COLLECTED FROM LAYER 5	0.0055	176.739	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.260	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0013		
CHANGE IN WATER STORAGE	-0.150	-4780.515	-0.27
SOIL WATER AT START OF YEAR	250.859	7995225.000	
SOIL WATER AT END OF YEAR	250.709	7990444.500	
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	0.0000	0.386	0.00

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ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	53.55	1706713.620	100.00
RUNOFF	17.086	544552.687	31.91
EVAPOTRANSPIRATION	36.320	1157574.620	67.82
PERC./LEAKAGE THROUGH LAYER 3	0.005796	184.714	0.01
AVG. HEAD ON TOP OF LAYER 2	2.9278		
DRAINAGE COLLECTED FROM LAYER 5	0.0057	181.684	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.265	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0014		
CHANGE IN WATER STORAGE	0.138	4404.104	0.26
SOIL WATER AT START OF YEAR	250.709	7990444.500	
SOIL WATER AT END OF YEAR	250.847	7994848.500	
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	0.0000	0.238	0.00

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	48.96	1560423.870	100.00
RUNOFF	10.959	349293.500	22.38
EVAPOTRANSPIRATION	38.279	1219998.120	78.18
PERC./LEAKAGE THROUGH LAYER 3	0.005798	184.790	0.01
AVG. HEAD ON TOP OF LAYER 2	2.9197		
DRAINAGE COLLECTED FROM LAYER 5	0.0059	185.125	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.268	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0014		
CHANGE IN WATER STORAGE	-0.284	-9053.313	-0.58
SOIL WATER AT START OF YEAR	250.847	7994848.500	
SOIL WATER AT END OF YEAR	250.563	7985795.500	
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	0.0000	0.229	0.00

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	64.57	2057935.750	100.00
RUNOFF	25.562	814711.500	39.59

EVAPOTRANSPIRATION	38.744	1234823.370	60.00
PERC./LEAKAGE THROUGH LAYER 3	0.006439	205.223	0.01
AVG. HEAD ON TOP OF LAYER 2	3.2369		
DRAINAGE COLLECTED FROM LAYER 5	0.0064	203.464	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000009	0.285	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0015		
CHANGE IN WATER STORAGE	0.257	8197.393	0.40
SOIL WATER AT START OF YEAR	250.563	7985795.500	
SOIL WATER AT END OF YEAR	250.820	7993993.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.346	0.00

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	50.91	1622572.120	100.00
RUNOFF	14.035	447307.531	27.57
EVAPOTRANSPIRATION	37.059	1181113.120	72.79
PERC./LEAKAGE THROUGH LAYER 3	0.006080	193.778	0.01
AVG. HEAD ON TOP OF LAYER 2	3.0742		
DRAINAGE COLLECTED FROM LAYER 5	0.0061	195.104	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000009	0.278	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0015		
CHANGE IN WATER STORAGE	-0.190	-6043.485	-0.37
SOIL WATER AT START OF YEAR	250.820	7993993.000	
SOIL WATER AT END OF YEAR	250.631	7987949.500	
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	0.0000	-0.489	0.00

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ANNUAL TOTALS FOR YEAR 26

	INCHES	CU. FEET	PERCENT
PRECIPITATION	66.62	2123272.250	100.00
RUNOFF	30.510	972389.750	45.80
EVAPOTRANSPIRATION	35.990	1147054.870	54.02
PERC./LEAKAGE THROUGH LAYER 3	0.005890	187.718	0.01
AVG. HEAD ON TOP OF LAYER 2	2.9930		
DRAINAGE COLLECTED FROM LAYER 5	0.0058	184.219	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.266	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0014		
CHANGE IN WATER STORAGE	0.114	3643.988	0.17
SOIL WATER AT START OF YEAR	250.631	7987949.500	
SOIL WATER AT END OF YEAR	250.745	7991593.500	
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	0.0000	-0.900	0.00

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ANNUAL TOTALS FOR YEAR 27

	INCHES	CU. FEET	PERCENT

PRECIPITATION	51.66	1646476.750	100.00
RUNOFF	13.804	439960.250	26.72
EVAPOTRANSPIRATION	37.822	1205454.500	73.21
PERC./LEAKAGE THROUGH LAYER 3	0.005501	175.315	0.01
AVG. HEAD ON TOP OF LAYER 2	2.7532		
DRAINAGE COLLECTED FROM LAYER 5	0.0058	184.825	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000008	0.268	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0014		
CHANGE IN WATER STORAGE	0.027	876.347	0.05
SOIL WATER AT START OF YEAR	250.745	7991593.500	
SOIL WATER AT END OF YEAR	250.772	7992469.500	
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	0.0000	0.529	0.00

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ANNUAL TOTALS FOR YEAR 28

	INCHES	CU. FEET	PERCENT
PRECIPITATION	59.15	1885193.370	100.00
RUNOFF	21.180	675031.687	35.81
EVAPOTRANSPIRATION	38.198	1217435.500	64.58
PERC./LEAKAGE THROUGH LAYER 3	0.006108	194.676	0.01
AVG. HEAD ON TOP OF LAYER 2	3.0911		
DRAINAGE COLLECTED FROM LAYER 5	0.0059	188.575	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000009	0.271	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0014		
CHANGE IN WATER STORAGE	-0.234	-7463.051	-0.40
SOIL WATER AT START OF YEAR	250.772	7992469.500	
SOIL WATER AT END OF YEAR	250.538	7985006.500	
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	0.0000	0.392	0.00

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ANNUAL TOTALS FOR YEAR 29

	INCHES	CU. FEET	PERCENT
PRECIPITATION	45.69	1456204.250	100.00
RUNOFF	15.722	501092.937	34.41
EVAPOTRANSPIRATION	29.672	945673.937	64.94
PERC./LEAKAGE THROUGH LAYER 3	0.003992	127.228	0.01
AVG. HEAD ON TOP OF LAYER 2	1.9963		
DRAINAGE COLLECTED FROM LAYER 5	0.0041	130.289	0.01
PERC./LEAKAGE THROUGH LAYER 7	0.000007	0.215	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0010		
CHANGE IN WATER STORAGE	0.292	9307.172	0.64
SOIL WATER AT START OF YEAR	250.538	7985006.500	
SOIL WATER AT END OF YEAR	250.830	7994314.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.292	0.00

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ANNUAL TOTALS FOR YEAR 30

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

	INCHES		CU. FEET	PERCENT
PRECIPITATION	53.41	(7.432)	1702336.4	100.00
RUNOFF	18.610	(6.0661)	593113.81	34.841
EVAPOTRANSPIRATION	34.798	(3.2992)	1109053.37	65.149
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00533	(0.00074)	169.861	0.00998
AVERAGE HEAD ON TOP OF LAYER 2	2.688	(0.376)		
LATERAL DRAINAGE COLLECTED FROM LAYER 5	0.00532	(0.00060)	169.564	0.00996
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00001	(0.00000)	0.253	0.00001
AVERAGE HEAD ON TOP OF LAYER 6	0.001	(0.000)		
CHANGE IN WATER STORAGE	0.000	(0.1892)	-0.65	0.000

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	8.09	257819.625
RUNOFF	6.821	217409.0000
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000032	1.01299
AVERAGE HEAD ON TOP OF LAYER 2	6.000	
DRAINAGE COLLECTED FROM LAYER 5	0.00003	0.93076
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00112
AVERAGE HEAD ON TOP OF LAYER 6	0.003	
MAXIMUM HEAD ON TOP OF LAYER 6	0.004	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	16.4 FEET	
SNOW WATER	1.61	51322.9883

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4630

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1160

*** 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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