City of Las Cruces

Closure Plan
1965 – 1996 Foothills Landfill

February 2007

Final

Prepared by:

CDM
6000 Uptown Blvd. NE
Suite 200
Albuquerque, NM 87110
Phone: (505) 243-3200
Fax: (505) 243-2700

Prepared for:

City of Las Cruces
P.O. Box 20000
Las Cruces, NM 88004-9002
Phone: (505) 528-3543

State of New Mexico
ENVIRONMENT DEPARTMENT
Solid Waste Bureau
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502-6110
Telephone (505) 827-0197
Fax (505) 827-2902
www.nmenv.state.nm.us

BILL RICHARDSON
GOVERNOR

RON CURRY
SECRETARY

JIM NORTON
DIRECTOR

CERTIFIED MAIL RETURN RECEIPT REQUESTED# 7004 0750 0001 3307 1888

January 8, 2007

Mr. Klaus Kemmer
Solid Waste Administrator
Utilities Division
P.O. Box 20000
Las Cruces, New Mexico 88004

RECEIVED
JAN 10 2007
CAMP DRESSER & McKEE INC.
ALBUQUERQUE

RE: Approval of the Closure/ Post Closure Care Plan

Dear Mr. Kemmer:

Upon review of the information and schedules for closure, provided by the City of Las Cruces at the request of the Solid Waste Bureau (Bureau), the Bureau hereby approves the Closure/ Post Closure Care Plan for the City of Las Cruces Foothills Municipal Landfill. Las Cruces should at this time be placing and grading final cover material over the greater part of the Foothills Landfill.

As agreed, Las Cruces shall complete total closure of the Foothills Municipal Landfill on or before June 15, 2009. When the landfill closure is complete, on or before June 15, 2009, Las Cruces shall notify the Bureau in order that the Bureau may inspect the landfill and thereby verify the completion of closure.

If you have any questions on this subject please contact me at 505-827-2775, or Dan Fuqua at 505-827-2863.

Sincerely,

Auralie Ashley-Marx

Auralie Ashley-Marx
Solid Waste Bureau Chief

AAM/dff

cc: Harry Mikel, SWB Enforcement, NMED District III, Las Cruces
Tom Parker, PE, CDM, Albuquerque

Contents

Appendices

Figures

List of Tables

Section 1
Introduction

1.1 Purpose

The purpose of this report is to present the closure and post-closure plans for the City of Las Cruces 1965-1996 Foothills landfill. Camp Dresser & McKee Inc. (CDM) has prepared this report for the New Mexico Environment Department (NMED) Solid Waste Bureau in compliance with 20 NMAC 9.1 regulations.

1.1.1 Closure

The purpose of this closure plan is to:

- Provide a detailed plan and schedule which the City of Las Cruces will implement upon landfill closure;
- Provide a basis for the operator to establish an accurate cost estimate for closure;
- Allow the NMED to easily monitor closure activities to determine that all landfill closure requirements have been implemented in accordance with the approved plan.

1.1.2 Post-Closure

The purpose of this post-closure plan is to:

- Provide a detailed plan for operation, maintenance, inspection, monitoring, and recording which the City of Las Cruces will implement during the post-closure period;
- Provide a basis for the City of Las Cruces to establish an accurate cost estimate for post-closure operations;
- Allow the NMED to easily monitor post-closure activities to determine that all landfill post-closure requirements have been implemented in accordance with the approved plan.

1.2 State Regulations

New Mexico Solid Waste Management Regulations (SWMR 4) Title 20, NMAC Chapter 9, Part 1 (20 NMAC 9.1) presents the general format for closure plans, and requirements for the long-term care and post-closure activities for municipal solid waste landfills. See Table 1-1 for closure requirements and Table 1-2 for post-closure requirements.

1.3 Organization

This report is organized into the following four sections:

Section 1 Introduction
Section 2 Historical Background
Section 3 Closure Plan
Section 4 Post-Closure Plan

Section 2 provides a historical background of the Las Cruces 1965-1996 Foothills landfill site that describes the specific history, location, topography, waste inventory, subsurface investigation, surface water, and groundwater analysis.

Section 3 presents the closure plan for the existing site. This section includes:

- Objectives of the closure plan
- Detailed analysis of the final alternative cap design and grading plan
- Surface water control system
- Landfill gas monitoring system
- Site security
- Proposed closure schedule
- Final land use
- Closure proceedings

Section 4 presents the post-closure plan for the existing site. The post-closure plan includes:

- Operation, Maintenance, and Inspection
  - Alternative final cover
  - Stormwater control structures
- Monitoring Programs
  - Methane gas
  - Groundwater
- Record Keeping

Table 1-1 Closure Plan Requirements
New Mexico Solid Waste Management Regulations

Requirement		Description	Response
Section 402 Article E (2)		Owners and operators shall collect and control the run-off of a 24-hour, 25-year storm	Section 3.3
Section 502 Article A (1)		Owners and operators shall install a final cover system consisting of the following:	
	(a)	An infiltration layer comprised of a minimum of 18-inches of $1x10^{-5}$ cm/sec soil	Section 3.2.1
	(b)	An erosion layer consisting of a minimum of 6-inches of soil that is capable of sustaining native plant growth	Section 3.2.1
	(c)	Side slopes that shall not exceed a 25% grade and top slopes that have a 2% to 5% grade	Section 3.2.2
Section 502 Article A (3)		The written closure plan shall include the following information:	
	(a)	Written description of final cover and methods and procedures to be used to install the cover	Section 3.2.1
	(b)	Estimate of largest area of the landfill ever requiring a final cover at any time during the active life	Section 2.1
	(c)	Estimate of the maximum volume of waste ever on-site during the active life of the landfill	Section 2.4
	(d)	Schedule for completing all activities necessary to satisfy the closure criteria	Section 3.6
	(e)	Plan drawing showing the final contours and vegetation in relationship to the surrounding land, and a plan and description of the vegetation proposed for permanent soil stabilization	Table 3.1 and Appendix F, Sheet C-1

Table 1-2 Post-Closure Plan Requirements
New Mexico Solid Waste Management Regulations

Requirement	Description	Response
Section 402 Article C	Implement a routine methane monitoring program to ensure that levels in 402.B.1 and 402.B.2 are met	Section 4.3.1
Section 402 Article B (1)	The concentration of methane generated by the facility shall not exceed 25% of the L.E.L. for the gases in facility structures	Section 3.4
Section 402 Article B (2)	The concentration of methane gas do not exceed the L.E.L. for the gases at the facility property boundary	Section 3.4
Section 502 Article B (1)	Submit a post-closure care and monitoring plan which shall include, but not be limited to:	
	(i) maintenance of cover integrity	Section 4.2.1
	(ii) operation and maintenance of leachate collection system	Section 4.2.3
	(iii) operation of methane monitoring system	Section 4.3.1
	(iv) operation of ground water monitoring system	Section 4.3.2
Section 502 Article B (2)	Reports of monitoring performance and data collected shall be submitted to the Secretary within 45 days from the end of each calendar year	Section 4.4
Section 502 Article B (3)	The post-closure care period for a landfill shall be thirty (30) years	Section 4.1

Section 2
Historical Background

2.1 History

The Foothills Landfill is located just beyond the eastern boundary of the Las Cruces City Limits, directly east of the Interstate 25 - Lohman Avenue intersection. It occupies Section 11, Township 23 South and Range 2 East of the New Mexico Principal Meridian in Doña Ana County, New Mexico.

Construction of the landfill began in 1966 and originally consisted of 40 acres in the north half of Section 11. In 1974 the City leased an additional 80 acres adjacent to the east edge of the existing property. Landfill operations were contained within the boundaries of this site. All excavation, bury and daily cover activities were performed using site soils. The Landfill ceased acceptance of municipal solid waste on September 30, 1996.

A right-of-way (NMNM61211) for a fiber optic line owned by AT&T exists that crosses the site from the southwest corner to the northeast corner. The expansion of the landfill is restricted to the north side of this right-of-way, however the area to the south is available for daily and final cover material.

2.2 Location

The landfill is located on the eastern edge of the City of Las Cruces, New Mexico. The property lies on portions of the north half of Section 11 in Township 23 South, Range 2 East of the New Mexico Principal Meridian in Dona Ana County, New Mexico (Fig 2-1).

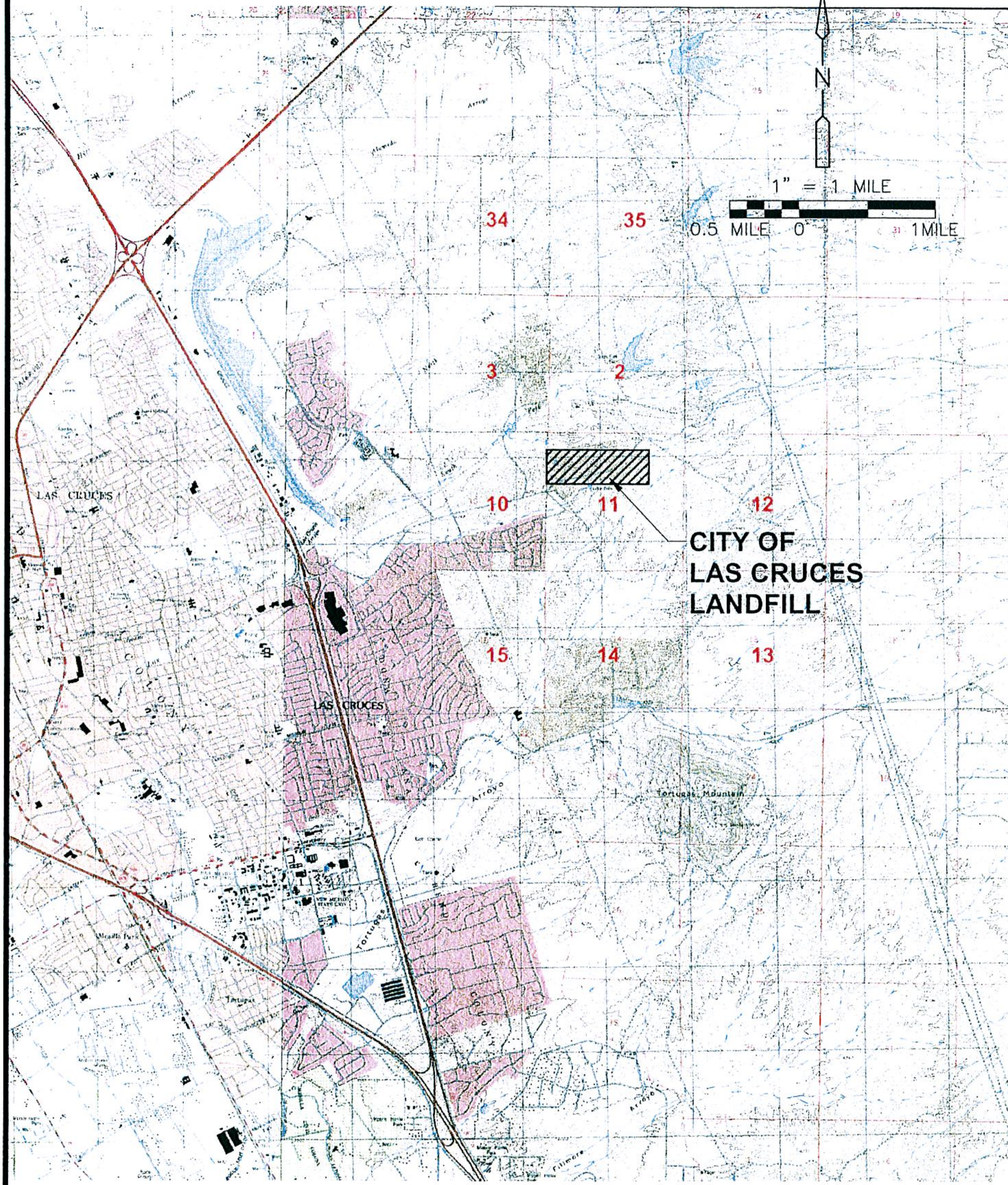
2.3 Topography

The topography of the site is mixed, including steep slopes and flat, gently sloping areas. The cap, or top of the landfill, is consistently held to a minimum 2% to 5% slope. The side slopes of the landfill are maintained at a 4:1 slope or less, beginning from top to toe. The site drainage area, excluding the landfill, has light vegetative cover over approximately 70% of the area. The landfill has none or less than 30% vegetative cover. Figure 2-2 shows the existing topographic conditions at the landfill site. The estimated total landfill area requiring closure is 87 acres.

2.4 Waste Inventory

2.4.1 Municipal Solid Waste

The last day of waste acceptance at the landfill was September 30, 1996. The estimated total quantity of municipal solid waste in place is 3,038,624 cubic yards.



USGS MAP - TORTUGAS MOUNTAIN QUADRANGLE

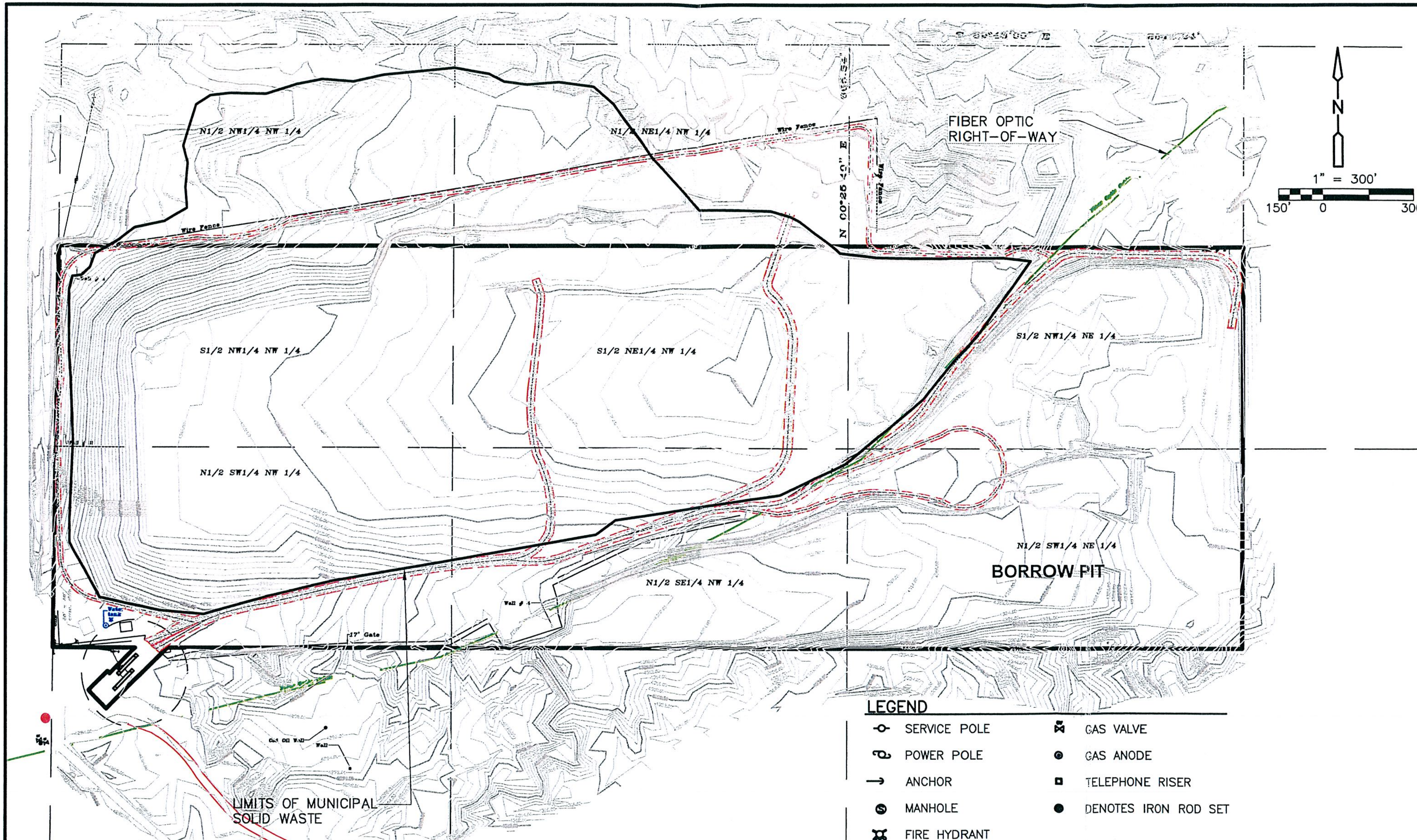
S:\8501\41913\sheets\ FIGURE-2-1 07/07/04 17:09 palmerrs

CDM
consulting . engineering . construction . operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Figure No. 2-1
SITE LOCATION MAP

S:\8501\41913\sheets\ FIGURE-2-2 07/29/04 11:09 palmerrs XREFS: 1-29-04Landfill, x-border, xtbcdmlogo



CDM
consulting . engineering . construction . operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Figure No. 2-2
EXISTING CONDITIONS

2.4.2 Clean Fill

The City began depositing clean fill (rock, dirt, rubble, asphalt, and concrete) at the landfill site to fill in low spots and to promote drainage. Clean fill operations began on October 1, 1996. The average acceptance rate (tons/month) of clean fill for the period from July 2000 through March 2004 is shown in Table 2-1.

Table 2-1
Clean Fill Waste Inventory

Year	Average Acceptance Rate (tons/month)
2000	9135
2001	6065
2002	6735
2003	4538
2004	4280

2.5 Investigations

2.5.1 Landfill Cap Investigation (1999)

Southwest Engineering, Inc. (SEI) performed thirty-five (35) soil test borings through the existing cap in March 1999. The purpose of the investigation was to obtain existing cap data at the site and conduct laboratory testing on soil samples retrieved from the 35 test borings. Results of SEI's investigation are summarized in Appendix A.

2.5.2 Landfill Cap Investigation (2004)

In March, CDM subcontracted with Precision Engineering to perform 45 additional test pits within the existing landfill cap to confirm/verify existing cap thicknesses and material properties. See Appendix F, Sheet C-1 for test pit and boring locations.

Precision also performed ten (10) auger borings to a depth of thirty (30) feet in the proposed borrow pit to develop a subsurface profile of available cap material. Results of the investigation are summarized in Appendix B.

Section 3
Closure

3.1 Objective

The primary purpose of a closure plan is to develop a working plan to assist in closure of the landfill in accordance with the regulations. The goal of landfill closure is to reduce leachate generation from the fill area. Leachate generation is reduced by applying a cap system which will promote surface water runoff and minimize infiltration into the solid waste layers, thereby reducing leachate and landfill gas generation.

These closure objectives are successfully accomplished through the application of the following design considerations:

- Cap system design
- Final grading design
- Surface water control
- Landfill gas control
- Re-vegetation of the final cap

The following sections present a detailed plan to ensure that the Las Cruces landfill is closed according to the provisions of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1), Subpart V: Closure and Post-Closure Requirements.

3.2 Final Cap

The purpose of the final cap is to minimize surface water intrusion, isolate landfill wastes from the surface and reduce odor and gas emissions. HELP modeling was completed in accordance with the New Mexico Environment Document *Performance Demonstration for an Alternative Cover Design under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling.* Based on results from the HELP modeling, construction of an alternative final cap is recommended.

3.2.1 Alternative Cap System Design

The alternative cap system was designed in accordance with 20 NMAC 9.1 and consists, from bottom to top, of the following layers.

- A 22-inch cover (existing cap or borrow material with a hydraulic conductivity equal to or less than 6.4×10^{-5} cm/sec.)
- A 6-inch vegetative layer (borrow material amended with on-site mulch to promote growth)
- A final landscape vegetation palette featuring a local natural seed mix

Appendix C includes a summary of the HELP modeling input parameters, comparison of HELP modeling results and recommendations for construction of the alternative landfill cap.

To ensure that the infiltration layer achieves a permeability of 6.4 x 10^{-5} cm/sec, the soil will be conditioned to the optimal moisture levels and applied to the landfill surfaces in specified lift thicknesses. Field inspection will be performed to verify that the required permeability is achieved through proper construction practices including: the use of proper equipment, proper depths of lifts, and the proper number of passes over the lift.

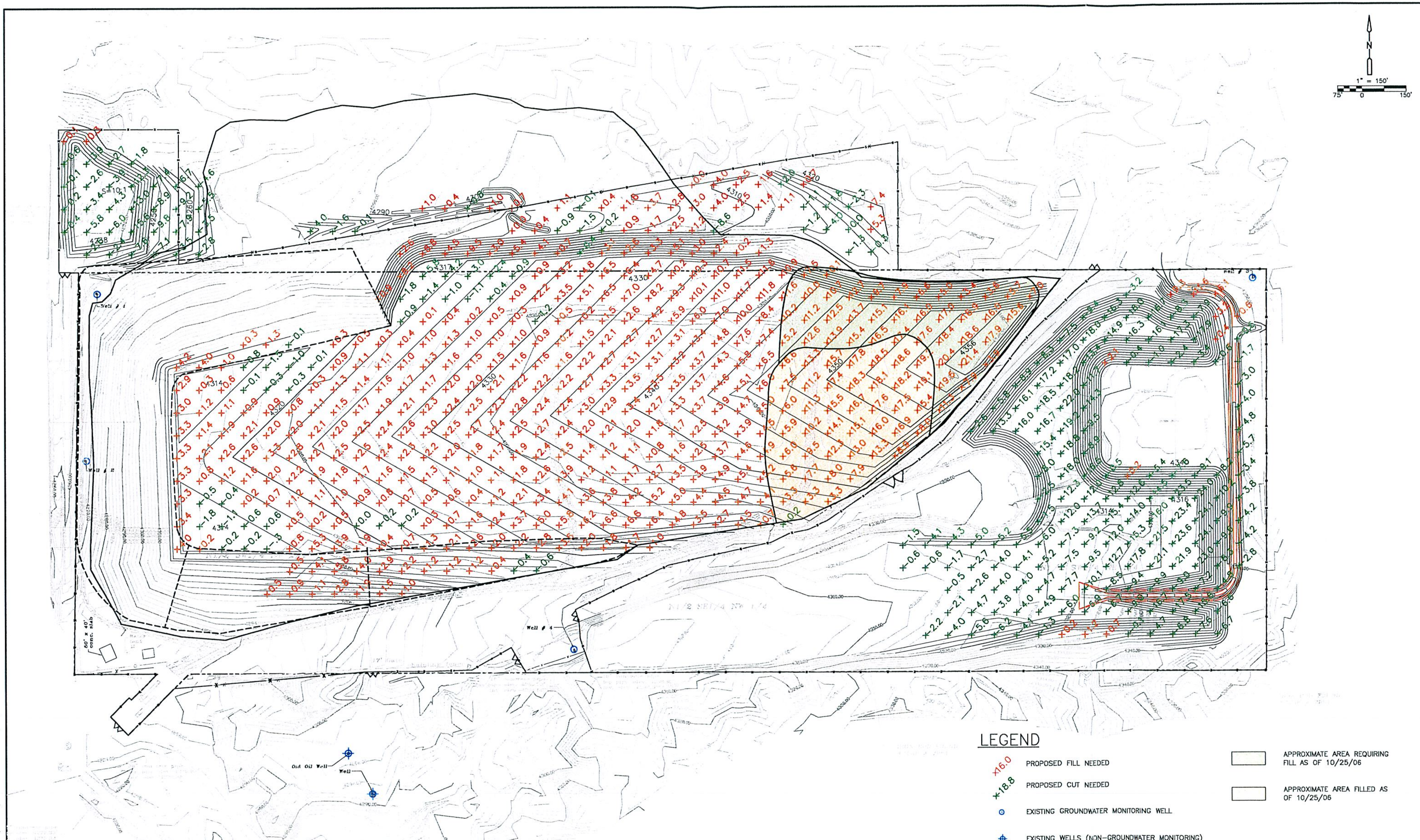
The resistance of the outer layer to erosion from wind and surface water is critical in the protection of the infiltration layer. This resistance is achieved by the development of a viable vegetative cover with a shallow root system, which holds together the soil profile. The seed mix will be drought resistant and require little or no fertilization. The seed mix and planting rate to be used are as shown in Table 3-1.

Table 3-1
Seed Mix

Species	Percentage
Spike dropseed	30
Mesa dropseed	30
Black grama	10
Giant dropseed	10
Sand sagebrush	10
Broom dalea	10

3.2.2 Final Cap Contours

New Mexico Solid Waste Management Regulations stipulate that side slopes of closed municipal solid waste landfills shall not exceed a 25 percent grade and the top portion shall have a gradient of 2 to 5%to prevent ponding of surface water. To prevent erosion of the soil yet facilitate the removal of surface water, the top slopes of the landfill will be graded to a 2% to 5% slope and the side slopes at 25%. See Appendix F, Sheet C-1 for final grading plan. Figure 3-1 presents the site plan showing cuts and fills, and Figure 3-2 shows existing mulch thickness at the landfill. Full depth final cap will be constructed in areas north of the fenced area as shown on Appendix F – Sheet C—1. In the event that waste is encountered during excavation of drainage channels, a solid waste excavation plan shall be prepared identifying monitoring requirements, transportation methods, and health and safety requirements.



S:\8501\41913\sheets\ CSTPLCUT-FILL 11/10/06 08:54 dookec XREFS: x-survey, x-border22X34, xtbcdmlogo, X-DESIGN, x-border

CDM
consulting.engineering.construction.operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Figure No. 3-1
SITE PLAN SHOWING CUTS AND FILLS

3.3 Surface Water Collection and Conveyance System

The purpose of the surface water collection and conveyance system is to control surface run on and runoff, preventing erosion of the landfill cover, and discharge the flow off-site. The Soil Conservation Service (SCS) method as outlined in "Peak Rates of Discharge for Small Watersheds, Chapter 2 (Revised 2/85 for New Mexico), Engineering Field Manual for Conservation Practices" was used as the basis for the runoff analysis. All other methodology was based on the City of Las Cruces, New Mexico and Five-Mile Planning and Platting Jurisdiction (Extra-Territorial Zone) Design Standards, effective September 18, 1987, Article III: Drainage, in particular Section 3.1C, 2. Development Equal to or Greater than Three Acres. The Soil SCS Number method was used to calculate the peak discharge and runoff volume resulting from 24-hour storms with return intervals of 10 and 100 years. Surface water structures are designed to handle the 100-year storm event.

Surface water from the top of the landfill will be diverted to one of four downdrains. These downdrains will prevent erosion of the side slopes and direct flow into the retention basin in the northwest corner of the site (Appendix F, Sheet C-1). A detailed analysis of the surface water and conveyance system is presented in the Drainage Report for the Las Cruces Municipal Landfill, Camp Dresser & McKee Inc., June 2004, included as Appendix D.

3.4 Landfill Gas Control System

Gases from the chemical decomposition of landfill refuse can be generated in substantial amounts at landfill sites. If these gases are not managed properly, they can migrate laterally across subsurface soils until they reach the atmosphere. Methane gas, a common component of landfill gases, can harm vegetation by displacing the oxygen from the plants root zone. Landfill gases can also migrate into buildings where they can present an explosion potential.

In accordance with 20 NMAC 9.1, landfill operators are required to prevent the lateral migration of methane gas. Gas concentrations in facility structures must be maintained below 25 percent of the lower explosive limit and, at the facility boundary, below the total lower explosive limit.

Methane generation testing was performed by Kramer and Associates, Inc., in June 1999 at the landfill to ensure that the generation rate is far below the allowable 50mg. Results of the emission compliance testing is found in Appendix E. Methane gas will be monitored as part of the post-closure monitoring program, if methane is detected above allowable limits, gas vents will be installed in those areas.

3.5 Site Security

Access to site will be restricted by several fences including new and existing chain link fences. Gated entries will be established to provide access for future clean fill disposal operations. Six-foot high chain link fencing will be installed along the perimeter of the drainage retention pond.

3.6 Estimated Closure Schedule

The last day of municipal solid waste acceptance at the landfill was September 30, 1996. However, clean fill continues to be accepted at the facility to achieve minimum slope requirements and to promote drainage off of the landfill. The proposed schedule to complete various closure activities at the landfill site is described below:

January 2007	Assume NMED Approves Closure Plan
July 2007	Start Closure of Sideslopes
December 2007	Start Closure of "BLM" Area
July 2008	Start Closure of "Top" Deck
December 31, 2008	Final Acceptance of Clean Fill
June 30, 2009	Closure Complete

3.7 Final Land Use

The final land use for the existing site is planned as recreational and open space.

3.8 Closure Procedures

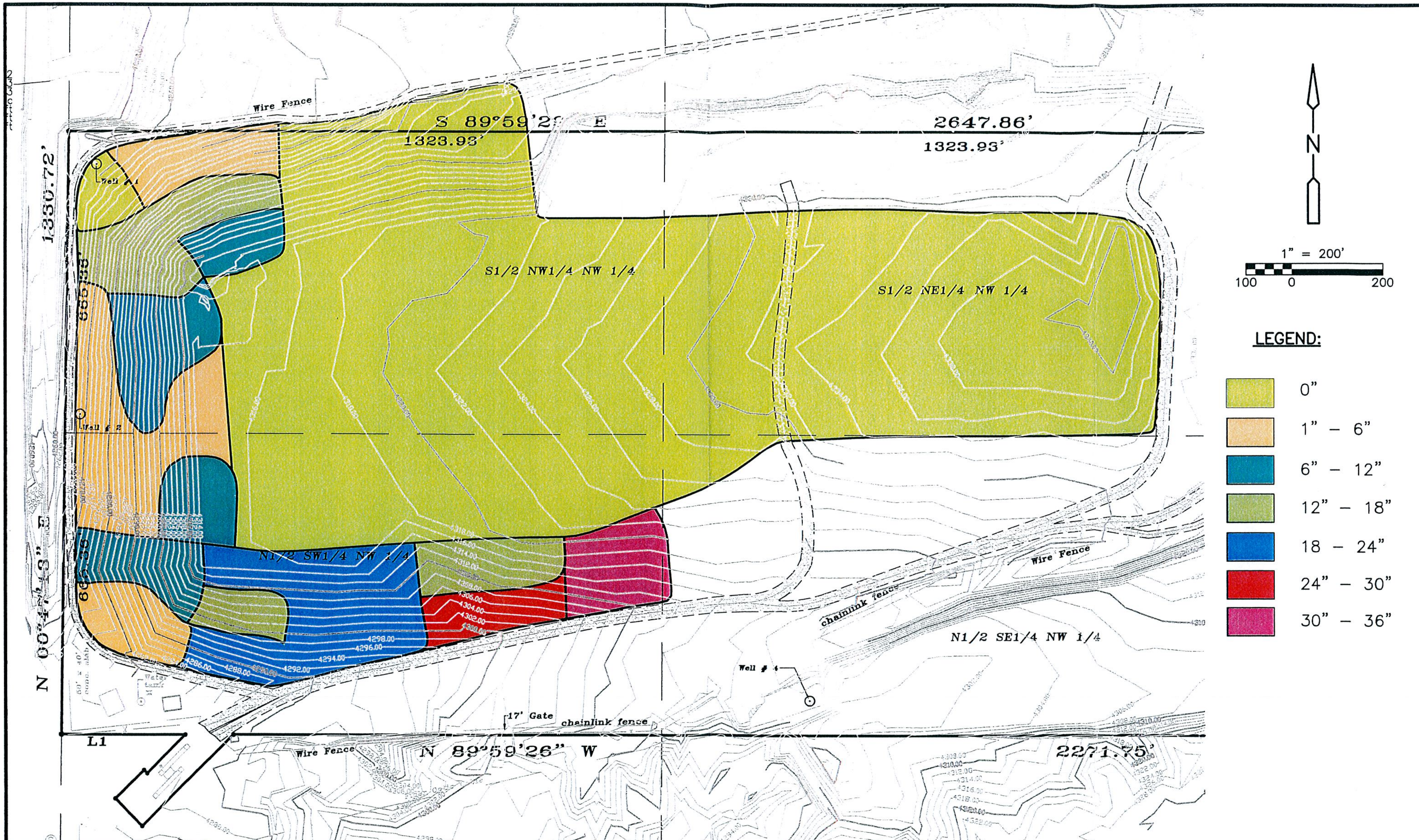
Existing cap thickness testing performed in March 2004 revealed that areas of the landfill require additional cap material. The following summarizes closure activities that will be implemented at the site:

- Clean fill material will continue to be placed in low areas of the landfill, specifically in the eastern area of the landfill, to achieve minimum slopes to promote drainage.
- Mulch material will be removed from sideslope areas and stockpiled. See Figure 3-2 for existing mulch cap thickness.
- Additional cap material will be placed along sideslopes in thicknesses identified in the final cap grading plan shown in Appendix F, Sheet C-1.
- Downdrains, diversion berms, and other stormwater control structures will be installed.
- Final cap material will be placed on the top deck of the landfill.
- Perimeter fencing and gates will be installed.
- The entire site will be seeded.

Appendix F contains final closure drawings which include the following:

Sheet	Title
G-1	Test Pit and Boring Location Map
C-1	Final Cap Grading Plan
CD-1	Site Details – 1
CD-2	Site Details – 2
CD-3	Site Details - 3

S:\8501\41913\sheets\ FIGURE-3-2 07/28/04 18:04 palmerrs XREFS: x-survey, x-border, xtbcdmlogo



CDM
consulting. engineering. construction. operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Figure No. 3-2
EXISTING MULCH CAP THICKNESS MAP

Section 4
Post-Closure

4.1 Objective

The objective of the post-closure plan for the existing landfill is to develop a plan to be implemented after closure to monitor all performance system facilities such as the final cap, and the ground water and landfill gas monitoring system, and to ensure that they are maintained and operating properly.

These post-closure objectives are successfully accomplished through the application of the following elements:

- Operation, Maintenance, and Inspection
  - Alternative Final Cover
  - Stormwater Control Structures
- Monitoring Programs
  - Methane Gas
  - Groundwater
- Record Keeping

Post-closure care will be conducted for 30 years, unless otherwise reduced by the Secretary of the NMED. The following sections present a detailed post-closure plan to ensure that the Las Cruces 1965-1996 Foothills landfill adheres to the New Mexico Solid Waste Management Regulations (20 NMAC 9.1), Subpart V: Closure and Post-Closure Requirements.

4.2 Inspection, Maintenance and Monitoring

Post-closure inspection and monitoring will be conducted regularly throughout the post-closure period. During this period, the City will correct the effects of settlement, subsidence, ponded water, and erosion. Table 4-1 depicts the periodic maintenance and inspection intervals for each of the following systems associated with the landfill.

4.2.1 Final Cover

The alternative final cover will be inspected for damage from settlement, wind and water erosion, loss of vegetation, vandalism, or any other contributing events. Inspections will be conducted following major storm events and will be done as depicted in Table 4-1. Damage will be identified, and repairs such as regrading, stabilizing, and revegetating will be done when necessary.

Table 4-1
Post-Closure Inspection and Monitoring Schedule

Requirements	Frequency (After completion of alternative cap)					
	0-5 years	**5-10 years**	**10-15 years**	**15-20 years**	**20-25 years**	**25-30 years**
Inspection & Maintenance						
Alternative Final Cap						
1. Inspection	D	D	D	D	D	D
2. Maintenance	L	L	L	L	L	L
Surface Water Collection and Conveyance System						
1. Inspection of Inlet Structures	K	K	K	K	K	K
2. Inspection of Perimeter Drainage Channels	B	B	B	B	B	B
3. Maintenance	L	L	L	L	L	L
Groundwater Monitoring Wells						
1. Inspection	D	D	D	D	D	D
2. Maintenance	D	D	D	D	D	D
Gas Monitoring Wells						
1. Inspection	D	D	D	D	D	D
2. Maintenance	L	L	L	L	L	L
Monitoring						
Gas Monitoring						
1. Gas Monitoring Probes	D(1)	A	A	A	A	A
Groundwater Monitoring Wells						
1. Groundwater Monitoring*	C	C	C	C	C	C

*Or as directed by NMED
(1)Perform gas monitoring quarterly for two years, annually thereafter

A = Annually
B = Annually During Summer
C = Twice Each Year
D = Quarterly
E = Bimonthly
F = Monthly
G = Biweekly
H = Weekly
I = Twice a Week
J = Daily
K = After Each Significant Storm Event
L = As Required

4.2.2 Stormwater Control Structures

Stormwater control structures will be inspected concurrently with the final cover system. Inspections will focus on erosion damage, settlement and reduction in flow capacity due to the deposition of sediment and debris. Damage will be identified and repaired as necessary.

4.2.3 Leachate Collection System

The existing Las Cruces 1965-1996 Foothills landfill does not have a leachate collection system.

4.3 Monitoring Programs

4.3.1 Methane Gas Generation

Landfill gas monitoring activities will continue throughout the post-closure period as they did during operations. Structure monitoring and barhoe probe monitoring will be performed quarterly for two years and annually thereafter during the post-closure period.

If methane concentrations greater than 25% of the lower explosive limit (LEL) are detected within facility structures or exceed the LEL at the facility boundary, the following measures will be taken:

- Notify the Secretary of the NMED and take necessary steps to ensure the protection of public health, welfare, and environment
- Within seven days of detection, record methane gas levels and submit description of actions taken to the Secretary regarding the protection of public health, welfare and the environment;
- Within sixty days of detection, implement a remediation plan for the methane gas releases and notify the Secretary of the plan that has been implemented.

4.3.2 Groundwater Quality

There are currently seven groundwater monitoring wells at the existing site. Groundwater is encountered at an elevation of approximately 3940 feet in the existing site monitor wells. The direction of groundwater flow at the site is to the west-southwest at a gradient of approximately 0.1 foot per foot. Figure 4.1, prepared by John Shomaker and Associates, shows the location of the monitoring wells, groundwater elevation contours and direction of groundwater flow for December 29, 2003. See Figure 4-1 for groundwater map for the site developed by John Shomaker and Associates, Inc.

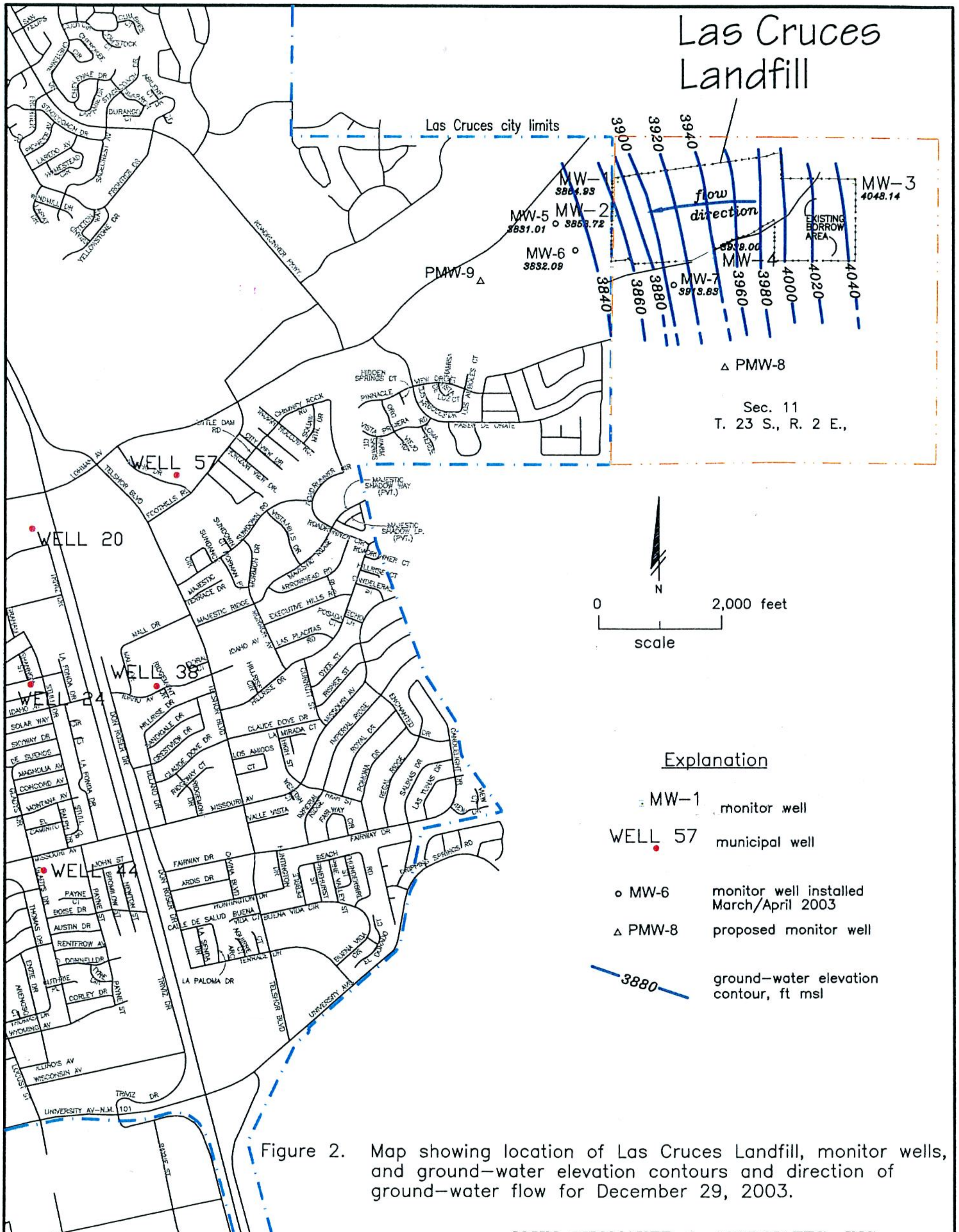


Figure 2. Map showing location of Las Cruces Landfill, monitor wells, and ground-water elevation contours and direction of ground-water flow for December 29, 2003.

JOHN SHOMAKER & ASSOCIATES, INC.

FIGURE 4-1 GROUNDWATER MAP

As required by the Solid Waste Management Regulations, the groundwater monitoring wells will be sampled semiannually during the period of post-closure care, or as directed by NMED. Part of the approved sampling procedures will be to visually inspect wells for damage.

All monitoring and testing parameters will follow the requirements of Section 803 and 804 of Part VIII of the NMED Solid Waste Regulations (20 NMAC 9.1). Given the background data obtained from the existing monitoring wells, the post-closure monitoring program will address the detection monitoring requirements of Section 804. The monitoring sites will be inspected as a part of the site inspections, and maintenance will be carried out immediately if required.

Post-closure inspection and monitoring will be conducted regularly throughout the post-closure period. During this period, the City will correct the effects of settlement, subsidence, ponded water, and erosion. Table 4-1 depicts the periodic maintenance and inspection intervals for each of the following systems associated with the landfill.

4.4 Recording

The existing site will be maintained, inspected, and monitored every quarter during the 30-year post-closure period. Formal inspections will be compiled and stored for further examination. Records of all inspections will be kept and, at a minimum, will include: date, time of day, weather conditions, identity of inspector, general landfill conditions, problems requiring action, and repairs completed. Original reporting documents will be filed at the City of Las Cruces Joint Utilities Building, Solid Waste Department. In addition, reports of monitoring performance and collected data will be submitted to the Secretary of the NMED within 45 days from the end of each calendar year.

APPENDIX A
SOUTHWEST ENGINEERING, INC.
EXISTING CAP INVESTIGATION SUMMARY TABLE
MARCH 1999

APPENDIX A
City of Las Cruces Foothills Landfill
SOIL PROPERTIES AND CLASSIFICATION
SOUTHWEST ENGINEERING INCORPORATED, INC.
EXISTING CAP PROPERTIES SUMMARY TABLE
MARCH 1999

Test Hole Number *	Max Dry Density	%Optimum Mositure	3"	21/2"	2"	11/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 10	No. 40	No. 80	No. 200	Depth (Feet) (Top Of Trash)	Permeability (cm/sec)
1	114.5	10.0	-	-	-	100	95	93	91	90	87	82	79	56	37.1	3	1.5×10^{-6}
2	114.1	13.4	-	-	-	-	100	97	94	-	86	82	76	54	34.8	4	3.0×10^{-6}
3	110.1	13.2	-	-	-	-	-	100	99	-	97	93	66	62	42.7	3	7.4×10^{-7}
4	114.5	10.0	-	-	100	95	95	95	93	91	89	83	69	64	41.1	1	4.1×10^{-5}
5	118.9	8.2	-	-	100	85	82	76	69	66	58	52	45	27	16.2	1	3.0×10^{-4}
6	126.7	8.9	100	86	82	78	78	76	70	67	60	48	36	26	17	2	2.5×10^{-4}
7	125.9	5.8	-	100	95	92	88	86	80	73	64	54	37	28	13.7	2	5.7×10^{-4}
8	124.7	9.7	-	-	-	100	92	90	86	83	78	72	66	44	25.3	2	5.8×10^{-4}
9	122.0	7.5	-	-	-	-	100	94	91	87	78	74	67	47	31.9	1 1/2	2.6×10^{-5}
10	120.2	10.9	-	-	100	81	76	76	73	72	68	65	59	43	22.6	2 1/2	1.1×10^{-5}
11	115.7	10.4	-	-	-	-	-	100	91	88	77	72	61	42	24.4	1	4.8×10^{-5}
12	127.6	6.8	-	100	85	75	77	73	65	59	48	43	36	23	12.5	1 1/2	1.4×10^{-3}
13	127.6	6.8	-	-	-	100	94	92	88	83	76	72	65	47	25.1	2	3.5×10^{-5}
14	125.8	8.7	-	-	100	96	92	87	85	79	75	68	54	45	25.5	2	1.0×10^{-3}
15	118.0	9.6	-	-	-	100	98	95	92	90	87	84	74	42	27.0	3	9.6×10^{-5}
16	122.4	7.2	-	-	-	-	100	93	89	85	74	66	57	37	22.8	1 1/2	1.3×10^{-3}
17	118.9	10.8	100	83	77	72	70	68	64	61	58	50	44	37	22.3	1 1/2	2.8×10^{-4}
18	127.4	8.6	-	-	100	93	81	77	69	64	55	50	42	27	15.8	1 1/2	4.4×10^{-4}
19	124.9	8.6	-	-	100	93	93	88	80	76	69	73	54	39	20.8	1 1/2	5.7×10^{-5}
20	116.9	12.9	-	-	-	-	100	96	92	88	82	77	72	54	31.7	1	1.9×10^{-6}
21	118.4	9.7	-	-	100	87	79	75	73	72	69	65	60	43	25.2	3 1/2	3.2×10^{-5}
22	112.5	11.3	-	-	-	-	-	-	100	94	92	83	63	56	36.4	5	4.5×10^{-5}
23	115.1	10.2	-	-	-	-	100	99	98	95	93	87	81	58	41.4	5	2.7×10^{-6}
24	120.0	7.2	-	-	-	100	97	94	85	81	70	62	55	42	22.3	3	1.2×10^{-4}
25	123.5	8.8	-	-	-	-	100	98	90	83	71	66	58	40	19.0	3	1.1×10^{-3}
26	117.4	13.4	-	-	-	-	100	88	81	76	67	61	50	26	11.8	4	1.8×10^{-3}
27	125.5	8.4	-	-	100	93	81	77	70	67	59	53	45	31	18.7	2	6.3×10^{-5}
28	124.5	9.8	-	-	100	95	83	80	76	72	63	56	49	35	19.1	4 1/2	9.0×10^{-5}
29	118.6	9.2	-	-	100	95	88	82	75	71	63	58	51	35	19.6	5	
30	119.0	11.1	100	-	80	80	77	73	69	67	60	55	50	39	19.3	4	6.7×10^{-4}
31	114.8	10.8	-	-	100	87	87	86	84	83	80	78	74	47	30.8	3 1/2	3.2×10^{-6}
32	119.0	7.8	-	-	-	-	100	98	92	88	81	77	62	53	29.4	2	7.9×10^{-5}
33	122.4	10.6	-	-	100	94	91	88	86	83	75	64	58	42	22.0	4	3.4×10^{-5}
34	122.0	8.5	-	-	100	93	87	83	78	75	68	63	56	38	18.9	5	2.5×10^{-5}
35	118.0	10.8	-	-	-	-	100	99	92	76	71	67	57	41	24.6	3 1/2	4.1×10^{-5}

*See Appendix F - Drawing G-1 for test locations.

APPENDIX B
PRECISION ENGINEERING, INC.
MARCH 2004 FIELD INVESTIGATION

PRECISION ENGINEERING, INC.
P.O. BOX 422 • LAS CRUCES, NM 88004
PH: (505) 523-7674
FAX 505-523-7248 • e-mail: werpei@aol.com

April 5, 2004

Mr. Tom Parker, PE
Camp Dresser & McKee, Inc.
121 Tijeras Avenue, NE, Suite 1000
Albuquerque, New Mexico 87102-3400

Re: Foothills Landfill Las Cruces, New Mexico
PEI File No.: 04-026

Dear Mr. Parker,

Precision Engineering, Inc. conducted a field investigation and associated laboratory analysis on cap material and borrow pit material to aid in the design of the landfill closure plan. Forty-five (45) test pit locations were investigated through the soil cap using a backhoe. Locations selected in concurrence with CDM, Inc. At each test pit location, an insitu density test (ASTM D-3017) was performed on the surface of the cap. The test pits were advanced to the first signs of significant refuse. Mulch and soil cap thickness measurements were recorded at each location. Representative samples of cap soil were collected from each test pit for laboratory testing. The test pits were then backfilled and compacted with a mixture of soil and montmorillonite clay. The laboratory testing performed consisted of hydraulic conductivity testing (ASTM D-5084, D-5856), moisture content testing (ASTM D-2216), moisture-density testing (ASTM D-698) and particle size determination (ASTM D-422) As designated by CDM, Inc. Samples for hydraulic conductivity testing were selected based on gradation similarities within pre-selected regions of the cap. All test results are attached to this letter report.

Analysis of the proposed borrow pit was also performed. Ten (10) auger borings were advanced in the area of the borrow pit to develop a subsurface profile of available material. The borings were advanced to depths of thirty (30) feet each. The borings were advanced using a truck-mounted CME 75 drill with four and one-quarter (4-1/4) inch inside diameter, continuous flight hollow-stemmed auger. The borings were completed in accordance with ASTM D-1452: Standard Method for Soil Investigation and Sampling by Auger Methods. At each boring location composite samples were collected from zero (0) to ten (10) feet, ten (10) to twenty (20) feet and twenty (20) to thirty (30) feet. A total of thirty (30) composite samples were collected and transported to our laboratory for further analysis. Particle size determination (ASTM D-422) and moisture content (ASTM D-2216) tests were performed on each of the thirty (30) samples. Moisture-density testing

(ASTM D-698) and Hydraulic conductivity tests (ASTM D-5084, D-5856) were performed on ten (10) representative samples. All test results and auger boring logs are attached to this letter report.

If you have any questions please contact our office.

Sincerely,
Precision Engineering, Inc.

William H. Kingsley, PE

Cap Evaluation Foothills Landfill Las Cruces, NM
PEI File No. 04-026

Location	PEI Lab #	Sample Depth in	Mulch in	Soil Cap Thickness in	Lab %M	Insitu Dry Dens PCF	2"	1 ½"	1"	3/4"	½"	3/8"	#4	#10	#20	#40	#60	#140	#200	Hydraulic Conductivity cm/second
1	45417	0-12	0	31	5.5	101.2				100	97	95	87	82	79	76	68	29	22.1	
2	45420	12-24	0	27	4.4	104.3		100	88	88	85	82	77	73	69	65	58	31	21.4	2.1×10^{-5}
3	45421	0-12	10	34	6.5	107.8				100	98	96	92	88	84	79	71	36	27.2	
4	45424	12-24	13	33	6.5	104				100	98	94	86	80	74	68	61	34	25.2	
5	45425	0-12	4	22	5	104.8		100	86	82	82	81	79	76	73	70	63	34	24.2	
6	45428	12-24	14	26	5.3	111.9					100	95	83	74	69	65	57	26	18.1	
7	45429	0-12	13	27	8.6	118.5				100	96	89	78	67	60	54	47	25	19.2	
8	45432	12-26	0	32	3.3	99.8			100	95	90	86	81	74	66	50	33	12	8.9	1.3×10^{-3}
9	45433	0-12	2.5	19	4.1	106.4				100	96	94	87	81	75	67	55	27	21.5	1.8×10^{-5}
10	45436	12-30	9	51	10.4	108.2				100	96	89	83	76	71	66	59	31	23.6	
11	45437	0-8	4	8	2.6	102.5				100	93	90	79	70	63	54	43	23	17.6	
12	45440	0-12	12	16	5.6	96.9			100	89	89	88	82	78	74	70	64	38	31.1	9.8×10^{-6}
13	45443	12-20	6	20	8.1	106.1					100	97	95	93	91	88	81	50	41.5	
14	45444	0-12	1	25	5.6	117.1			100	96	94	89	81	72	63	55	46	25	19.8	6.8×10^{-6}
15	45446	0-12	21	31	12.7	110.5						100	97	95	92	90	80	44	35.5	
16	45449	12-23	24	23	10.1	115.8		100	92	92	87	82	72	63	57	53	47	25	19.9	2.8×10^{-7}
17	45450	0-12	16	32	9.8	109.6						100	96	92	89	85	77	42	33.3	7.2×10^{-7}
18	45453	12-24	30	36	10.5	112.4					100	96	92	86	82	78	69	36	27.7	
19	45454	0-12	34	20	8.2	116.9					100	95	88	80	75	71	62	31	23.8	
20	45457	12-24	0	24	2.1	107.6			100	95	92	89	81	71	59	43	30	14	10.6	
21	45458	0-12	0	24	4.3	116.9			100	95	88	87	80	72	64	51	37	18	14.6	4.8×10^{-5}
22	45460	0-12	0	12	6.5	99.5				100	98	95	89	83	79	75	69	44	37.2	
23	45461	0-7	0	7	3.3	120.1	100	93	93	85	78	71	59	51	45	41	34	15	10.6	1.9×10^{-5}
24	45462	0-5	0	5	2.6	120.3	100	95	84	83	80	75	65	56	50	45	38	19	14.3	2.4×10^{-5}
25	45463	0-7	0	7	3.9	112.8		100	92	88	83	79	71	63	57	53	47	28	21.9	

Note: hydaulic conductivities performed at dry density and moisture content shown (insitu values)

See Appendix F - Sheet G-1 for Test Locations.

Cap Evaluation Foothills Landfill Las Cruces, NM
Additional Cap Thickness Measurements
PEI File No. 04-026

Location	PEI Lab #	Sample Depth in	Mulch in	Soil Cap Thickness in	%M	Insitu Dry Dens PCF
26	45470	0-12	7	12	8.0	103.7
27	45471	0-12,12-24	12	30	2.6	112.1
28	45472	0-12	4	25	3.0	111.8
29	45473	0-12	9	29	3.4	99.0
30	45474	0-12	6	19	2.8	108.6
31	45475	0-12	1	12	2.7	110.7
32	45476	0-12	22	27	8.1	122.1
33	45477	0-12	13	25	6.6	109.1
34	45478	0-12	22	29	10.4	115.6
35	45479	0-12	0	14	3.6	93.7
36	45480	0-12	0	27	3.4	100.1
37	45481	0-12	0	13	3.6	113.1
38	45482	0-12	0	18	4.2	109.3
39	45483	0-12	0	14	3.6	111.7
40	45484	0-12	0	15	3.8	116.9
41	45485	0-12	0	14	3.7	102.4
42	45486	0-12	0	25	3.8	108.6
43	45487	0-12	0	13	3.5	112.0
44	45488	0-12	0	20	2.2	103.3
45	45489	0-12	0	45	4.1	105.7

See Appendix F - Sheet G-1 for Test Locations.

Borrow Pit Evaluation Foothills Landfill Las Cruces, NM
PEI File No. 04-026

Location	PEI Lab #	Sample Depth ft	Optimum %M	Proctor PCF	2"	1 ½"	1"	3/4"	½"	3/8"	#4	#10	#20	#40	#60	#140	#200	Insitu %M	Hydraulic Conductivity cm/sec
B9	45492	0-10					100	98	93	90	85	82	79	77	72	51	41	5.4	
B9	45493	10-20							100	96	93	89	85	81	73	44	36	4.8	
B9	45494	20-30	10.7	123.5				100	94	91	86	82	78	73	63	34	28	3.3	1.2×10^{-6}
B10	45495	0-10				100	98	95	91	85	73	64	56	49	43	27	21	8.9	
B10	45496	10-20					100	96	93	91	83	78	73	69	59	33	27	5.8	
B10	45497	20-30	10.9	122.2			100	96	88	83	72	68	67	64	54	24	19	4.6	3.2×10^{-6}
B6	45498	0-10			100	97	96	91	84	76	65	58	54	50	46	27	21	3.0	
B6	45499	10-20					100	98	92	88	80	75	72	69	62	35	26	3.6	
B6	45500	20-30	12.3	119.2			100	99	97	93	85	79	75	71	61	27	20	3.1	5.8×10^{-6}
B3	45501	0-10				100	97	95	90	85	71	61	55	51	45	27	21	3.9	
B3	45502	10-20	11.5	122.2				100	98	96	93	90	87	83	71	39	33	4.6	3.3×10^{-6}
B3	45503	20-30							100	98	95	93	90	87	79	49	42	5.8	
B5	45504	0-10								100	98	96	94	89	80	41	32	6.0	
B5	45505	10-20					100	97	91	85	75	69	65	62	55	27	20	4.5	
B5	45506	20-30	11.3	120.2			100	97	94	89	75	65	58	55	48	24	17	4.2	2.7×10^{-6}
B7	45507	0-10	10.6	124.9		100	99	90	80	66	42	27	20	17	14	8	7	2.2	2.1×10^{-5}
B7	45508	10-20				100	97	94	87	77	57	41	33	28	23	12	9	3.0	
B7	45509	20-30						100	99	97	93	90	88	81	64	28	22	3.8	
B4	45510	0-10	11.2	121.6		100	98	97	89	84	73	66	61	58	52	32	25	2.9	9.5×10^{-6}
B4	45511	10-20							100	99	97	95	94	88	74	32	23	3.0	
B4	45512	20-30					100	95	93	89	84	79	76	72	63	34	24	3.4	
B2	45513	0-10					100	99	93	87	77	71	66	61	53	31	24	2.9	
B2	45514	10-20							100	99	95	92	89	84	72	35	28	4.0	
B2	45515	20-30	10.3	120.3			100	98	95	92	85	81	78	74	66	36	28	4.8	4.9×10^{-7}
B1	45516	0-10	9.7	119.9						100	98	96	95	93	85	51	43	4.4	5.1×10^{-5}
B1	45517	10-20										100	99	93	70	35	31	3.2	
B1	45518	20-30								100	99	99	98	92	76	20	8.9	4.2	
B8	45519	0-10				100	98	93	88	82	70	60	51	45	40	25	20	4.2	
B8	45520	10-20				100	94	88	79	70	55	46	41	38	35	26	22	6.5	
B8	45521	20-30	9.9	124.6			100	99	96	93	83	72	65	60	53	37	32	4.3	5.6×10^{-6}

Hydraulic Conductivities Performed at 95% of Standard Proctor (ASTM D-698)

See Appendix F - Sheet G-1 for Test Locations.

Sheet: 1 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: One

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills Landfill Las Cruces, NM
Elevation: EXISTING
Date: 3/1/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, ETC.)	%M	LL	PI	CLASS.
45516	0.0-10.0	Grab			**Sand**, fine, very silty, occasional gravel, damp	4.4			
				5.0					
45517	10-20	GRAB		10	**Sand**, fine, silty, dry	3.2			
					clayey from 10-12'				
				15	slightly silty 15-20'				
45518	20-30	GRAB		20	**Sand**, fine, slightly silty, damp	4.2			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED

LOGGED BY: KM

C:\AAFWFILE\projects\2004\04-026\[B1 borrow pit.xls]Sheet1

Sheet: 2 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Two

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills Landfill Las Cruces, NM
Elevation: EXISTING
Date: 3/1/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45513	0.0-10.0	Grab			**Sand**, fine, silty, gravelly, dry	2.9			
				5.0					
45514	10-20	GRAB		10	**Sand**, fine, silty, occasional fine gravel, dry,	4.0			
				15					
45515	20-30	GRAB		20	**Sand**, fine, silty, occasional fine gravel, damp, brown	4.8			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED

C:\AAFWFILE\projects\2004\04-026\[B2 borrow pit.xls]Sheet1

LOGGED BY: KM

Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Three

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills Landfill Las Cruces, NM
Elevation: EXISTING
Date: 2/27/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45501	0.0-10.0	Grab			**Sand**, fine, gravelly, silty, dry, brown	3.9			
				5.0					
45502	10-20	GRAB		10	**Sand**, fine, silty, scattered fine gravel, damp, brown	4.6			
				15					
45503	20-30	GRAB		20	**Sand**, fine, very silty, occasional fine gravel, damp, brown	5.8			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED

LOGGED BY: KM

Sheet: 4 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Four

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills Landfill Las Cruces, NM
Elevation: EXISTING
Date: 3/1/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, ETC.)	%M	LL	PI	CLASS.
45510	0.0-10.0	Grab			**Sand**, fine, gravelly, silty, dry	2.9			
				5.0					
45511	10-20	GRAB		10	**Sand**, fine, silty, dry	3.0			
				15					
45512	20-30	GRAB		20	**Sand**, fine,silty, gravel, dry, brown	3.4			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED — LOGGED BY: KM

C:\AAFWFILE\projects\2004\04-026\[B4 borrow pit.xls]Sheet1

Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Five

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills
Landfill Las Cruces, NM
Elevation: EXISTING
Date: 2/27/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45504	0.0-10.0	Grab			Sand, fine, silty, damp, red-brown	6.0			
				5.0					
				10					
45505	10-20	GRAB			Sand, fine, gravelly, silty, damp	4.5			
				15					
				20					
45506	20-30	GRAB			Sand, fine, gravelly, silty, damp	4.2			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED — LOGGED BY: KM

C:\AAFWFILE\projects\2004\04-026\[B5 borrow pit.xls]Sheet1

Sheet: 6 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Six

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills
Landfill Las Cruces, NM
Elevation: EXISTING
Date: 2/26/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45498	0.0-10.0	Grab			**Sand**, fine, gravelly, silty, dry, light brown	3.0			
				5.0	cobbles 5-6'				
45499	10-20	GRAB		10	**Sand**, fine, silty, gravelly, dry, brown	3.6			
				15					
45500	20-30	GRAB		20	**Sand**, fine, silty, gravelly, dry, brown	3.1			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED

LOGGED BY: KM

C:\AAFWFILE\projects\2004\04-026\[B6 borrow pit.xls]Sheet1

Sheet: 7 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Seven

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills
Landfill Las Cruces, NM
Elevation: EXISTING
Date: 2/26/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45507	0.0-10.0	Grab			Gravel, cobbles, sandy, slightly silty, dry, brown	2.2			
				5.0					
				10					
45508	10-20	GRAB			Sand, very gravelly, slightly silty, dry, brown	3.0			
				15					
				20					
45509	20-30	GRAB			Sand, fine, silty, gravelly, dry, red-brown	3.8			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED
LOGGED BY: KM

C:\AAFWFILE\projects\2004\04-026\[B7 borrow pit.xls]Sheet1

Sheet: 8 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Eight

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills Landfill Las Cruces, NM
Elevation: EXISTING
Date: 2/27/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45519	0.0-10.0	Grab			Sand, fine-medium, gravelly, silty, damp, brown	4.2			
				5.0					
45520	10-20	GRAB		10	Sand, fine-coarse, very gravelly, damp, brown	6.5			
				15					
45521	20-30	GRAB		20	Sand, fine, silty, gravelly, damp, brown	4.3			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED

C:\AAFWFILE\projects\2004\04-026\[B8 borrow pit.xls]Sheet1

LOGGED BY: KM

Sheet: 9 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Nine

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills Landfill Las Cruces, NM
Elevation: EXISTING
Date: 2/26/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45492	0.0-10.0	Grab			**Sand**, fine, very silty, gravelly, damp, brown	5.4			
				5.0					
45493	10-20	GRAB		10	**Sand**, silty, scattered gravel, damp, red-brown	4.8			
				15					
45494	20-30	GRAB		20	**Sand**, fine, silty, gravelly, dry, brown	3.3			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED — LOGGED BY: KM

C:\AAFWFILE\projects\2004\04-026\[B8 borrow pit.xls]Sheet1

Sheet: 10 OF 10
Bore Point: See Plan

Water Elevation: Not Encountered
Boring No.: Ten

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 04-026
Site: Foothills
Landfill Las Cruces, NM
Elevation: EXISTING
Date: 2/26/04

Log of Test Borings

LAB #	DEPTH FEET	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
45495	0.0-10.0	Grab			**Sand**, fine-medium, silty, gravelly, moist, brown	8.9			
				5.0					
45496	10-20	GRAB		10	**Sand**, silty, gravelly, damp, brown	5.8			
				15					
45497	20-30	GRAB		20	**Sand**, fine, gravelly, silty, damp, red-brown	4.6			
				25					
				30	total depth 30'				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED

LOGGED BY: KM

C:\AAFWFILE\projects\2004\04-026\[B10 borrow pit.xls]Sheet1

APPENDIX C
ALTERNATIVE CAP DESIGN –
HELP MODELING

CDM

CDM

Memorandum

To: *File*

From: *Thomas D. Parker, P.E.* TDP 10/6/05

Date: *October 6, 2005*

Subject: *City of Las Cruces Landfill Closure*
HELP Modeling Results – Revised

This memorandum documents the results of the alternative cap HELP modeling completed for the City of Las Cruces Landfill Closure Update project. This memorandum discusses the HELP modeling input parameters, compares the HELP modeling results, and provides recommendations for construction of the alternative landfill cap.

HELP Modeling Input Parameters

All HELP modeling was completed in accordance with the New Mexico Environment Document *Performance Demonstration for an Alternative cover Design under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling.* Hereinafter referred to as the *Guidance Document*. This document dictates the input parameters required for use in the HELP modeling for satisfactory review and acceptance of a proposed alternative cover design by the Solid Waste Bureau.

Climatedata was used to obtain precipitation and temperature data. The five wettest consecutive years in Las Cruces were determined to be the period of 1901 to 1905. This data was utilized for modeling.

The prescribed cover system per the regulations consists of an 18-inch soil cover with a 6-inch vegetative cover capable of sustaining growth. Per Edward Hansen of the Solid Waste Bureau, the typical soil used for the 18-inch prescribed soil layer is soil type 15, slightly modified to a 1.0×10^{-5} cm/sec hydraulic conductivity. Substantial geotechnical information was collected on the existing cap material and the borrow material which will be used to finish the cap construction. It was determined that the existing cap nearly meets the regulatory requirements and that the landfill is covered with material having a hydraulic conductivity of 4.8×10^{-5} cm/sec or less in all locations but one. One measurement in the northwest corner at the toe of slope (location 8) has a measured hydraulic conductivity of 1.3×10^{-3} cm/sec. This measurement was ignored as improved material will be used to construct an appropriate cap layer in this area. The highest measured hydraulic conductivity for the borrow source was 5.1 x 10^{-5} cm/sec. This measurement was used for all alternative cap HELP runs because this measurement is slightly worse than the existing cap worse case (4.8 x 10^{-5} cm/sec). A soil type of 11 was used to represent the on-site soil. The hydraulic conductivity characteristics for Soil Type 11 material is 6.4 x 10-5 cm/sec. This represents a conservative approach in modeling in-situ and proposed cap material identified during the geotechnical investigation work performed by Precision Engineering, Inc.. The soil type was selected based on the substantial field and laboratory geotechnical information available for the site. The vegetative soil layer is expected to consist of the sandy silt material (SM classification) mixed with the mulch created by the City. A soil type 7 was used to depict the vegetative soil layer for all runs.

Appendix A includes a summary of the input data used for all HELP modeling runs. The Climatedata output and the geotechnical information are also included in Appendix A.

HELP Modeling Results

Table 1 presents a comparison of the HELP Modeling results from the six runs (three prescribed and three alternates. The comparison of the average annual percolation is used as the comparison per the *Guidance Document.*

Table 1. Comparison of HELP Modeled Average Annual Percolation Through Cap

	Prescribed Cover - Average Annual Percolation, Inches	Alternative Cover - Average Annual Percolation, Inches
Top	0.00107	0.00015
Minimum Side Slopes	0.00401	0.00019
Maximum Side Slopes	0.00322	0.00017

The alternative cap design modeled for the top slope consisted of a 21.5-inch layer of 6.4 x 10^{-5} cm/sec material. For the minimum and maximum side slope, the alternative cap consisting of 21-inches of 6.4 x 10^{-5} cm/sec material was determined equivalent. The HELP Modeling output is included in Appendix B. A floppy disk with the input and output files is also included in Appendix B.

Recommendations

Based upon the HELP Modeling Results, it is recommended that the cap be constructed as follows:

- 22-inch cover (existing cap or borrow material with a hydraulic conductivity equal to or less than 6.4 x 10^{-5} cm/sec)

- 6-inch vegetative layer (borrow material amended with on-site mulch to promote growth)

Appendix A

HELP Modeling Input Parameters Justification

Las Cruces Landfill Closure, Alternative Cover Equivalency Demonstration
HELP Modeling Input Parameters Justification

HELP Model data/output files: **prestop.D10 and presctop.OUT**
Description: **Prescriptive Cover with 18-inches of $1x10^{-5}$ cm/sec soil with 6-inches vegetative cover (soil and mulch)**

Parameter	Value Used	Justification
WEATHER DATA		
City / State	Las Cruces, NM	Landfill located on east side of City
Latitude	32.19	Approximate for Landfill location
Evaporative Zone Depth	24"	From Guidance Document for Las Cruces
Maximum Leaf Area Index	0.8	From Guidance Document for Las Cruces
Precipitation	Climatedata for 1901-1905	5 wettest years according to Climatedata (see Attachment 1)
Temperature	Climatedata for 1901-1905	Temperature for 5 wettest years according to Climatedata (see Attachment 1)
Solar Radiation Data	Synthetic	Synthetic for El Paso (nearest location used by model)
LANDFILL COVER DATA		
Type of Vegetation	2	Poor Stand of Grass, from Guidance Document
SCS Runoff Curve Number	81.70	Generated by HELP
% of Area for Runoff	100%	Bare closed cap, from Guidance Document
SOIL AND DESIGN DATA		
Source of Soil Characteristics		Geotech info included as Attachment 2 and discussions with NMED
Number of Layers	2	Prescribed Cover
LAYERS		
Layer No. 1	6" vegetative cover	Type 1, slope 2% with drainage length of 1100' (maximum distance on top of landfill), texture 7 which approximates the soil characteristics of a the sandy soil mixed with the mulch, initial moisture content initialized according to guidance document, default for all other information
Layer No. 2	18" infiltration layer	Type 1, slope 2% with drainage length of 1100' (maximum distance on top of landfill), texture 15 which approximates the regulated material but conductivity was modified slightly to 1.0e-05, initial moisture content initialized according to guidance document, default for all other information

HELP Model data/output files: **alt2top.D10 and alt2top.OUT**

Description: **Alternate Cover with 21.5-inches of 6.4 x10^{-5} cm/sec soil with 6-inches vegetative cover (soil and mulch)**

Input Parameter	Value	Justification
WEATHER DATA		
City / State	Las Cruces, NM	Landfill located on east side of City
Latitude	32.19	Approximate for Landfill location
Evaporative Zone Depth	27.5"	From Guidance Document for Las Cruces
Maximum Leaf Area Index	0.8	From Guidance Document for Las Cruces
Precipitation	Climatedata for 1901-1905	5 wettest years according to Climatedata (see Attachment 1)
Temperature	Climatedata for 1901-1905	Temperature for 5 wettest years according to Climatedata (see Attachment 1)
Solar Radiation Data	Synthetic	Synthetic for El Paso (nearest location used by model)
LANDFILL COVER DATA		
Type of Vegetation	2	Poor Stand of Grass, from Guidance Document
SCS Runoff Curve Number	81.30	Generated by HELP
% of Area for Runoff	100%	Bare closed cap, from Guidance Document
SOIL AND DESIGN DATA		
Source of Soil Characteristics		Geotech info included as Attachment 2
Number of Layers	2	Alternate Cover
LAYERS		
Layer No. 1	6" vegetative cover	Type 1, slope 2% with drainage length of 1100' (maximum distance on top of landfill), texture 7 which approximates the soil characteristics of a the sandy soil mixed with the mulch, initial moisture content initialized according to guidance document, default for all other information
Layer No. 2	21" infiltration layer	Type 1, slope 2% with drainage length of 1100' (maximum distance on top of landfill), texture 11 which approximates the classification of the on-site material with the hydraulic conductivity of 6.4e-05 for worst case material (maximum conductivity) from borrow pit (see attachment 2), initial moisture content initialized according to guidance document, default for all other information

HELP Model data/output files: **sidemin.D10 and sidemin.OUT**

Description: **Prescribed Cover for Minimum Slope of Side Slopes with 18-inches of $1x10^{-5}$ cm/sec soil with 6-inches vegetative cover (soil and mulch)**

Input Parameter	Value	Justification
WEATHER DATA		
City / State	Las Cruces, NM	Landfill located on east side of City
Latitude	32.19	Approximate for Landfill location
Evaporative Zone Depth	24"	From Guidance Document for Las Cruces
Maximum Leaf Area Index	0.8	From Guidance Document for Las Cruces
Precipitation	Climatedata for 1901-1905	5 wettest years according to Climatedata (see Attachment 1)
Temperature	Climatedata for 1901-1905	Temperature for 5 wettest years according to Climatedata (see Attachment 1)
Solar Radiation Data	Synthetic	Synthetic for El Paso (nearest location used by model)
LANDFILL COVER DATA		
Type of Vegetation	2	Poor Stand of Grass, from Guidance Document
SCS Runoff Curve Number	83.20	Generated by HELP
% of Area for Runoff	100%	Bare closed cap, from Guidance Document
SOIL AND DESIGN DATA		
Source of Soil Characteristics		Geotech info included as Attachment 2 and discussions with NMED
Number of Layers	2	Prescribed Cover
LAYERS		
Layer No. 1	6" vegetative cover	Type 1, slope 5% with drainage length of 350' (distance on flattest portion of landfill side), texture 7 which approximates the soil characteristics of a the sandy soil mixed with the mulch, initial moisture content initialized according to guidance document, default for all other information
Layer No. 2	18" infiltration layer	Type 1, slope 5% with drainage length of 350' (distance on flattest portion of landfill side), texture 15 which approximates the regulated material but conductivity was modified slightly to 1.0e-05, initial moisture content initialized according to guidance document, default for all other information

HELP Model data/output files: **alt1side.D10 and alt1side.OUT**
Description: **Alternative Cover for Minimum Slope of Side Slopes with 21-inches of $6.4x10^{-5}$ cm/sec soil with 6-inches vegetative cover (soil and mulch)**

Input Parameter	Value	Justification
WEATHER DATA		
City / State	Las Cruces, NM	Landfill located on east side of City
Latitude	32.19	Approximate for Landfill location
Evaporative Zone Depth	27	From Guidance Document for Las Cruces
Maximum Leaf Area Index	0.8	From Guidance Document for Las Cruces
Precipitation	Climatedata for 1901-1905	5 wettest years according to Climatedata (see Attachment 1)
Temperature	Climatedata for 1901-1905	Temperature for 5 wettest years according to Climatedata (see Attachment 1)
Solar Radiation Data	Synthetic	Synthetic for El Paso (nearest location used by model)
LANDFILL COVER DATA		
Type of Vegetation	2	Poor Stand of Grass, from Guidance Document
SCS Runoff Curve Number	83.20	Generated by HELP
% of Area for Runoff	100%	Bare closed cap, from Guidance Document
SOIL AND DESIGN DATA		
Source of Soil Characteristics		Geotech info included as Attachment 2
Number of Layers	2	Alternative Cover for minimum side slope
LAYERS		
Layer No. 1	6" vegetative cover	Type 1, slope 5% with drainage length of 350' (distance on flattest portion of landfill side), texture 7 which approximates the soil characteristics of a the sandy soil mixed with the mulch, initial moisture content initialized according to guidance document, default for all other information
Layer No. 2	21" infiltration layer	Type 1, slope 5% with drainage length of 350' (distance on flattest portion of landfill side), texture 11 which approximates the classification of the on-site material with the hydraulic conductivity modified of 6.4e-05 for worst case material (maximum conductivity) from borrow pit (see attachment 2), initial moisture content initialized according to guidance document, default for all other information

HELP Model data/output files: **sidemax.D10 and sidemax.OUT**
Description: **Prescribed Cover for Maximum Slope of Side Slopes with 18-inches of $1x10^{-5}$ cm/sec soil with 6-inches vegetative cover (soil and mulch)**

Input Parameter	Value	Justification
WEATHER DATA		
City / State	Las Cruces, NM	Landfill located on east side of City
Latitude	32.19	Approximate for Landfill location
Evaporative Zone Depth	24"	From Guidance Document for Las Cruces
Maximum Leaf Area Index	0.8	From Guidance Document for Las Cruces
Precipitation	Climatedata for 1901-1905	5 wettest years according to Climatedata (see Attachment 1)
Temperature	Climatedata for 1901-1905	Temperature for 5 wettest years according to Climatedata (see Attachment 1)
Solar Radiation Data	Synthetic	Synthetic for El Paso (nearest location used by model)
LANDFILL COVER DATA		
Type of Vegetation	2	Poor Stand of Grass, from Guidance Document
SCS Runoff Curve Number	83.90	Generated by HELP
% of Area for Runoff	100%	Bare closed cap, from Guidance Document
SOIL AND DESIGN DATA		
Source of Soil Characteristics		Geotech info included as Attachment 2 and discussions with NMED
Number of Layers	2	Prescribed Cover
LAYERS		
Layer No. 1	6" vegetative cover	Type 1, slope 21.8% with drainage length of 350' (distance on steepest portion of landfill side), texture 7 which approximates the soil characteristics of a the sandy soil mixed with the mulch, initial moisture content initialized according to guidance document, default for all other information
Layer No. 2	18" infiltration layer	Type 1, slope 21.8% with drainage length of 350' (distance on flattest portion of landfill side), texture 15 which approximates the regulated material but conductivity was modified slightly to 1.0e-05, initial moisture content initialized according to guidance document, default for all other information

HELP Model data/output files: **alt2side.D10 and alt2side.OUT**
Description: **Alternative Cover for Maximum Slope of Side Slopes with 18-inches of $5.1x10^{-5}$ cm/sec soil with 6-inches vegetative cover (soil and mulch)**

Input Parameter	Value	Justification
WEATHER DATA		
City / State	Las Cruces, NM	Landfill located on east side of City
Latitude	32.19	Approximate for Landfill location
Evaporative Zone Depth	27"	From Guidance Document for Las Cruces
Maximum Leaf Area Index	0.8	From Guidance Document for Las Cruces
Precipitation	Climatedata for 1901-1905	5 wettest years according to Climatedata (see Attachment 1)
Temperature	Climatedata for 1901-1905	Temperature for 5 wettest years according to Climatedata (see Attachment 1)
Solar Radiation Data	Synthetic	Synthetic for El Paso (nearest location used by model)
LANDFILL COVER DATA		
Type of Vegetation	2	Poor Stand of Grass, from Guidance Document
SCS Runoff Curve Number	83.90	Generated by HELP
% of Area for Runoff	100%	Bare closed cap, from Guidance Document
SOIL AND DESIGN DATA		
Source of Soil Characteristics		Geotech info included as Attachment 2
Number of Layers	2	Alternative Cover for maximum side slope
LAYERS		
Layer No. 1	6" vegetative cover	Type 1, slope 21.8% with drainage length of 350' (distance on steepest portion of landfill side), texture 7 which approximates the soil characteristics of a the sandy soil mixed with the mulch, initial moisture content initialized according to guidance document, default for all other information
Layer No. 2	20" infiltration layer	Type 1, slope 21.8% with drainage length of 350' (distance on flattest portion of landfill side), texture 13 which approximates the classification of the on-site material with the hydraulic conductivity of 6.4e-05 for worst case material (maximum conductivity) from borrow pit (see attachment 2), initial moisture content initialized according to guidance document, default for all other information

Attachment 1
5 Wettest Year Selection/Justification

Day	Total
1892	5.09
1893	10.8
1894	4.51
1895	9.49
1896	8.11
1897	9.21
1898	11.37
1899	9.91
1900	8.71

Five Wettest Years-POR		Sum of Five Years	Average Max Daily Temp	Average Min Daily Temp
1901	11.96	60.37	78.6	43.7
1902	10.9		78.3	42.4
1903	10.29		76.6	41.6
1904	10.13		77.6	43.2
1905	17.09		75.3	45.2

1906	9.02
1907	6.75
1908	6.08
1909	5.05
1910	4.08
1911	5.83
1912	9.36
1913	11.86
1914	11.98
1915	7.63
1916	8.16
1917	5.82
1918	7.6
1919	8.29
1920	8.3
1921	7.67
1922	5.7
1923	10.42
1924	4.86
1925	7.8
1926	14.53
1927	9.52
1928	9.38
1929	9.22
1930	7
1931	13.83
1932	9.03
1933	4.78
1934	4.79
1935	5.88
1936	9.54
1937	7.09
1938	9.34
1939	5.86

1940	9.3
1941	19.6
1942	9.8
1943	7.55
1944	9.28
1945	5.87
1946	7.09
1947	6.27
1948	5.24
1949	9.24
1950	5.51
1951	5.15
1952	6.6
1953	3.95
1954	4.84
1955	7.42
1956	5.12
1957	9.75
1958	14.46
1959	6.24
1960	8.09
1961	10.26
1962	6.71
1963	6.42
1964	3.85
1965	8.53
1966	9.98
1967	8.72
1968	13.42
1969	12.15
1970	3.53
1971	5.93
1972	12.3
1973	9.26
1974	14.04
1975	8.23
1976	7.86
1977	8.89
1978	14.94
1979	9.49
1980	8.25
1981	9.81
1982	7.98
1983	7.41

Most Recent Five Wettest Years		Sum of Five Years	Average Max Daily Temp	Average Min Daily Temp
1984	13.86	60.56	76.1	46.5
1985	12.72		76.3	45.6
1986	13.19		76.7	47.8

1987	9.39		76.0	46.0
1988	11.4		76.5	46.9
1989	8.95			
1990	9.53			
1991	14.66			
1992	11.03			
1993	9.62			
1994	8.16			
1995	7.59			
1996	6.21			
1997	10.42			
1998	7.14			
1999	9.18			
2000	9.94			
2001	5.27			
2002	7.62			

Attachment 2
Geotechnical Information

Cap Evaluation Foothills Landfill Las Cruces, NM
PEI File No. 04-026

Location	PEI Lab #	Sample Depth in	Mulch in	Soil Cap Thickness in	Lab %M	Insitu Dry Dens PCF	2"	1 ½"	1"	3/4"	½"	3/8"	#4	#10	#20	#40	#60	#140	#200	Hydraulic Conductivity cm/second
1	45417	0-12	0	31	5.5	101.2				100	97	95	87	82	79	76	68	29	22.1	
2	45420	12-24	0	27	4.4	104.3		100	88	88	85	82	77	73	69	65	58	31	21.4	2.1 X 10^{-5}
3	45421	0-12	10	34	6.5	107.8				100	98	96	92	88	84	79	71	36	27.2	
4	45424	12-24	13	33	6.5	104				100	98	94	86	80	74	68	61	34	25.2	
5	45425	0-12	4	22	5	104.8		100	86	82	82	81	79	76	73	70	63	34	24.2	
6	45428	12-24	14	26	5.3	111.9					100	95	83	74	69	65	57	26	18.1	
7	45429	0-12	13	27	8.6	118.5				100	96	89	78	67	60	54	47	25	19.2	
8	45432	12-26	0	32	3.3	99.8			100	95	90	86	81	74	66	50	33	12	8.9	(1) 1.3 X 10^{-3}
9	45433	0-12	2.5	19	4.1	106.4				100	96	94	87	81	75	67	55	27	21.5	1.8 X 10^{-5}
10	45436	12-30	9	51	10.4	108.2				100	96	89	83	76	71	66	59	31	23.6	
11	45437	0-8	4	8	2.6	102.5				100	93	90	79	70	63	54	43	23	17.6	
12	45440	0-12	12	16	5.6	96.9			100	89	89	88	82	78	74	70	64	38	31.1	9.8 X 10^{-6}
13	45443	12-20	6	20	8.1	106.1					100	97	95	93	91	88	81	50	41.5	
14	45444	0-12	1	25	5.6	117.1			100	96	94	89	81	72	63	55	46	25	19.8	6.8 X 10^{-6}
15	45446	0-12	21	31	12.7	110.5						100	97	95	92	90	80	44	35.5	
16	45449	12-23	24	23	10.1	115.8		100	92	92	87	82	72	63	57	53	47	25	19.9	2.8 X 10^{-7}
17	45450	0-12	16	32	9.8	109.6						100	96	92	89	85	77	42	33.3	7.2 X 10^{-7}
18	45453	12-24	30	36	10.5	112.4					100	96	92	86	82	78	69	36	27.7	
19	45454	0-12	34	20	8.2	116.9					100	95	88	80	75	71	62	31	23.8	
20	45457	12-24	0	24	2.1	107.6			100	95	92	89	81	71	59	43	30	14	10.6	
21	45458	0-12	0	24	4.3	116.9			100	95	88	87	80	72	64	51	37	18	14.6	(2) 4.8 X 10^{-5}
22	45460	0-12	0	12	6.5	99.5				100	98	95	89	83	79	75	69	44	37.2	
23	45461	0-7	0	7	3.3	120.1	100	93	93	85	78	71	59	51	45	41	34	15	10.6	1.9 X 10^{-5}
24	45462	0-5	0	5	2.6	120.3	100	95	84	83	80	75	65	56	50	45	38	19	14.3	2.4 X 10^{-5}
25	45463	0-7	0	7	3.9	112.8		100	92	88	83	79	71	63	57	53	47	28	21.9	

Note: hydaulic conductivities performed at dry density and moisture content shown (insitu values)

(1) Worst-Case - Ignored as will be reconstructed (bottom of slope, likely from erosion deposition)

(2) Worst-case existing cap

Borrow Pit Evaluation Foothills Landfill Las Cruces, NM
PEI File No. 04-026

Location	PEI Lab #	Sample Depth ft	Optimum %M	Proctor PCF	2"	1 ½"	1"	3/4"	½"	3/8"	#4	#10	#20	#40	#60	#140	#200	Insitu %M	Hydraulic Conductivity cm/sec
B9	45492	0-10					100	98	93	90	85	82	79	77	72	51	41	5.4	
B9	45493	10-20							100	96	93	89	85	81	73	44	36	4.8	
B9	45494	20-30	10.7	123.5				100	94	91	86	82	78	73	63	34	28	3.3	1.2×10^{-6}
B10	45495	0-10				100	98	95	91	85	73	64	56	49	43	27	21	8.9	
B10	45496	10-20					100	96	93	91	83	78	73	69	59	33	27	5.8	
B10	45497	20-30	10.9	122.2			100	96	88	83	72	68	67	64	54	24	19	4.6	3.2×10^{-6}
B6	45498	0-10			100	97	96	91	84	76	65	58	54	50	46	27	21	3.0	
B6	45499	10-20					100	98	92	88	80	75	72	69	62	35	26	3.6	
B6	45500	20-30	12.3	119.2			100	99	97	93	85	79	75	71	61	27	20	3.1	5.8×10^{-6}
B3	45501	0-10				100	97	95	90	85	71	61	55	51	45	27	21	3.9	
B3	45502	10-20	11.5	122.2				100	98	96	93	90	87	83	71	39	33	4.6	3.3×10^{-6}
B3	45503	20-30							100	98	95	93	90	87	79	49	42	5.8	
B5	45504	0-10								100	98	96	94	89	80	41	32	6.0	
B5	45505	10-20					100	97	91	85	75	69	65	62	55	27	20	4.5	
B5	45506	20-30	11.3	120.2			100	97	94	89	75	65	58	55	48	24	17	4.2	2.7×10^{-6}
B7	45507	0-10	10.6	124.9		100	99	90	80	66	42	27	20	17	14	8	7	2.2	2.1×10^{-5}
B7	45508	10-20				100	97	94	87	77	57	41	33	28	23	12	9	3.0	
B7	45509	20-30						100	99	97	93	90	88	81	64	28	22	3.8	
B4	45510	0-10	11.2	121.6		100	98	97	89	84	73	66	61	58	52	32	25	2.9	9.5×10^{-6}
B4	45511	10-20							100	99	97	95	94	88	74	32	23	3.0	
B4	45512	20-30					100	95	93	89	84	79	76	72	63	34	24	3.4	
B2	45513	0-10					100	99	93	87	77	71	66	61	53	31	24	2.9	
B2	45514	10-20							100	99	95	92	89	84	72	35	28	4.0	
B2	45515	20-30	10.3	120.3			100	98	95	92	85	81	78	74	66	36	28	4.8	4.9×10^{-7}
B1	45516	0-10	9.7	119.9						100	98	96	95	93	85	51	43	4.4	5.1×10^{-5}
B1	45517	10-20										100	99	93	70	35	31	3.2	
B1	45518	20-30								100	99	99	98	92	76	20	8.9	4.2	
B8	45519	0-10				100	98	93	88	82	70	60	51	45	40	25	20	4.2	
B8	45520	10-20				100	94	88	79	70	55	46	41	38	35	26	22	6.5	
B8	45521	20-30	9.9	124.6			100	99	96	93	83	72	65	60	53	37	32	4.3	5.6×10^{-6}

Hydraulic Conductivities Performed at 95% of Standard Proctor (ASTM D-698)

Appendix B

HELP Modeling Output

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              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:      a:\DATA4.D4
TEMPERATURE DATA FILE:        a:\DATA7.D7
SOLAR RADIATION DATA FILE:    a:\DATA13.D13
EVAPOTRANSPIRATION DATA:      a:\DATA11.D11
SOIL AND DESIGN DATA FILE:    a:\PRESTOP.D10
OUTPUT DATA FILE:             a:\PRESTOP.OUT


TIME:  21:26     DATE:  10/ 5/2005


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

     TITLE:  Las Cruces Landfill Closure - Prescribed Cover for Top

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


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


                                   LAYER  1
                                   --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   7
           THICKNESS                     =        6.00   INCHES
           POROSITY                      =        0.4730 VOL/VOL
           FIELD CAPACITY                =        0.2220 VOL/VOL
           WILTING POINT                 =        0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT    =        0.1260 VOL/VOL
           EFFECTIVE SAT. HYD. COND.     =    0.520000001000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3310	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 1100. FEET.

SCS RUNOFF CURVE NUMBER	=	81.70	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	6.714	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	11.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	5.394	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	6.714	INCHES
TOTAL INITIAL WATER	=	6.714	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM EL PASO TEXAS

STATION LATITUDE	=	32.19	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.80	
START OF GROWING SEASON (JULIAN DATE)	=	66	
END OF GROWING SEASON (JULIAN DATE)	=	315	
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	9.20	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	40.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	27.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	46.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	48.00	%

NOTE: PRECIPITATION DATA FOR Las Cruces New Mexico

WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Las Cruces New Mexico
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.19 DEGREES

****

ANNUAL TOTALS FOR YEAR 1901

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.96	43414.801	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.277	48197.137	111.02
PERC./LEAKAGE THROUGH LAYER 2	0.002554	9.271	0.02
CHANGE IN WATER STORAGE	-1.320	-4791.601	-11.04
SOIL WATER AT START OF YEAR	6.714	24371.818	
SOIL WATER AT END OF YEAR	5.394	19580.219	
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	-0.009	0.00

****

****

ANNUAL TOTALS FOR YEAR 1902

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.90	39567.008	100.00
RUNOFF	0.203	736.883	1.86
EVAPOTRANSPIRATION	9.963	36164.641	91.40
PERC./LEAKAGE THROUGH LAYER 2	0.000085	0.308	0.00

CHANGE IN WATER STORAGE	0.734	2665.167	6.74
SOIL WATER AT START OF YEAR	5.394	19580.219	
SOIL WATER AT END OF YEAR	6.128	22245.385	
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	0.009	0.00

****

****

ANNUAL TOTALS FOR YEAR 1903

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.29	37352.711	100.00
RUNOFF	0.222	804.234	2.15
EVAPOTRANSPIRATION	10.802	39211.734	104.98
PERC./LEAKAGE THROUGH LAYER 2	0.000520	1.887	0.01
CHANGE IN WATER STORAGE	-0.734	-2665.167	-7.14
SOIL WATER AT START OF YEAR	6.128	22245.385	
SOIL WATER AT END OF YEAR	5.394	19580.219	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.022	0.00

****

****

ANNUAL TOTALS FOR YEAR 1904

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.13	36771.902	100.00
RUNOFF	0.040	143.787	0.39
EVAPOTRANSPIRATION	8.102	29408.689	79.98

PERC./LEAKAGE THROUGH LAYER 2	0.001388	5.037	0.01
CHANGE IN WATER STORAGE	1.987	7214.383	19.62
SOIL WATER AT START OF YEAR	5.394	19580.219	
SOIL WATER AT END OF YEAR	7.381	26794.602	
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	0.007	0.00

****

****

ANNUAL TOTALS FOR YEAR 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.09	62036.699	100.00
RUNOFF	0.005	19.403	0.03
EVAPOTRANSPIRATION	18.146	65868.609	106.18
PERC./LEAKAGE THROUGH LAYER 2	0.000783	2.842	0.00
CHANGE IN WATER STORAGE	-1.062	-3854.118	-6.21
SOIL WATER AT START OF YEAR	7.381	26794.602	
SOIL WATER AT END OF YEAR	6.320	22940.484	
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	-0.036	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1901 THROUGH 1905

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

PRECIPITATION

TOTALS	0.31	0.66	0.61	0.45	0.04	1.22
	1.71	2.27	2.40	1.04	0.85	0.52
STD. DEVIATIONS	0.41	0.57	0.83	0.81	0.04	1.41
	0.54	1.96	1.20	1.20	0.80	0.46

RUNOFF

TOTALS	0.000	0.000	0.000	0.000	0.000	0.044
	0.000	0.041	0.009	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.099
	0.000	0.091	0.017	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.626	0.586	0.704	0.907	0.063	1.131
	1.635	2.281	1.832	1.034	0.786	0.473
STD. DEVIATIONS	0.588	0.612	0.867	1.379	0.064	1.335
	0.553	1.758	0.743	0.775	0.718	0.344

PERCOLATION/LEAKAGE THROUGH LAYER 2

TOTALS	0.0000	0.0005	0.0001	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0000	0.0001	0.0000	0.0003
STD. DEVIATIONS	0.0001	0.0007	0.0002	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0000	0.0002	0.0000	0.0006

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1901 THROUGH 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.07 (2.895)	43828.6	100.00
RUNOFF	0.094 (0.1093)	340.86	0.778
EVAPOTRANSPIRATION	12.058 (3.8784)	43770.16	99.867
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00107 (0.00096)	3.869	0.00883
CHANGE IN WATER STORAGE	-0.079 (1.4024)	-286.27	-0.653

****

****

PEAK DAILY VALUES FOR YEARS 1901 THROUGH 1905

	(INCHES)	(CU. FT.)
PRECIPITATION	2.43	8820.900
RUNOFF	0.222	804.2311
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.001730	6.27966
SNOW WATER	0.51	1852.4432

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3453
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2247

****

****

FINAL WATER STORAGE AT END OF YEAR 1905

LAYER	(INCHES)	(VOL/VOL)
1	1.3719	0.2286
2	4.9478	0.2749
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              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:     a:\DATA4.D4
TEMPERATURE DATA FILE:       a:\DATA7.D7
SOLAR RADIATION DATA FILE:   a:\DATA13.D13
EVAPOTRANSPIRATION DATA:     a:\DATA11.D11
SOIL AND DESIGN DATA FILE:   a:\ALT2TOP.D10
OUTPUT DATA FILE:            a:\ALT2TOP.OUT


TIME:  21:21     DATE:  10/ 5/2005


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

     TITLE:  Las Cruces Landfill Closure - Alternate Cover 1 for Top

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


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


                                    LAYER  1
                                    --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   7
          THICKNESS                    =      6.00   INCHES
          POROSITY                     =      0.4730 VOL/VOL
          FIELD CAPACITY               =      0.2220 VOL/VOL
          WILTING POINT                =      0.1040 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.1260 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.520000001000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	21.50	INCHES
POROSITY	=	0.4640	VOL/VOL
FIELD CAPACITY	=	0.3100	VOL/VOL
WILTING POINT	=	0.1870	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2340	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 1100. FEET.

SCS RUNOFF CURVE NUMBER	=	81.70	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	27.5	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.787	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.814	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.645	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	5.787	INCHES
TOTAL INITIAL WATER	=	5.787	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM EL PASO TEXAS

STATION LATITUDE	=	32.19	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.80	
START OF GROWING SEASON (JULIAN DATE)	=	66	
END OF GROWING SEASON (JULIAN DATE)	=	315	
EVAPORATIVE ZONE DEPTH	=	27.5	INCHES
AVERAGE ANNUAL WIND SPEED	=	9.20	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	40.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	27.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	46.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	48.00	%

NOTE: PRECIPITATION DATA FOR Las Cruces New Mexico

WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Las Cruces New Mexico
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.19 DEGREES

****

ANNUAL TOTALS FOR YEAR 1901

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.96	43414.801	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.101	47554.992	109.54
PERC./LEAKAGE THROUGH LAYER 2	0.000385	1.399	0.00
CHANGE IN WATER STORAGE	-1.141	-4141.589	-9.54
SOIL WATER AT START OF YEAR	5.787	21006.811	
SOIL WATER AT END OF YEAR	4.646	16865.223	
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	-0.002	0.00

****

****

ANNUAL TOTALS FOR YEAR 1902

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.90	39567.008	100.00
RUNOFF	0.205	744.456	1.88
EVAPOTRANSPIRATION	10.038	36437.855	92.09
PERC./LEAKAGE THROUGH LAYER 2	0.000234	0.850	0.00

CHANGE IN WATER STORAGE	0.657	2383.832	6.02
SOIL WATER AT START OF YEAR	4.646	16865.223	
SOIL WATER AT END OF YEAR	5.303	19249.055	
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	0.013	0.00

****

****

ANNUAL TOTALS FOR YEAR 1903

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.29	37352.711	100.00
RUNOFF	0.222	804.255	2.15
EVAPOTRANSPIRATION	10.727	38937.797	104.24
PERC./LEAKAGE THROUGH LAYER 2	0.000046	0.168	0.00
CHANGE IN WATER STORAGE	-0.658	-2389.518	-6.40
SOIL WATER AT START OF YEAR	5.303	19249.055	
SOIL WATER AT END OF YEAR	4.645	16859.535	
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	0.010	0.00

****

****

ANNUAL TOTALS FOR YEAR 1904

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.13	36771.902	100.00
RUNOFF	0.038	139.347	0.38
EVAPOTRANSPIRATION	7.943	28831.586	78.41

PERC./LEAKAGE THROUGH LAYER 2	0.000010	0.037	0.00
CHANGE IN WATER STORAGE	2.149	7800.928	21.21
SOIL WATER AT START OF YEAR	4.645	16859.535	
SOIL WATER AT END OF YEAR	6.794	24660.463	
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	0.007	0.00

****

****

ANNUAL TOTALS FOR YEAR 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.09	62036.699	100.00
RUNOFF	0.004	15.081	0.02
EVAPOTRANSPIRATION	17.689	64212.598	103.51
PERC./LEAKAGE THROUGH LAYER 2	0.000051	0.184	0.00
CHANGE IN WATER STORAGE	-0.604	-2191.198	-3.53
SOIL WATER AT START OF YEAR	6.794	24660.463	
SOIL WATER AT END OF YEAR	6.190	22469.266	
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	0.036	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1901 THROUGH 1905

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

PRECIPITATION

TOTALS	0.31	0.66	0.61	0.45	0.04	1.22
	1.71	2.27	2.40	1.04	0.85	0.52
STD. DEVIATIONS	0.41	0.57	0.83	0.81	0.04	1.41
	0.54	1.96	1.20	1.20	0.80	0.46

RUNOFF

TOTALS	0.000	0.000	0.000	0.000	0.000	0.044
	0.000	0.041	0.008	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.099
	0.000	0.092	0.017	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.482	0.661	0.696	0.899	0.130	1.137
	1.636	2.281	1.828	1.046	0.743	0.360
STD. DEVIATIONS	0.452	0.575	0.964	1.556	0.204	1.331
	0.552	1.773	0.752	0.776	0.712	0.292

PERCOLATION/LEAKAGE THROUGH LAYER 2

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

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1901 THROUGH 1905

	INCHES		CU. FEET	PERCENT
PRECIPITATION	12.07	(2.895)	43828.6	100.00
RUNOFF	0.094	(0.1102)	340.63	0.777
EVAPOTRANSPIRATION	11.899	(3.7237)	43194.96	98.554
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00015	(0.00016)	0.528	0.00120
CHANGE IN WATER STORAGE	0.081	(1.3338)	292.49	0.667

****

****

PEAK DAILY VALUES FOR YEARS 1901 THROUGH 1905

	(INCHES)	(CU. FT.)
PRECIPITATION	2.43	8820.900
RUNOFF	0.222	804.2311
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.000177	0.64414
SNOW WATER	0.51	1852.4432
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2865	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1689	

****

****

FINAL WATER STORAGE AT END OF YEAR 1905

LAYER	(INCHES)	(VOL/VOL)
1	1.4012	0.2335
2	4.7886	0.2227
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              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:     a:\DATA4.D4
TEMPERATURE DATA FILE:       a:\DATA7.D7
SOLAR RADIATION DATA FILE:   a:\DATA13.D13
EVAPOTRANSPIRATION DATA:     a:\DATA11.D11
SOIL AND DESIGN DATA FILE:   a:\SIDEMIN.D10
OUTPUT DATA FILE:            a:\SIDEMIN.OUT


TIME:  23:56     DATE:  10/ 6/2005


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

     TITLE:  Las Cruces Landfill Closure - Prescribed Cover for Side Min

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


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


                                   LAYER  1
                                   --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   7
          THICKNESS                   =      6.00   INCHES
          POROSITY                    =      0.4730 VOL/VOL
          FIELD CAPACITY              =      0.2220 VOL/VOL
          WILTING POINT               =      0.1040 VOL/VOL
          INITIAL SOIL WATER CONTENT  =      0.1260 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.520000001000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3310	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 350. FEET.

SCS RUNOFF CURVE NUMBER	=	83.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	6.714	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	11.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	5.394	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	6.714	INCHES
TOTAL INITIAL WATER	=	6.714	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM EL PASO TEXAS

STATION LATITUDE	=	32.19	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.80	
START OF GROWING SEASON (JULIAN DATE)	=	66	
END OF GROWING SEASON (JULIAN DATE)	=	315	
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	9.20	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	40.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	27.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	46.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	48.00	%

NOTE: PRECIPITATION DATA FOR Las Cruces New Mexico

WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Las Cruces New Mexico
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.19 DEGREES

****

ANNUAL TOTALS FOR YEAR 1901

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.96	43414.801	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.277	48197.137	111.02
PERC./LEAKAGE THROUGH LAYER 2	0.002554	9.271	0.02
CHANGE IN WATER STORAGE	-1.320	-4791.601	-11.04
SOIL WATER AT START OF YEAR	6.714	24371.818	
SOIL WATER AT END OF YEAR	5.394	19580.219	
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	-0.009	0.00

****

****

ANNUAL TOTALS FOR YEAR 1902

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.90	39567.008	100.00
RUNOFF	0.283	1026.700	2.59
EVAPOTRANSPIRATION	9.886	35887.203	90.70
PERC./LEAKAGE THROUGH LAYER 2	0.000080	0.292	0.00

CHANGE IN WATER STORAGE	0.731	2652.796	6.70
SOIL WATER AT START OF YEAR	5.394	19580.219	
SOIL WATER AT END OF YEAR	6.125	22233.014	
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	0.017	0.00

****

****

ANNUAL TOTALS FOR YEAR 1903

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.29	37352.711	100.00
RUNOFF	0.286	1038.679	2.78
EVAPOTRANSPIRATION	10.735	38966.645	104.32
PERC./LEAKAGE THROUGH LAYER 2	0.000050	0.182	0.00
CHANGE IN WATER STORAGE	-0.731	-2652.796	-7.10
SOIL WATER AT START OF YEAR	6.125	22233.014	
SOIL WATER AT END OF YEAR	5.394	19580.219	
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	0.002	0.00

****

****

ANNUAL TOTALS FOR YEAR 1904

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.13	36771.902	100.00
RUNOFF	0.070	254.683	0.69
EVAPOTRANSPIRATION	8.095	29385.951	79.91

PERC./LEAKAGE THROUGH LAYER 2	0.000701	2.546	0.01
CHANGE IN WATER STORAGE	1.964	7128.713	19.39
SOIL WATER AT START OF YEAR	5.394	19580.219	
SOIL WATER AT END OF YEAR	7.358	26708.932	
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	0.010	0.00

****

****

ANNUAL TOTALS FOR YEAR 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.09	62036.699	100.00
RUNOFF	0.024	88.893	0.14
EVAPOTRANSPIRATION	18.078	65624.227	105.78
PERC./LEAKAGE THROUGH LAYER 2	0.016687	60.576	0.10
CHANGE IN WATER STORAGE	-1.029	-3737.002	-6.02
SOIL WATER AT START OF YEAR	7.358	26708.932	
SOIL WATER AT END OF YEAR	6.328	22971.930	
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	0.010	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1901 THROUGH 1905

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

PRECIPITATION

TOTALS	0.31	0.66	0.61	0.45	0.04	1.22
	1.71	2.27	2.40	1.04	0.85	0.52
STD. DEVIATIONS	0.41	0.57	0.83	0.81	0.04	1.41
	0.54	1.96	1.20	1.20	0.80	0.46

RUNOFF

TOTALS	0.000	0.000	0.000	0.001	0.000	0.057
	0.000	0.057	0.018	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.002	0.000	0.128
	0.000	0.126	0.030	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.625	0.592	0.692	0.921	0.047	1.118
	1.635	2.265	1.830	1.034	0.785	0.471
STD. DEVIATIONS	0.586	0.624	0.842	1.409	0.043	1.307
	0.553	1.722	0.737	0.775	0.717	0.342

PERCOLATION/LEAKAGE THROUGH LAYER 2

TOTALS	0.0000	0.0004	0.0000	0.0032	0.0000	0.0000
	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
STD. DEVIATIONS	0.0001	0.0007	0.0000	0.0072	0.0000	0.0000
	0.0000	0.0001	0.0001	0.0002	0.0000	0.0002

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1901 THROUGH 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.07 (2.895)	43828.6	100.00
RUNOFF	0.133 (0.1408)	481.79	1.099
EVAPOTRANSPIRATION	12.014 (3.8695)	43612.23	99.506
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00401 (0.00716)	14.573	0.03325
CHANGE IN WATER STORAGE	-0.077 (1.3872)	-279.98	-0.639

****

****

PEAK DAILY VALUES FOR YEARS 1901 THROUGH 1905

	(INCHES)	(CU. FT.)
PRECIPITATION	2.43	8820.900
RUNOFF	0.285	1034.5486
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.015787	57.30805
SNOW WATER	0.51	1852.4432
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3439	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2247	

****

****

FINAL WATER STORAGE AT END OF YEAR 1905

LAYER	(INCHES)	(VOL/VOL)
1	1.3735	0.2289
2	4.9548	0.2753
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              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:     a:\DATA4.D4
TEMPERATURE DATA FILE:       a:\DATA7.D7
SOLAR RADIATION DATA FILE:   a:\DATA13.D13
EVAPOTRANSPIRATION DATA:     a:\DATA11.D11
SOIL AND DESIGN DATA FILE:   a:\ALT1SIDE.D10
OUTPUT DATA FILE:            a:\ALT1SIDE.OUT


TIME:   0: 2     DATE:  10/ 7/2005


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

     TITLE:  Las Cruces Landfill Closure - Alternate Cover 1 for Side Min

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


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


                                      LAYER  1
                                      --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                            MATERIAL TEXTURE NUMBER   7
           THICKNESS                       =       6.00   INCHES
           POROSITY                        =       0.4730 VOL/VOL
           FIELD CAPACITY                  =       0.2220 VOL/VOL
           WILTING POINT                   =       0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT      =       0.1260 VOL/VOL
           EFFECTIVE SAT. HYD. COND.       =   0.520000001000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	21.00	INCHES
POROSITY	=	0.4640	VOL/VOL
FIELD CAPACITY	=	0.3100	VOL/VOL
WILTING POINT	=	0.1870	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2340	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 350. FEET.

SCS RUNOFF CURVE NUMBER	=	83.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	27.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.670	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.582	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.551	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	5.670	INCHES
TOTAL INITIAL WATER	=	5.670	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
EL PASO TEXAS

STATION LATITUDE	=	32.19	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.80	
START OF GROWING SEASON (JULIAN DATE)	=	66	
END OF GROWING SEASON (JULIAN DATE)	=	315	
EVAPORATIVE ZONE DEPTH	=	27.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	9.20	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	40.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	27.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	46.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	48.00	%

NOTE: PRECIPITATION DATA FOR Las Cruces New Mexico

WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Las Cruces New Mexico
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.19 DEGREES

****

ANNUAL TOTALS FOR YEAR 1901

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.96	43414.801	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.077	47468.992	109.34
PERC./LEAKAGE THROUGH LAYER 2	0.000366	1.327	0.00
CHANGE IN WATER STORAGE	-1.117	-4055.505	-9.34
SOIL WATER AT START OF YEAR	5.670	20582.100	
SOIL WATER AT END OF YEAR	4.553	16526.596	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.015	0.00

****

****

ANNUAL TOTALS FOR YEAR 1902

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.90	39567.008	100.00
RUNOFF	0.286	1037.695	2.62
EVAPOTRANSPIRATION	9.961	36159.141	91.39
PERC./LEAKAGE THROUGH LAYER 2	0.000238	0.863	0.00

CHANGE IN WATER STORAGE	0.653	2369.304	5.99
SOIL WATER AT START OF YEAR	4.553	16526.596	
SOIL WATER AT END OF YEAR	5.205	18895.900	
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	0.005	0.00

****

****

ANNUAL TOTALS FOR YEAR 1903

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.29	37352.711	100.00
RUNOFF	0.287	1040.561	2.79
EVAPOTRANSPIRATION	10.658	38687.805	103.57
PERC./LEAKAGE THROUGH LAYER 2	0.000029	0.105	0.00
CHANGE IN WATER STORAGE	-0.654	-2375.768	-6.36
SOIL WATER AT START OF YEAR	5.205	18895.900	
SOIL WATER AT END OF YEAR	4.551	16520.133	
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	0.006	0.00

****

****

ANNUAL TOTALS FOR YEAR 1904

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.13	36771.902	100.00
RUNOFF	0.069	251.433	0.68
EVAPOTRANSPIRATION	7.942	28829.305	78.40

PERC./LEAKAGE THROUGH LAYER 2	0.000011	0.040	0.00
CHANGE IN WATER STORAGE	2.119	7691.127	20.92
SOIL WATER AT START OF YEAR	4.551	16520.133	
SOIL WATER AT END OF YEAR	6.670	24211.260	
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	-0.002	0.00

****

****

ANNUAL TOTALS FOR YEAR 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.09	62036.699	100.00
RUNOFF	0.022	78.392	0.13
EVAPOTRANSPIRATION	17.741	64400.340	103.81
PERC./LEAKAGE THROUGH LAYER 2	0.000307	1.113	0.00
CHANGE IN WATER STORAGE	-0.673	-2443.116	-3.94
SOIL WATER AT START OF YEAR	6.670	24211.260	
SOIL WATER AT END OF YEAR	5.997	21768.143	
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	-0.028	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1901 THROUGH 1905

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

PRECIPITATION						
TOTALS	0.31	0.66	0.61	0.45	0.04	1.22
	1.71	2.27	2.40	1.04	0.85	0.52
STD. DEVIATIONS	0.41	0.57	0.83	0.81	0.04	1.41
	0.54	1.96	1.20	1.20	0.80	0.46
RUNOFF						
TOTALS	0.000	0.000	0.000	0.001	0.000	0.057
	0.000	0.057	0.017	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.002	0.000	0.128
	0.000	0.128	0.030	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.483	0.674	0.718	0.886	0.095	1.123
	1.637	2.266	1.824	1.046	0.755	0.370
STD. DEVIATIONS	0.449	0.593	1.006	1.531	0.128	1.304
	0.551	1.734	0.746	0.776	0.717	0.296
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1901 THROUGH 1905

	INCHES		CU. FEET	PERCENT
PRECIPITATION	12.07	(2.895)	43828.6	100.00
RUNOFF	0.133	(0.1424)	481.62	1.099
EVAPOTRANSPIRATION	11.876	(3.7573)	43109.12	98.358
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00019	(0.00016)	0.690	0.00157
CHANGE IN WATER STORAGE	0.065	(1.3251)	237.21	0.541

****

PEAK DAILY VALUES FOR YEARS 1901 THROUGH 1905

	(INCHES)	(CU. FT.)
PRECIPITATION	2.43	8820.900
RUNOFF	0.285	1034.5486
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.000208	0.75576
SNOW WATER	0.51	1852.4432
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2828	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1686	

****

FINAL WATER STORAGE AT END OF YEAR 1905

LAYER	(INCHES)	(VOL/VOL)
1	1.3945	0.2324
2	4.6022	0.2192
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              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:      a:\DATA4.D4
TEMPERATURE DATA FILE:        a:\DATA7.D7
SOLAR RADIATION DATA FILE:    a:\DATA13.D13
EVAPOTRANSPIRATION DATA:      a:\DATA11.D11
SOIL AND DESIGN DATA FILE:    a:\SIDEMAX.D10
OUTPUT DATA FILE:             a:\SIDEMAX.OUT


TIME:   0:23     DATE:  10/ 7/2005


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

     TITLE:  Las Cruces Landfill Closure - Prescribed Cover fof Side Max.

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


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


                                   LAYER  1
                                   --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   7
           THICKNESS                     =       6.00   INCHES
           POROSITY                      =       0.4730 VOL/VOL
           FIELD CAPACITY                =       0.2220 VOL/VOL
           WILTING POINT                 =       0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT    =       0.1260 VOL/VOL
           EFFECTIVE SAT. HYD. COND.     =   0.520000001000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	18.00 INCHES
POROSITY	=	0.4750 VOL/VOL
FIELD CAPACITY	=	0.3780 VOL/VOL
WILTING POINT	=	0.2650 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3310 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 22.% AND A SLOPE LENGTH OF 350. FEET.

SCS RUNOFF CURVE NUMBER	=	83.90	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	6.714	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	11.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	5.394	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	6.714	INCHES
TOTAL INITIAL WATER	=	6.714	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
EL PASO TEXAS

STATION LATITUDE	=	32.19	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.80	
START OF GROWING SEASON (JULIAN DATE)	=	66	
END OF GROWING SEASON (JULIAN DATE)	=	315	
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	9.20	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	40.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	27.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	46.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	48.00	%

NOTE: PRECIPITATION DATA FOR Las Cruces New Mexico

WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Las Cruces New Mexico
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.19 DEGREES

****

ANNUAL TOTALS FOR YEAR 1901

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.96	43414.801	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.277	48197.137	111.02
PERC./LEAKAGE THROUGH LAYER 2	0.002554	9.271	0.02
CHANGE IN WATER STORAGE	-1.320	-4791.601	-11.04
SOIL WATER AT START OF YEAR	6.714	24371.818	
SOIL WATER AT END OF YEAR	5.394	19580.219	
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	-0.009	0.00

****

****

ANNUAL TOTALS FOR YEAR 1902

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.90	39567.008	100.00
RUNOFF	0.327	1186.103	3.00
EVAPOTRANSPIRATION	9.845	35735.535	90.32
PERC./LEAKAGE THROUGH LAYER 2	0.000087	0.316	0.00

CHANGE IN WATER STORAGE	0.729	2645.041	6.68
SOIL WATER AT START OF YEAR	5.394	19580.219	
SOIL WATER AT END OF YEAR	6.123	22225.260	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.012	0.00

****

****

ANNUAL TOTALS FOR YEAR 1903

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.29	37352.711	100.00
RUNOFF	0.321	1164.340	3.12
EVAPOTRANSPIRATION	10.685	38788.125	103.84
PERC./LEAKAGE THROUGH LAYER 2	0.012473	45.277	0.12
CHANGE IN WATER STORAGE	-0.729	-2645.041	-7.08
SOIL WATER AT START OF YEAR	6.123	22225.260	
SOIL WATER AT END OF YEAR	5.394	19580.219	
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	0.009	0.00

****

****

ANNUAL TOTALS FOR YEAR 1904

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.13	36771.902	100.00
RUNOFF	0.089	323.466	0.88
EVAPOTRANSPIRATION	8.089	29362.857	79.85

PERC./LEAKAGE THROUGH LAYER 2	0.000570	2.069	0.01
CHANGE IN WATER STORAGE	1.951	7083.509	19.26
SOIL WATER AT START OF YEAR	5.394	19580.219	
SOIL WATER AT END OF YEAR	7.345	26663.727	
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	0.003	0.00

****

****

ANNUAL TOTALS FOR YEAR 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.09	62036.699	100.00
RUNOFF	0.039	142.391	0.23
EVAPOTRANSPIRATION	18.070	65592.359	105.73
PERC./LEAKAGE THROUGH LAYER 2	0.000405	1.472	0.00
CHANGE IN WATER STORAGE	-1.019	-3699.521	-5.96
SOIL WATER AT START OF YEAR	7.345	26663.727	
SOIL WATER AT END OF YEAR	6.326	22964.207	
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	-0.002	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1901 THROUGH 1905

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

PRECIPITATION

TOTALS	0.31	0.66	0.61	0.45	0.04	1.22
	1.71	2.27	2.40	1.04	0.85	0.52
STD. DEVIATIONS	0.41	0.57	0.83	0.81	0.04	1.41
	0.54	1.96	1.20	1.20	0.80	0.46

RUNOFF

TOTALS	0.000	0.000	0.000	0.002	0.000	0.064
	0.000	0.065	0.024	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.003	0.000	0.143
	0.000	0.146	0.039	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.624	0.591	0.705	0.910	0.047	1.108
	1.635	2.257	1.827	1.034	0.784	0.471
STD. DEVIATIONS	0.585	0.623	0.869	1.385	0.042	1.287
	0.553	1.703	0.732	0.776	0.717	0.342

PERCOLATION/LEAKAGE THROUGH LAYER 2

TOTALS	0.0000	0.0004	0.0000	0.0000	0.0000	0.0025
	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
STD. DEVIATIONS	0.0000	0.0008	0.0001	0.0000	0.0000	0.0056
	0.0001	0.0001	0.0000	0.0002	0.0000	0.0001

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1901 THROUGH 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.07 (2.895)	43828.6	100.00
RUNOFF	0.155 (0.1571)	563.26	1.285
EVAPOTRANSPIRATION	11.993 (3.8775)	43535.20	99.331
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00322 (0.00526)	11.681	0.02665
CHANGE IN WATER STORAGE	-0.078 (1.3803)	-281.52	-0.642

****

****

PEAK DAILY VALUES FOR YEARS 1901 THROUGH 1905

	(INCHES)	(CU. FT.)
PRECIPITATION	2.43	8820.900
RUNOFF	0.318	1155.4630
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.012434	45.13406
SNOW WATER	0.51	1852.4432
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3431	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2247	

****

****

FINAL WATER STORAGE AT END OF YEAR 1905

LAYER	(INCHES)	(VOL/VOL)
1	1.3731	0.2288
2	4.9532	0.2752
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              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:      a:\DATA4.D4
TEMPERATURE DATA FILE:        a:\DATA7.D7
SOLAR RADIATION DATA FILE:    a:\DATA13.D13
EVAPOTRANSPIRATION DATA:      a:\DATA11.D11
SOIL AND DESIGN DATA FILE:    a:\ALT2SIDE.D10
OUTPUT DATA FILE:             a:\ALT2SIDE.OUT


TIME:   0:34     DATE:  10/ 7/2005


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

     TITLE:  Las Cruces Landfill Closure - Alternate Cover 1 for Side Max

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


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


                                       LAYER  1
                                       --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                            MATERIAL TEXTURE NUMBER   7
            THICKNESS                    =       6.00    INCHES
            POROSITY                     =       0.4730 VOL/VOL
            FIELD CAPACITY               =       0.2220 VOL/VOL
            WILTING POINT                =       0.1040 VOL/VOL
            INITIAL SOIL WATER CONTENT   =       0.1260 VOL/VOL
            EFFECTIVE SAT. HYD. COND.    =   0.520000001000E-03 CM/SEC
          NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 11

THICKNESS	=	21.00 INCHES
POROSITY	=	0.4640 VOL/VOL
FIELD CAPACITY	=	0.3100 VOL/VOL
WILTING POINT	=	0.1870 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2340 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.639999998000E-04 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 22.% AND A SLOPE LENGTH OF 350. FEET.

SCS RUNOFF CURVE NUMBER	=	83.90	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	27.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.670	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.582	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.551	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	5.670	INCHES
TOTAL INITIAL WATER	=	5.670	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM EL PASO TEXAS

STATION LATITUDE	=	32.19	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.80	
START OF GROWING SEASON (JULIAN DATE)	=	66	
END OF GROWING SEASON (JULIAN DATE)	=	315	
EVAPORATIVE ZONE DEPTH	=	27.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	9.20	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	40.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	27.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	46.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	48.00	%

NOTE: PRECIPITATION DATA FOR Las Cruces New Mexico

WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA FOR Las Cruces New Mexico
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.19 DEGREES

****

ANNUAL TOTALS FOR YEAR 1901

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.96	43414.801	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	13.077	47468.992	109.34
PERC./LEAKAGE THROUGH LAYER 2	0.000366	1.327	0.00
CHANGE IN WATER STORAGE	-1.117	-4055.505	-9.34
SOIL WATER AT START OF YEAR	5.670	20582.100	
SOIL WATER AT END OF YEAR	4.553	16526.596	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.015	0.00

****

****

ANNUAL TOTALS FOR YEAR 1902

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.90	39567.008	100.00
RUNOFF	0.330	1197.279	3.03
EVAPOTRANSPIRATION	9.918	36003.875	90.99
PERC./LEAKAGE THROUGH LAYER 2	0.000238	0.863	0.00

CHANGE IN WATER STORAGE	0.652	2364.970	5.98
SOIL WATER AT START OF YEAR	4.553	16526.596	
SOIL WATER AT END OF YEAR	5.204	18891.566	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.022	0.00

****

****

ANNUAL TOTALS FOR YEAR 1903

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.29	37352.711	100.00
RUNOFF	0.322	1167.252	3.12
EVAPOTRANSPIRATION	10.622	38556.785	103.22
PERC./LEAKAGE THROUGH LAYER 2	0.000029	0.106	0.00
CHANGE IN WATER STORAGE	-0.653	-2371.433	-6.35
SOIL WATER AT START OF YEAR	5.204	18891.566	
SOIL WATER AT END OF YEAR	4.551	16520.133	
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	0.000	0.00

****

****

ANNUAL TOTALS FOR YEAR 1904

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.13	36771.902	100.00
RUNOFF	0.088	319.034	0.87
EVAPOTRANSPIRATION	7.945	28841.441	78.43

PERC./LEAKAGE THROUGH LAYER 2	0.000001	0.002	0.00
CHANGE IN WATER STORAGE	2.097	7611.415	20.70
SOIL WATER AT START OF YEAR	4.551	16520.133	
SOIL WATER AT END OF YEAR	6.648	24131.547	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.012	0.00

****

****

ANNUAL TOTALS FOR YEAR 1905

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.09	62036.699	100.00
RUNOFF	0.036	129.383	0.21
EVAPOTRANSPIRATION	17.650	64070.980	103.28
PERC./LEAKAGE THROUGH LAYER 2	0.000237	0.860	0.00
CHANGE IN WATER STORAGE	-0.596	-2164.531	-3.49
SOIL WATER AT START OF YEAR	6.648	24131.547	
SOIL WATER AT END OF YEAR	6.052	21967.016	
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	0.009	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1901 THROUGH 1905

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

PRECIPITATION

TOTALS	0.31	0.66	0.61	0.45	0.04	1.22
	1.71	2.27	2.40	1.04	0.85	0.52
STD. DEVIATIONS	0.41	0.57	0.83	0.81	0.04	1.41
	0.54	1.96	1.20	1.20	0.80	0.46

RUNOFF

TOTALS	0.000	0.000	0.000	0.002	0.000	0.064
	0.000	0.066	0.023	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.004	0.000	0.144
	0.000	0.148	0.038	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.481	0.668	0.710	0.880	0.112	1.116
	1.637	2.256	1.822	1.046	0.747	0.367
STD. DEVIATIONS	0.448	0.584	0.988	1.518	0.166	1.289
	0.551	1.715	0.741	0.776	0.713	0.294

PERCOLATION/LEAKAGE THROUGH LAYER 2

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

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1901 THROUGH 1905

	INCHES		CU. FEET	PERCENT
PRECIPITATION	12.07	(2.895)	43828.6	100.00
RUNOFF	0.155	(0.1590)	562.59	1.284
EVAPOTRANSPIRATION	11.843	(3.7295)	42988.41	98.083
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00017	(0.00015)	0.631	0.00144
CHANGE IN WATER STORAGE	0.076	(1.3060)	276.98	0.632

****

****

PEAK DAILY VALUES FOR YEARS 1901 THROUGH 1905

	(INCHES)	(CU. FT.)
PRECIPITATION	2.43	8820.900
RUNOFF	0.318	1155.4630
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.000185	0.67154
SNOW WATER	0.51	1852.4432
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2838	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1686	

****

****

FINAL WATER STORAGE AT END OF YEAR 1905

LAYER	(INCHES)	(VOL/VOL)
1	1.3992	0.2332
2	4.6523	0.2215
SNOW WATER	0.000	

****
****

APPENDIX D
DRAINAGE REPORT

Section 1
Introduction

This report presents the methodology, conclusions and recommendations based on the drainage analysis performed on the Foothills Landfill for the City of Las Cruces. The subject landfill has been known as the Foothills Landfill and the Las Cruces Sanitary Landfill and will be referred to in this study as the Foothills Landfill.

The CDM Drainage Report for the Las Cruces Municipal Landfill completed in August, 1994 will be used as background reference for the current analysis and report. Since the report was completed, very little change has occurred upstream of the landfill and therefore, some of the information contained in the report will still be valid to use in the current report.

1.1 Location and Description

The Foothills Landfill is located just beyond the eastern boundary of the Las Cruces City Limits, directly east of the Interstate 25 - Lohman Avenue intersection. It occupies Section 11, Township 23 South and Range 2 East of the New Mexico Principal Meridan in Doña Ana County, New Mexico.

Construction of the landfill began in 1966 and originally consisted of 40 acres in the south ½, northeast ¼, northwest ¼ and the north ½, southeast ¼, northwest ¼ of Section 11. In 1974 the City leased an additional 40 acres adjacent to the east edge of the existing property in the south ½, northeast ¼, northwest ¼ and the north ½, southeast ¼, northwest ¼ of Section 11. Landfill operations were contained within the boundaries of this site. All excavation, bury and daily cover activities were performed using site soils.

A right-of-way (NMNM61211) for a fiber optic line owned by AT&T exists that crosses the site from the southwest corner to the northeast corner. The expansion of the landfill is restricted to the north side of this right-of-way, however the area to the south is available for daily and final cover material.

1.2 Existing Drainage Patterns and Characteristics

The 1994 Report identified 6 independent drainage basins existing within the landfill boundaries, however since that time there has been substantial change to the areas included in these basins. We have identified two new basins on the existing site as presented in Figure 1- 1.

The existing flows from basin 1 and 2 begin at the east/west ridge in the landfill that divides the two basins. Runoff flows in a northerly and southerly direction respectively with slopes ranging between 3 and 4 percent. The location of this high dividing ridge has changed since the 1994 report and the surface is no longer uniform in slope on either side of the ridge. The landfill side slopes from the top are graded to a 25 percent slope.

Basin 3 is located in the middle of northern side of the landfill and includes a depression at the base that acts as an impoundment catching water from all directions. Slopes vary from 1 to 25 percent.

Basin 4 is located in along the northern side of the fiber optic easement between Basins 2 and 3. It is a depression with drainage flowing to the center. There is no outlet from this basin.

Basin 5 lies on the eastern end of the landfill on the south side of the fiber optic cable easement. The flow line generally to the eastern boundary of the site with slopes varying from 1 to 4 percent.

Basin 6 occurs in the southeastern corner of the site. This area is designated as the borrow pit and has been used to supply fill and cap material for the landfill operations. The basin drainage flows from northeast to southwest and exits the site to be detained by an off-site dam before reaching a culvert to the southwest.

Basin 7 occurs in the northwest topmost portion of the site. Drainage flows from a high ridge at the northwestern end down an arroyo to the road at the northern boundary of the borrow pit.

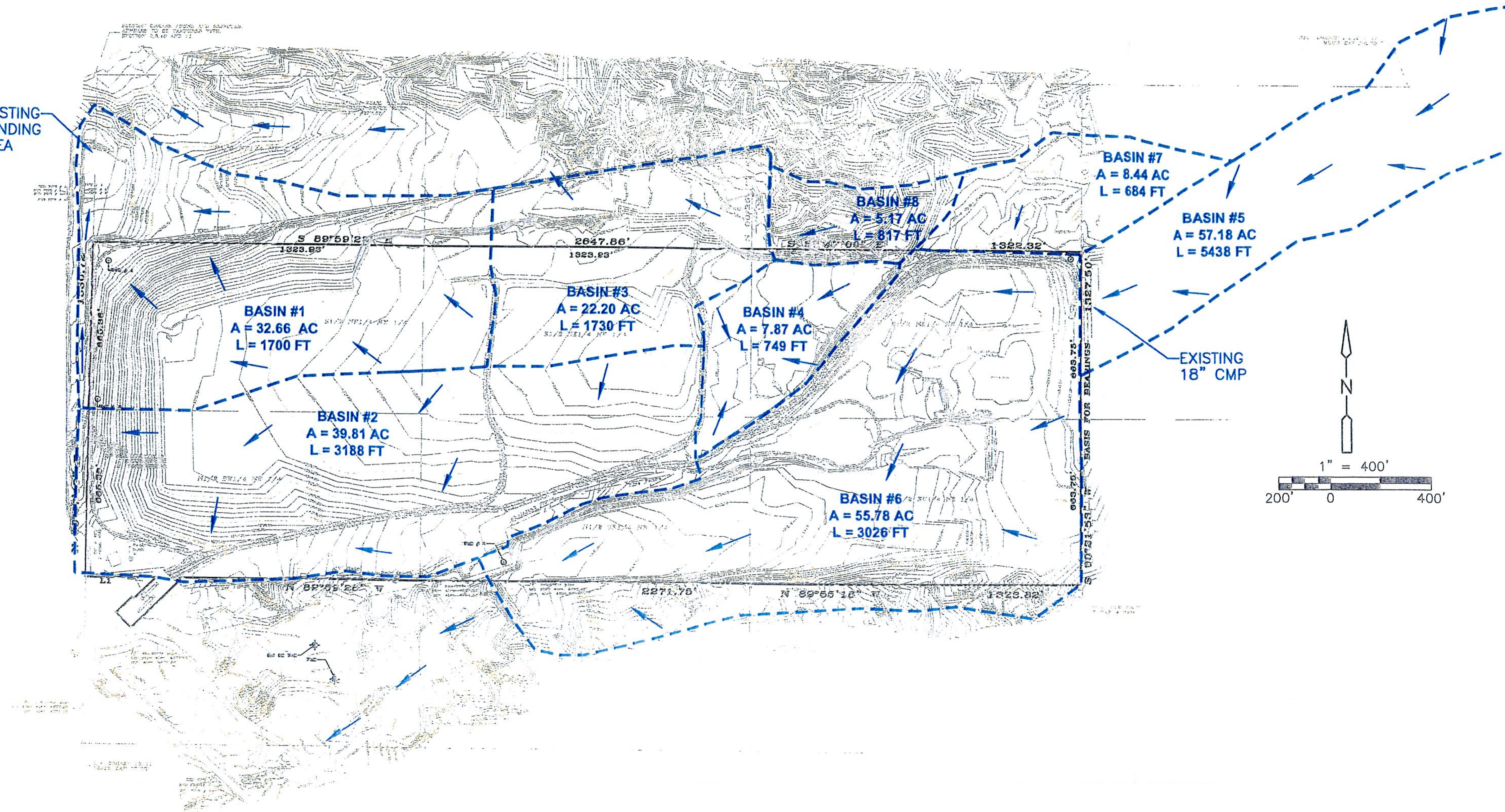
Basin 8 is located on the northern edge of Basin 4, wedged between Basins 3 and 7. It is an area of steeply sloped arroyos that direct flow from the northeast to the west.

1.3 Proposed Drainage Patterns and Characteristics

The City has been accepting clean fill since 2001. These activities have caused changes to occur on the upper surface and portion of the northeastern slope of the landfill. This analysis reviews these changes and their effects on the drainage patterns and the proposed drainage plan for closure. The proposed drainage basins are presented in Figure 1-2 Grading and Drainage Plan.

The purpose of this study is to determine and propose a drainage plan that will consider and include the changes necessary for closure. The existing conditions were analyzed as a starting point to understand the current drainage patterns so that the new patterns would represent at little change as possible.

The analysis of the proposed drainage plan after closure developed twelve basins, each basin draining to a structure that would move runoff to existing structures located at the northeastern or southeastern corner of the site. A detailed discussion is included in Section 3 - Conclusions and Recommendations.

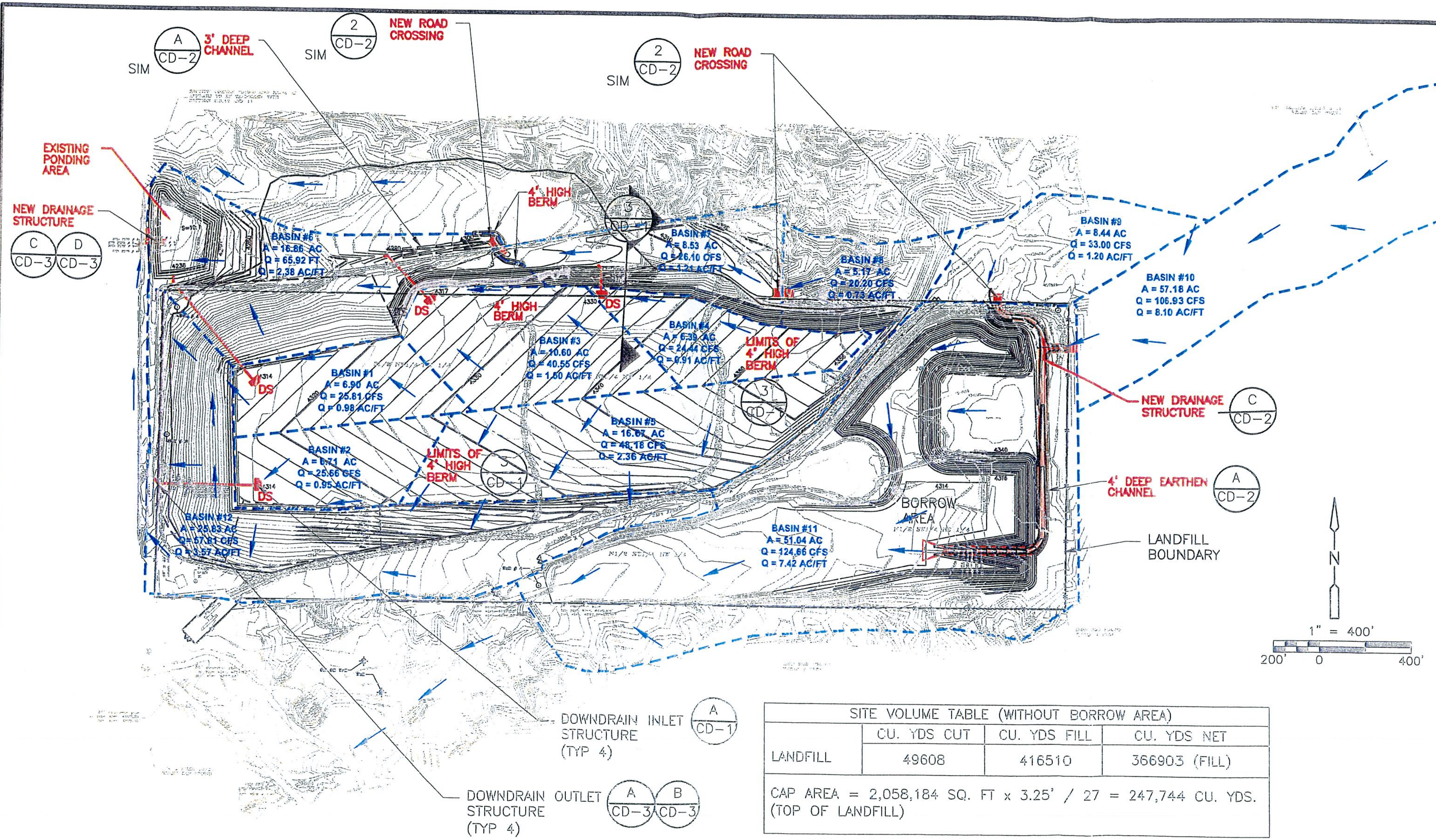


S:\8501\41913\sheets\ FIGURE-1-1 07/28/04 17:51 palmerrs XREFS: x-survey, x-border, xtbcdmlogo

CDM
consulting.engineering.construction.operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Figure No. 1-1
EXISTING DRAINAGE BASINS



SITE VOLUME TABLE (WITHOUT BORROW AREA)			
	CU. YDS CUT	CU. YDS FILL	CU. YDS NET
LANDFILL	49608	416510	366903 (FILL)
CAP AREA = 2,058,184 SQ. FT x 3.25' / 27 = 247,744 CU. YDS. (TOP OF LANDFILL)			

CDM
consulting . engineering . construction . operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Figure No. 1-2
GRADING AND DRAINAGE PLAN

Section 2
Methodology

The Soil Conservation Service (SCS) method as outlined in "Peak Rates of Discharge for Small Watersheds, Chapter 2 (Revised 2/85 for New Mexico), Engineering Field Manual for Conservation Practices" is used as the basis for the runoff analysis. All other methodology is based on the City of Las Cruces, New Mexico and Five-Mile Planning and Platting Jurisdiction (Extra-Territorial Zone) Design Standards, effective September 18, 1987, Article III: Drainage, in particular Section 3.1C, 2. Development Equal to or Greater than Three Acres.

2.1 Factors Affecting Surface Runoff

The volume and rate of runoff are affected by vegetative cover, topography, precipitation, hydrologic soil groups and conditions, conservation practices and antecedent moisture conditions. The SCS method depends on the combined effect of vegetative cover, conservation practices and soil as represented by the Runoff Curve Number (CN).

2.1.1 Precipitation

Rainfall in arid regions tends to be infrequent but intense. This means that a large volume of rainfall will fall in a very short time over an area. This high intensity rainfall produces a high rate and large volume of flow. On average, sixty percent of total rainfall in New Mexico occurs in a maximum of one hour. Precipitation records from New Mexico were used to produce a synthetic storm to compile the data, curves and graphs used to in the SCS method.

2.1.2 Antecedent Moisture Conditions

The Antecedent Moisture Condition (AMC) is a measure of the soil conditions prior to the "storm". The AMC is classified in three basic ways, Class I is dry soil conditions, Class II is typical soil conditions prior to annual flooding and Class III is saturated soil over a period 5 days prior to the "storm". The SCS method for New Mexico uses an AMC II.

2.1.3 Hydrologic Condition of Soils

The hydrologic condition of a soil is determined by the complex cover and soil conditions caused by temperature and decomposed organic matter content of the soil. This condition can affect the volume of runoff.

According to the Peak Rates of Discharge for Small Watersheds prepared by the SCS, there are four hydrologic soil groups in New Mexico. They are:

Group A: Low runoff potential. These are soils with a high rate of water transmission, generally sands or gravelly sands.

Group B: Slow runoff potential. These are moderately deep and moderately well drained soil with moderately fine to coarse texture.

Group C: Moderate runoff potential. These soils impede downward transmission of water and are moderately fine to fine texture.

Group D: High Runoff Potential. These soils have very slow infiltration rates when saturated and consist of clays with high shrink-swell potential.

Based on the Soil Survey of Dona Ana County, the Foothills Landfill soils are in the Bluepoint groups. This soil group tends to be comprised of loamy sand in the upper regions changing to stratified loamy fine sand to loamy sand from 10 to 20 ft. Permeability and available water capacity tends to be in the range of 6.0 to 20 in/hr and 0.06 to 0.10 in/in respectively. Bluepoint soils are in Group A.

2.1.4 Vegetative Cover

The relationship between slope and velocity of runoff can be affected by vegetative cover. It may impede the path of water over a surface and by increasing the porosity of the soil may reduce the volume of runoff.

The Foothills Landfill drainage area, excluding the landfill, has light vegetative cover over approximately 70% of the area. This is considered good cover conditions and the soil has low runoff potential and includes deep, well drained sands or gravels. The landfill has none or less than 30% vegetative cover. The result is poor cover conditions because there is no vegetation to slow or reduce the volume of the runoff.

The impact of vegetative cover will need to be assessed for each basin. Some of the basins contain portions of both the non-vegetated landfill and naturally vegetated areas outside of the landfill. This requires a judgment based on the proportion of the basin that is covered/uncovered to determine the basin's overall drainage condition.

Cover Condition Classes

Condition	Vegetative Cover
Poor	Less than 30% ground cover
Fair	About 30% to 70% ground cover
Good	More than 70% ground cover

The cover condition was determined using Figure 2-1, Hydrologic Soil – Cover Complexes and Associated Curve Numbers, Peak Rates of Discharge for Small Watersheds, Chapter 2, Engineering Field Manual for Conservation Practices, USDA, SCS (updated 2/85). The Desert Brush Curve was used to obtain a CN value of 83. This value is used consistently throughout the calculations.

2.1.5 Conservation Practices

Typical conservation practices are not appropriate to this site. The cap will include suitable material for the growth of a vegetative cover that will reduce erosion and slow down sheet flow.

2.1.6 Topography

The topography of the site is mixed, including steep slopes and flat, gently sloping areas. This will effect the rate of run-off but will not increase the volume and has been taken into consideration during this analysis. The cap, or top of the landfill, is consistently held to a minimum 2-5% slope. The side slopes of the landfill are maintained at a 4:1 slope, or less.

2.2 Peak Flow Calculations Method

Drainage basin areas used to calculate the peak flow at downstream points were determined using the AutoCADD drawings located in the Appendix. The following table lists the parameters and their notation as used in these calculations.

Peak Flow Calculation Parameters

Parameter	Notation
Drainage Basin Area (Acres)	A
Runoff Curve Number	CN
Time of Concentration (Hours)	Tc
Channel Loss Factor	CLF
Normal Annual Precipitation (in)	P_a
Average Annual Temperature (ºF)	T_a
Direct Runoff (in)	Q
Unit Discharge 24-hour Rainfall Amount	cfs/ac-in

The following relationships apply:

Qn = Net Runoff (in) = (Q)(CLF)

Peak Discharge (cfs) – (Qn)(A)(cfs/ac-in)

Runoff Volume (ac-ft) = (Qn)(A)/12

CN, the Runoff Curve Number was obtained from Figure 2-1, Hydrologic Soil – Cover Complexes and Associated Curve Numbers, Peak Rates of Discharge for Small Watersheds, Chapter 2, Engineering Field Manual for Conservation Practices, USDA, SCS (updated 2/85) (SCS Manual). A copy of the curve is located in the Appendix

Time of concentration, Tc, was obtained from Figure 2-2 Nomograph of Kirpich Formula to Determine Time of Concentration, the SCS Manual. A value for Tc was determined for each basin. Table 2-1 lists each basin, the drainage length, change in elevation and time of concentration.

Table 2-1. Time of Concentration for Proposed Improvements

Basin No.	Drainage Length (ft)	Change in Elevation (ft)	Time of Concentration T_c (hours)
1	950	18	0.12
2	900	17	0.11
3	1150	29	1.1
4	1100	27	1.1
5	2000	37	0.21
6	1300	64	0.10
7	1250	12	0.18
8	817	49	0.07
9	684	13	0.10
10	5438	101	0.45
11	3000	51	0.28
12	3660	90	0.30

Channel loss factors, CLF, were determined using Table 2-3 Channel-Loss Factors for Reduction of Direct Runoff 1/, SCS Manual. Per this table, the CLF for all drainage basins less than 640 acres is 1.00. All the drainage basins in this study are less than 640 acres; therefore a CLF of 1.00 is used for this evaluation.

The normal precipitation for the study area was determined using Exhibit 2-3 Normal Annual Precipitation in New Mexico, SCS Manual. The value used in this evaluation for the area surrounding Las Cruces is 16 inches.

The average annual temperature for the Las Cruces area was obtained from Exhibit 2-4, Average Annual Temperature, New Mexico, SCS Manual. The value used in this evaluation is 60°F.

Table 2-2 presents the Unit Peak Discharge for each basin. Figure 2-4, Unit Peak Discharge, SCS Manual was used to obtain these values.

Table 2-2. Unit Peak Discharge for Proposed Improvements

Basin No.	Time of Concentration, Tc (hours)	Unit Peak Discharge (cfs/ac-in)
1	0.12	2.2
2	0.11	2.25
3	1.1	2.25
4	1.1	2.25
5	0.21	1.70
6	0.10	2.30
7	0.18	1.80
8	6.07	2.30
9	0.10	2.30
10	0.45	1.10
11	0.28	1.40
12	0.30	1.35

The 10-year and 100-year storm event precipitation isopluvials used were taken from Exhibit 2-2, 10-year, 24-hour Precipitation and 100-year, 24-hour Precipitation, SCS Manual. Based on the exhibits, the 10-year, 24-hour storm results in 2.2 inches and the 100-year, 24-hour storm results in 3.4 inches of rainfall.

Figure 2-5, Hydrology: Solution of Runoff Equation, SCS Manual provides the value for Direct Runoff (Q) versus Rainfall (P_a) and the Runoff Curve Number (CN). Using assumed values for P_a for the 10-year and 100-year storms and a CN of 83, the Direct Runoff (Q) is 0.8 and 1.7 inches respectively.

Complete calculations for each basin may be found in the Appendix. The following table presents the volume of runoff as well as the peak discharge for the proposed drainage plan.

Table 2-3. Volume of Runoff and Peak Discharge For Proposed Improvements

Basin No.	Net Runoff (Q_n) (in)		Volume of Runoff, (ac-ft)		Peak Discharge (cfs)	
	10-year	100-year	10-year	100-year	10-year	100-year
1	0.80	1.70	0.46	0.98	12.14	25.81
2			0.45	0.95	12.08	25.66
3			0.71	1.50	19.08	40.55
4			0.43	0.91	11.50	24.44
5			1.11	2.36	22.67	48.18
6			1.12	2.38	31.02	65.92
7			0.57	1.21	12.28	26.10
8			0.34	0.73	9.51	20.20
9			0.56	1.20	15.53	33.00
10			3.81	8.10	50.32	106.93
11			3.49	7.42	58.67	124.66
12			1.70	3.57	27.20	57.81

Section 3
Conclusions and Recommendations

The closure of this landfill will produce a change in drainage patterns. This change would lead to erosion if the changes in runoff are not included in the plan for overall closure. Figure 1-2 presents our recommendations for final grading of the landfill for closure.

The final grading plan takes into account the need to provide a uniform slope that directs storm runoff into structures designed to reduce the erosion of the cap and possible exposure of buried waste. We have proposed a flow pattern on the top of the landfill that will direct flow to one of four downdrains. These downdrains will prevent erosion of the side slopes and direct flow into the retention basin in the northwest corner of the site.

Overflow of the retention basin currently exits through a group of PVC overflow pipes and an emergency spillway on the north end of the basin. A new overflow structure is proposed that is sized to replace the group of pipes. This structure will create a more reliable and permanent overflow.

A large drainage flow enters the site on the northeast end and flows through the borrow pit area. This flow has caused considerable erosion in the past and to correct this we have proposed concrete riprap at the mouths of the two discharging arroyos. An earthen channel is proposed to direct this flow south around the borrow pit and then back into its natural flow path.

We believe that these improvements, as illustrated in Figure 1-2 if installed properly, will reduce or prevent damage from runoff and preserve the integrity of the landfill.

BASIN #1

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ______________________ FIELD OFFICE ______________________

COOPERATOR ______________________ PRACTICE NAME ______________________

STRUCTURE NO. ______________________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ______________________

COMPUTATIONS BY ________ DATE ________ CHECKED BY ________ DATE ________

DRAINAGE AREA:		A =	6.90	ac
RUNOFF CURVE NUMBER: 1/	ELEV FT. 18	CN =	83	
TIME OF CONCENTRATION: 1/	L = 950	Tc =	0.12	hr
CHANNEL-LOSS FACTOR: (Table 2-3)		CLF =	1.00	
Normal Annual Precipitation: (Exh. 2-3)		Pa =	8	in
Average Annual Temperature: (Exh. 2-4)		Ta =	60	°F
UNIT DISCHARGE: (Fig. 2-4)		cfs/ac-in =	2.2	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	____ -YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	12.14	25.81	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	0.46	0.98	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN #2

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ________ FIELD OFFICE ________

COOPERATOR ________ PRACTICE NAME ________

STRUCTURE NO. ________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ________

COMPUTATIONS BY ________ DATE ________ CHECKED BY ________ DATE ________

DRAINAGE AREA:	A =	6.71	a
RUNOFF CURVE NUMBER: 1/ ELEV. FT. 17	CN =	83	
TIME OF CONCENTRATION: 1/ L=900	Tc =	0.11	h
CHANNEL-LOSS FACTOR: (Table 2-3)	CLF =	1.00	
Normal Annual Precipitation: (Exh. 2-3)	Pa =	8	i
Average Annual Temperature: (Exh. 2-4)	Ta =	60	o
UNIT DISCHARGE: (Fig. 2-4)	cfs/ac-in =	2.25	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	-YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	12.08	25.66	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	0.45	0.95	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN - J

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ________ FIELD OFFICE ________

COOPERATOR ________ PRACTICE NAME ________

STRUCTURE NO. ________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ________

COMPUTATIONS BY ____ DATE ____ CHECKED BY ____ DATE ____

DRAINAGE AREA: A = 10.60 ac

RUNOFF CURVE NUMBER: 1/ ELEV. FT. 29 CN = 83

TIME OF CONCENTRATION: 1/ L = 1150 Tc = 1.1 hr

CHANNEL-LOSS FACTOR: (Table 2-3) CLF = 1.00

Normal Annual Precipitation: (Exh. 2-3) Pa = 8 in

Average Annual Temperature: (Exh. 2-4) Ta = 60 °F

UNIT DISCHARGE: (Fig. 2-4) cfs/ac-in = 2.25

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	-YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	19.08	40.55	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	0.71	1.50	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

BASIN #4

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ______ FIELD OFFICE ______

COOPERATOR ______ PRACTICE NAME ______

STRUCTURE NO. ______ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ______

COMPUTATIONS BY ______ DATE ______ CHECKED BY ______ DATE ______

DRAINAGE AREA:		A =	6.39	ac
RUNOFF CURVE NUMBER: 1/	ELEV. FT. 27	CN =	83	
TIME OF CONCENTRATION: 1/	L = 1100	Tc =	1.1	hr
CHANNEL-LOSS FACTOR: (Table 2-3)		CLF =	1.00	
Normal Annual Precipitation: (Exh. 2-3)		Pa =	8	in
Average Annual Temperature: (Exh. 2-4)		Ta =	60	°F
UNIT DISCHARGE: (Fig. 2-4)		cfs/ac-in =	2.25	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	-YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	11.50	24.44	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	0.43	0.91	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN - 2

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ________ FIELD OFFICE ________

COOPERATOR ________ PRACTICE NAME ________

STRUCTURE NO. ________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ________

COMPUTATIONS BY ________ DATE ________ CHECKED BY ________ DATE ________

DRAINAGE AREA:		A =	16.67	ac
RUNOFF CURVE NUMBER: 1/	ELEV·FT. 37	CN =	83	
TIME OF CONCENTRATION: 1/	L=2000	Tc =	0.21	hr
CHANNEL-LOSS FACTOR: (Table 2-3)		CLF =	1.00	
Normal Annual Precipitation: (Exh. 2-3)		Pa =	8	in
Average Annual Temperature: (Exh. 2-4)		Ta =	60	°F
UNIT DISCHARGE: (Fig. 2-4)		cfs/ac-in =	1.7	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	____ -YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	22.67	48.18	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	1.11	2.36	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN # 6

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ________ FIELD OFFICE ________

COOPERATOR ________ PRACTICE NAME ________

STRUCTURE NO. ________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ________

COMPUTATIONS BY ______ DATE ______ CHECKED BY ______ DATE ______

DRAINAGE AREA:		A =	16.86	ac
RUNOFF CURVE NUMBER: 1/	ELEV. PT. 64	CN =	83	
TIME OF CONCENTRATION: 1/	L= 1,300	Tc =	0.10	hr
CHANNEL-LOSS FACTOR: (Table 2-3)		CLF =	1.00	
Normal Annual Precipitation: (Exh. 2-3)		Pa =	8	in
Average Annual Temperature: (Exh. 2-4)		Ta =	60	°F
UNIT DISCHARGE: (Fig. 2-4)		cfs/ac-in =	2.3	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	-YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	31.02	65.92	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	1.12	2.38	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN # 1

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ____________ FIELD OFFICE ____________

COOPERATOR ____________ PRACTICE NAME ____________

STRUCTURE NO. ____________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ____________

COMPUTATIONS BY ______ DATE ______ CHECKED BY ______ DATE ______

DRAINAGE AREA:		A =	8.53	ac
RUNOFF CURVE NUMBER: 1/	ELEV. FT. 12	CN =	83	
TIME OF CONCENTRATION: 1/	L = 1250	Tc =	0.18	hr
CHANNEL-LOSS FACTOR: (Table 2-3)		CLF =	1.00	
Normal Annual Precipitation: (Exh. 2-3)		Pa =	8	in
Average Annual Temperature: (Exh. 2-4)		Ta =	60	°F
UNIT DISCHARGE: (Fig. 2-4)		cfs/ac-in =	1.8	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	____ -YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	12.28	26.10	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	0.57	1.21	

1/ Snow computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN # 8

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ____________ FIELD OFFICE ____________

COOPERATOR ____________ PRACTICE NAME ____________

STRUCTURE NO. ____________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ____________

COMPUTATIONS BY ________ DATE ________ CHECKED BY ________ DATE ________

DRAINAGE AREA:	A =	5.17	ac	
RUNOFF CURVE NUMBER: 1/	CN =	83		
TIME OF CONCENTRATION: 1/	Tc =	6.07	hr	
CHANNEL-LOSS FACTOR: (Table 2-3)	CLF =	1.00		
Normal Annual Precipitation: (Exh. 2-3)	Pa =	8.0	in	
Average Annual Temperature: (Exh. 2-4)	Ta =	60	°F	
UNIT DISCHARGE: (Fig. 2-4)	cfs/ac-in =	2.3		

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	____ -YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	9.51	20.2	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	0.34	0.73	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN # 7

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ____________ FIELD OFFICE ____________

COOPERATOR ____________ PRACTICE NAME ____________

STRUCTURE NO. ____________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ____________

COMPUTATIONS BY ______ DATE ______ CHECKED BY ______ DATE ______

DRAINAGE AREA:	A =	8.44	ac
RUNOFF CURVE NUMBER: 1/	CN =	83	
TIME OF CONCENTRATION: 1/	Tc =	0.10	hr
CHANNEL-LOSS FACTOR: (Table 2-3)	CLF =	1.00	
Normal Annual Precipitation: (Exh. 2-3)	Pa =	8	in
Average Annual Temperature: (Exh. 2-4)	Ta =	60	°F
UNIT DISCHARGE: (Fig. 2-4)	cfs/ac-in =	2.3	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	____ -YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	15.53	33.00	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	0.56	1.20	

1/ Snow computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN # 1C

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ____________ FIELD OFFICE ____________

COOPERATOR ____________ PRACTICE NAME ____________

STRUCTURE NO. ____________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ____________

COMPUTATIONS BY ______ DATE ______ CHECKED BY ______ DATE ______

DRAINAGE AREA:	A =	57.18	ac
RUNOFF CURVE NUMBER: 1/	CN =	0.83	
TIME OF CONCENTRATION: 1/	Tc =	0.45	hr
CHANNEL-LOSS FACTOR: (Table 2-3)	CLF =	100	
Normal Annual Precipitation: (Exh. 2-3)	Pa =	16	in
Average Annual Temperature: (Exh. 2-4)	Ta =	60	°F
UNIT DISCHARGE: (Fig. 2-4)	cfs/ac-in =	1.1	

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	-YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	50.32	106.93	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	3.81	8.10	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN # 11

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ______ FIELD OFFICE ______

COOPERATOR ______ PRACTICE NAME ______

STRUCTURE NO. ______ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ______

COMPUTATIONS BY ______ DATE ______ CHECKED BY ______ DATE ______

DRAINAGE AREA:		A =	52.38 ac
RUNOFF CURVE NUMBER: 1/	ELEV. FT. 51	CN =	83
TIME OF CONCENTRATION: 1/	L=3000	Tc =	0.28 hr
CHANNEL-LOSS FACTOR: (Table 2-3)		CLF =	1.00
Normal Annual Precipitation: (Exh. 2-3)		Pa =	8 in
Average Annual Temperature: (Exh. 2-4)		Ta =	60 °F
UNIT DISCHARGE: (Fig. 2-4)		cfs/ac-in =	1.4

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	-YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	58.67	124.66	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	3.49	7.42	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

BASIN # 12

USDA/SCS
NM-ENG-121 (Rev. 5, 8/84)

HYDROLOGY DATA SHEET
(Chapter 2 - Engineering Field Manual for Conservation Practices)

SWCD ______________________ FIELD OFFICE ______________________

COOPERATOR ______________________ PRACTICE NAME ______________________

STRUCTURE NO. ______________________ PROGRAM (~~ACP~~, GPCP, ~~OTHER~~) ______________________

COMPUTATIONS BY ________ DATE ________ CHECKED BY ________ DATE ________

DRAINAGE AREA: A = 25.19 ac

RUNOFF CURVE NUMBER: 1/ ELEV. FT. 90 CN = 83

TIME OF CONCENTRATION: 1/ L = 3660 Tc = 0.30 hr

CHANNEL-LOSS FACTOR: (Table 2-3) CLF = 1.00

Normal Annual Precipitation: (Exh. 2-3) Pa = 8 in

Average Annual Temperature: (Exh. 2-4) Ta = 60 °F

UNIT DISCHARGE: (Fig. 2-4) cfs/ac-in = 1.35

RECURRENCE INTERVAL (FREQUENCY):	10 -YR	100 -YR	-YR
RAINFALL, 24-HR: (in) 2/ (Exhibit 2-2)	2.2	3.4	
DIRECT RUNOFF: Q (in) (Fig. 2-5)	0.8	1.7	
NET RUNOFF: Qn (in) (Q)(CLF)	0.8	1.7	
PEAK DISCHARGE: (cfs) (A)(Qn)(cfs/ac-in)	27.20	57.81	
VOLUME OF RUNOFF: (ac-ft) (Qn)(A)/12	1.70	3.57	

1/ Show computations on back.

2/ Adjust the rainfall from partial-duration to annual series if smaller than the 10-year storm.

APPENDIX E
KRAMER & ASSOCIATES, INC.
JUNE 1999
EMISSION COMPLIANCE TEST REPORT

CDM

Emission Compliance Test Report

for

Old Landfill Site

City of Las Cruces
Las Cruces, New Mexico

by

Kramer & Associates, Inc.
4501 Bogan NE Suite A-1
Albuquerque, New Mexico 87109
505-881-0243

June, 1999

Table of Contents

Introduction:

A. **Reason for Tests:**
Requirements of the 40CFR Subpart WWW; Subpart 60.754, Tier 2.

B. **Applicable Regulations:**
See Part A

C. **Testing Dates:**
June 9, 10, and 11, 1999

D. **Startup Date:**
Landfill use began 30 years ago; landfill closure was 3 years ago.

E. **Testing on Time:**
Yes

F. **Process:**
Mixed solid wastes (biodegradable and non-degradable) were landfilled during the 30 years in which the landfill was open. No records of quantity or characteristics of landfilled wastes were kept during most of the 30-year period. The landfill has been closed for 3 years.

G. **Company Name, Address, Phone and Contact Person:**
City of Las Cruces
Utilities Division
P.O. Box 20000
Las Cruces, NM 88004
Contact Person: Mr. Jorge Garcia (505-528-3595)

H. **Facility Location:**
Las Cruces
Three Miles East of Interstate 25 on Foothills Road

I. **Testing Firm:**
Kramer & Associates, Inc.
4501 Bogan NE, Suite A-1
Albuquerque, NM 87109
Gary R. Kramer (505 881-0243)

J. **Individuals Present at Test:**
1. City of Las Cruces - Jorge Garcia
2. Kramer & Associates, Inc. - Buster Wright, Bill Ristau, Gary Kramer
3. NMED - Helly Diaz Marcano

K. **Unit Description:**
Municipal Landfill

L. **Emissions Control Equipment:**
None

Table 1

Las Cruces Old Landfill NMOC Testing Summary

Sampling Dates: June 9, 10, and 11, 1999

Landfill Locations	Canister Number	Percent Methane	Percent CO2	ppm Non-Methane NMOC as C	PPM Non-Methane NMOC as Hexane	Percent Nitrogen
12,50,52	20740	19.2	14.9	256	42.67	40.5
15,55,58	20741	32.3	37	51718	8619.33	19.8
17,23,27	20742	45	38.9	558	93.00	10.6
2,47,54	20744	17.3	30.4	471	78.50	41.1
6,14,22	20745	41.1	43	616	102.67	18.4
10,19,20	20746	13.1	32.7	1456	242.67	47.8
38,63,65	20747	18.3	27.3	2428	404.67	44.4
60,70,71	20748	20.7	28.1	1838	306.33	37.6
33,35,36	20750	36	34	385	64.17	33.8
18,25,28	20751	45.3	42.8	1055	175.83	12.5
16,24,49	20752	36.8	39.6	1223	203.83	18.9
37,59,62	20753	41.1	37.3	438	73.00	17.4
9,11,53	20754	23.9	37.1	1918	319.67	27.7
26,32,57	20756	38.3	40.1	1514	252.33	20.4
66,67,68	20758	42.2	38.8	621	103.50	31
8,21	20759	39.4	37.3	831	138.50	21.1
44,46,61	20760	16.2	19.2	640	106.67	51.2
Averages	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Mnmoc = 2 * Lo * R * (e^(-kc) - e^(-kt)) * ((3.6x10^(-9)) * Cnmoc (60.754 (a)(1)(ii))

where:

Mnmoc = mass of non-methane organics, megagm per year	
k = methane generation rate constant, per year =	0.02
Lo = methane generation rate, m3/megagm waste =	170
R = Ave waste acceptance rate, megagm per year =	89000
c = time since closure, years =	3
t = age of landfill, years =	30

Cnmoc = average non-methane organics as hexane = 666.314 ppm
(Ave ppm NMOC/6)

Mnmoc = [illegible] megagrams per year [illegible]

Note: Details of the sampling and analysis program including the field data are included in the Myramid Analytical Report attached.

JAN-20-00 THU 12:07 AM

III. Test Procedures:

A. **Source Sampling Locations**:
See Figure 1 - Landfill Sampling Site

B. **Sampling Systems Schematics:**
See Figure 2

C. **Test Operating Procedures:**

Non-Methane Organic Compounds:

Sampling probes were inserted 10-11 feet below the top of the landfill cover (approximately 2 meters below the bottom of the landfill cover) using a Model 540U Geoprobe Systems hydraulically powered soil probing unit. The probe was equipped with a disposable tip for penetrating the landfill and Teflon sampling line inside the probe through which soil gas sample was conveyed from the bottom of the probe. This system had been demonstrated to provide the best sealing of the landfill gas sampling area from air intrusion. The sample line was purged at approximately 100 ml/min and soil gas was drawn from the landfill into a Tedlar bag for a preliminary nitrogen analysis (by GC-TCD) after which a decision was made (after consultation with the NMED observer on site) about whether to collect NMOC sample at the selected location. The NMED criteria for proceeding with sampling was <50% nitrogen.

If NMOC sampling was advised at the selected probe site, the probe's Teflon sampling line was connected to the stainless steel sampling train. Sample lines were purged and at least one liter of landfill gas sample was collected (at 100 ml/min) into an evacuated stainless steel sample tank. All sample tanks (6 liter) and calibrated sampling trains were provided by Myramid Analytical (Austin, Texas). Myramid Analytical also provided the Method 25 NMOC and Method 3C nitrogen analyses of the filled sample tanks. Three sampling sites were composited into one sample tank.

8. **Test Equipment**:
Model 540U Geoprobe Soil Probe
Beckman Model 2GC GC-TCD

9. **Operating Parameters Measured During Tests:**
none

D. **Deviations from EPA Methods:**

The 20% nitrogen maximum allowable concentration in the landfill gas sample was changed by the NMED observer to 50%.

E. **Test Instrumentation:**
See Myramid Analytical Report Attached

F. **Process Operating Parameters:**
The landfill was closed to biodegradable materials three years ago.

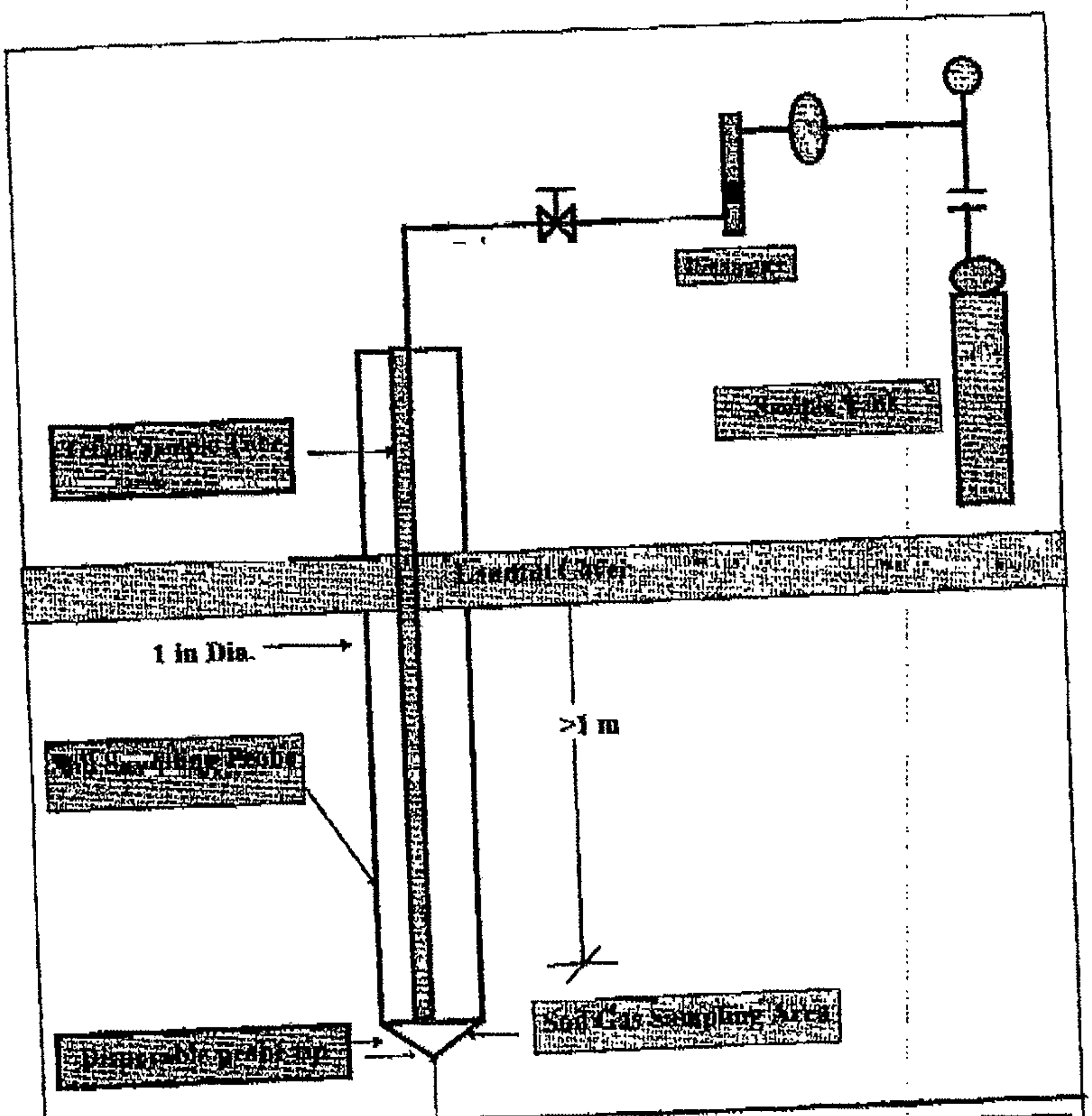


Figure 2

Sampling Schematic

Landfill Gas Testing
City of Las Cruces

APPENDIX F
CLOSURE PLAN AND
DETAIL DRAWINGS

LEGEND

Soil-S#10 Cap-30"	SOIL SAMPLE LOCATION (1999) WITH EXISTING CAP THICKNESS
13	METHANE GAS SAMPLE LOCATION (1999)
Test # 21 Thickness 24"	TEST HOLE LOCATION (2004) WITH EXISTING CAP THICKNESS

THOMAS D. PARKER NEW MEXICO 11272 REGISTERED PROFESSIONAL ENGINEER

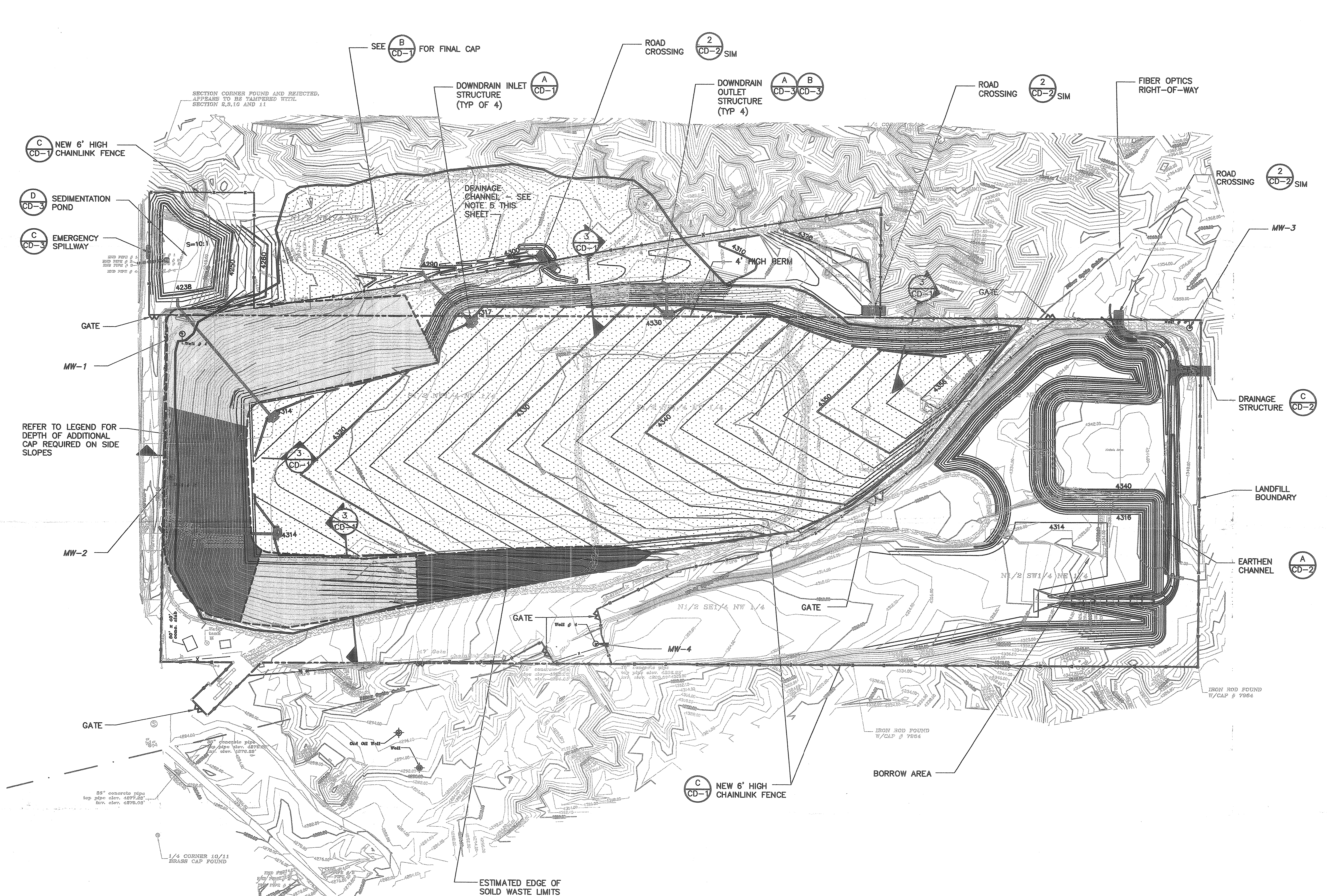
S:\8501\41913\sheets\ CSTPLtestholes 10/10/05 10:54 palmerrs XREFS: x-survey, x-border22X34, xtbcdmlogo, X-DESIGN, x-border, x-samples

CDM consulting.engineering.construction.operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Sheet No. G-1
TEST HOLE/BORING LOCATION MAP

S:\8501\41913\sheets\ CVOLPL02 10/10/05 10:37 palmerrs XREFS: x-survey, x-border22X34, xtbcdmlogo, X-DESIGN, x-border



LEGEND

6" / 12" / 20"	ADDITIONAL FINAL CAP
	FULL DEPTH CAP (B CD-1)
	PROPOSED 6' CHAINLINK FENCE
	EXISTING 2' CONTOUR
	EXISTING 10' CONTOUR
	PROPOSED 2' CONTOUR
4340	PROPOSED 10' CONTOUR
	EXISTING GRAVEL ACCESS ROAD
	PROPOSED DRAINAGE STRUCTURE
	EXISTING GROUNDWATER MONITORING WELL
	EXISTING WELLS (NON-GROUNDWATER MONITORING)

NOTES:

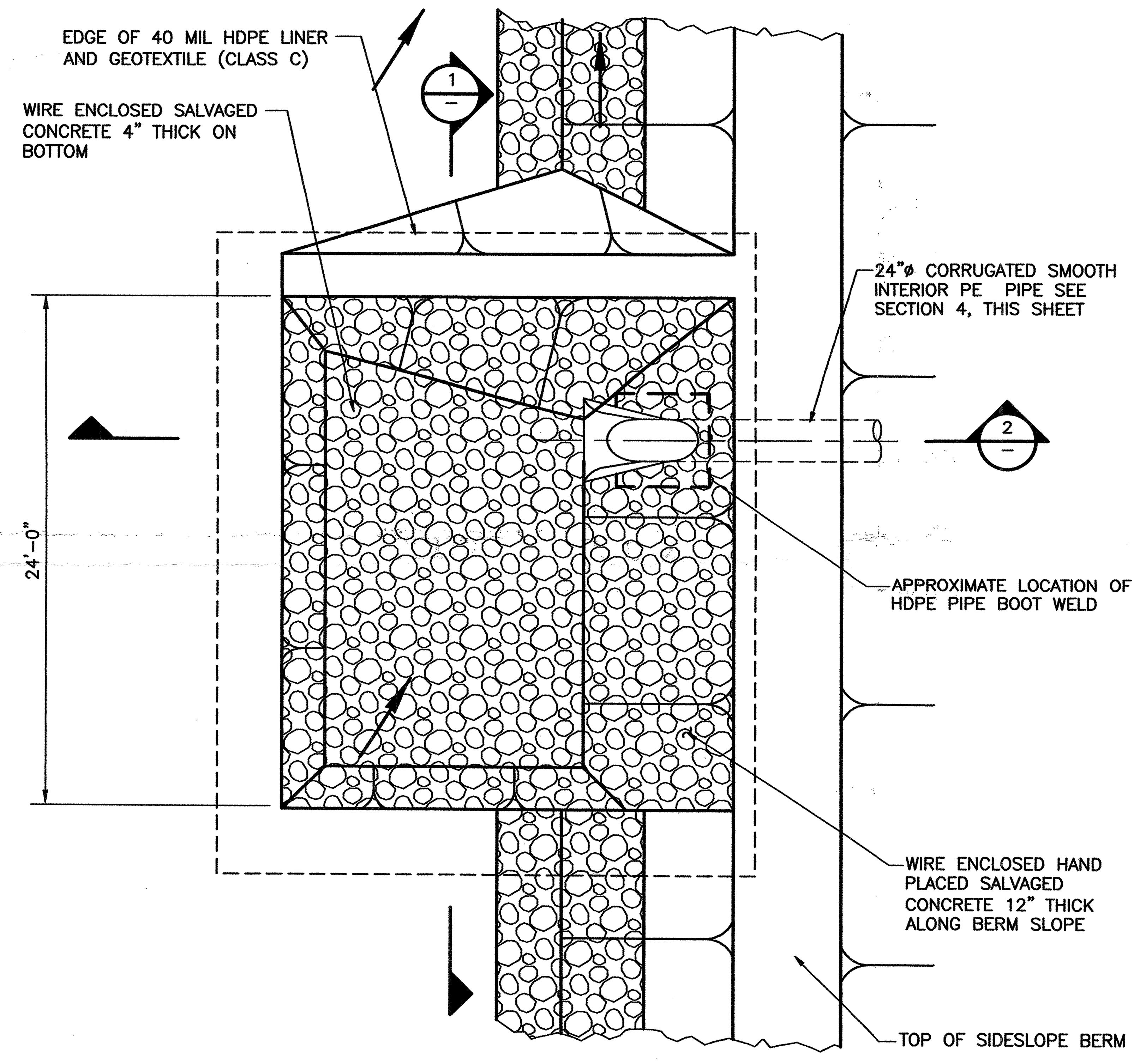
1. EXISTING GRADES REFLECT TOP OF EXISTING MULCH LAYER.
2. FINAL GRADES REFLECT TOP OF FINAL CAP VEGETATIVE COVER.
3. COLORED AREAS INDICATE THE DEPTH OF CAP REQUIRED TO BE ADDED. BORROW MATERIAL FOR CAP/VEGETATIVE COVER SHALL COME FROM THE DESIGNATED BORROW AREA AND MEET A MINIMUM HYDRAULIC CONDUCTIVITY OF 6.4X10^{-5} CM/SEC.
4. ALL EXISTING BARBED WIRE AND CHAINLINK FENCE TO BE REPLACED WITH CHAINLINK.
5. ALL WASTE MATERIAL ENCOUNTERED DURING DRAINAGE CHANNEL EXCAVATION SHALL BE EXCAVATED AND TRANSPORTED TO AN APPROVED SUBTITLE "D" LANDFILL IN ACCORDANCE WITH AN NMED APPROVED WASTE EXCAVATION PLAN.

THOMAS D. PARKER NEW MEXICO 11278 REGISTERED PROFESSIONAL ENGINEER

CDM
consulting. engineering. construction. operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

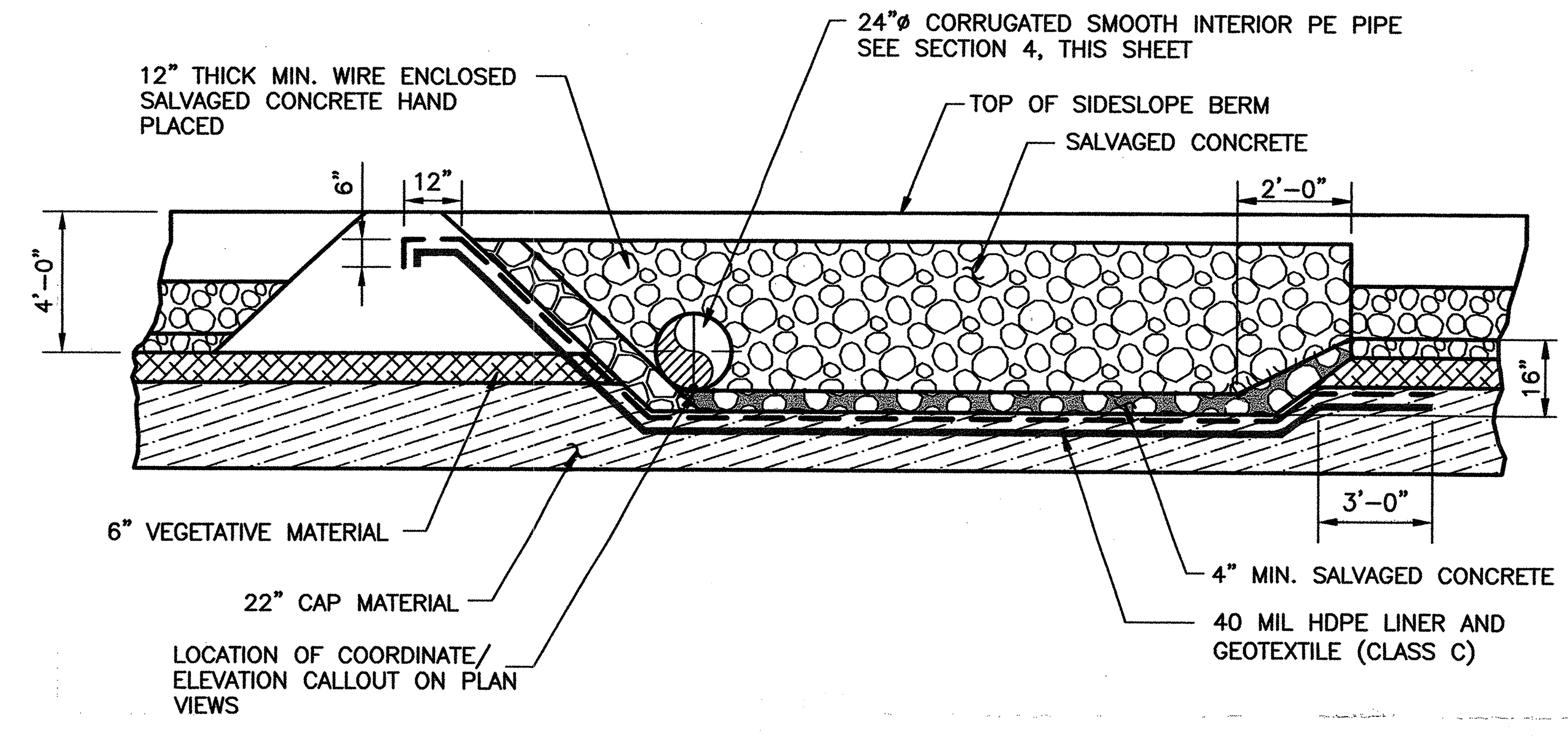
PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Sheet No. C-1
FINAL CAP AND GRADING PLAN



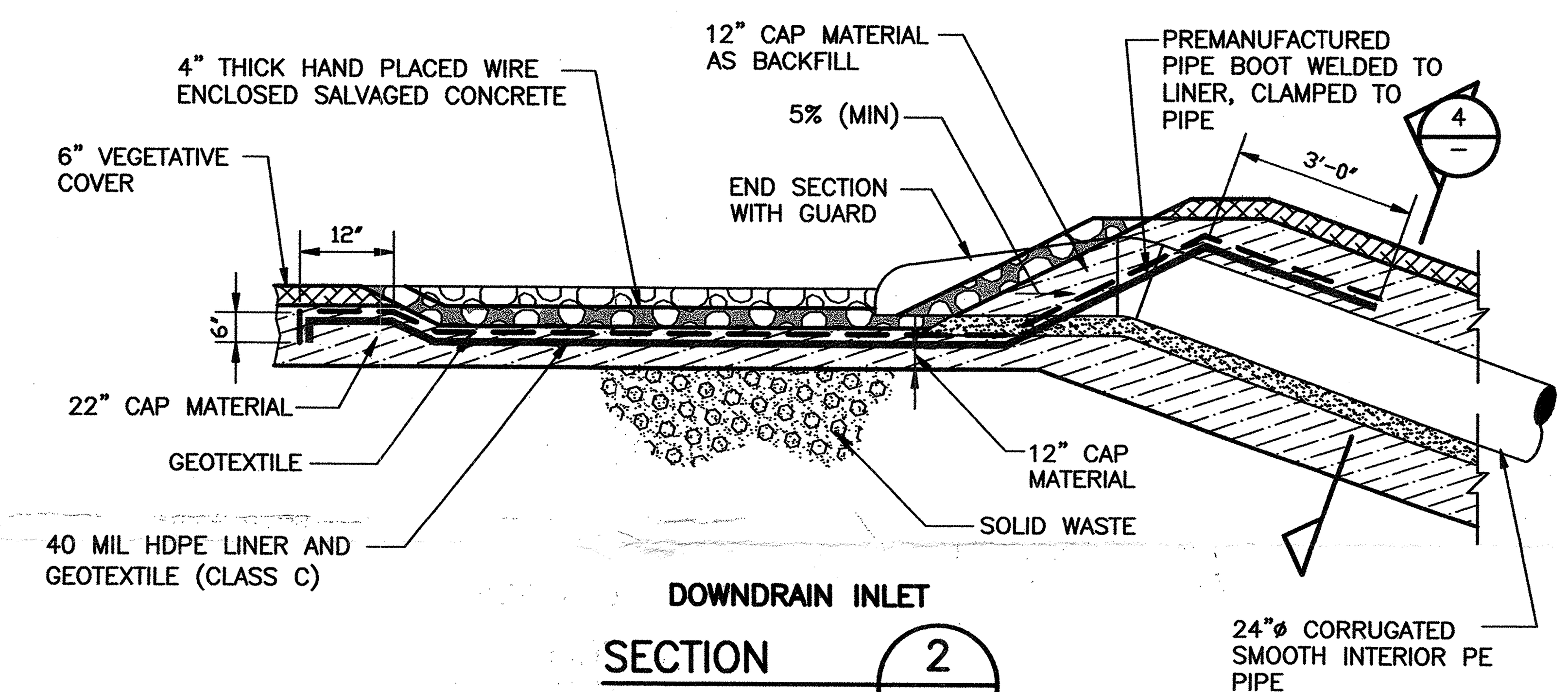
DOWNDRAIN INLET STRUCTURE

DETAIL A C-1
NTS



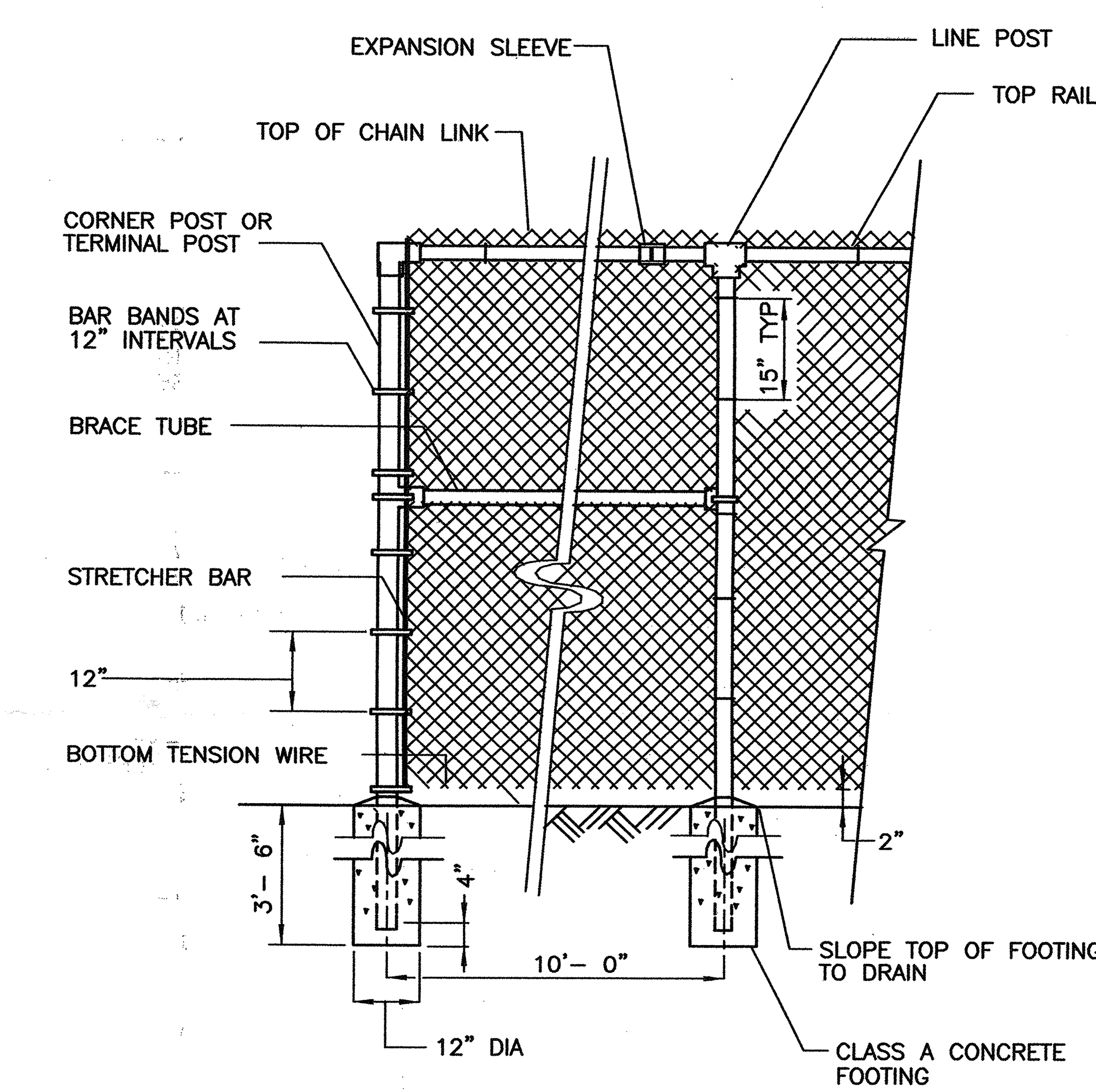
DOWNDRAIN INLET

SECTION 1 –
NTS



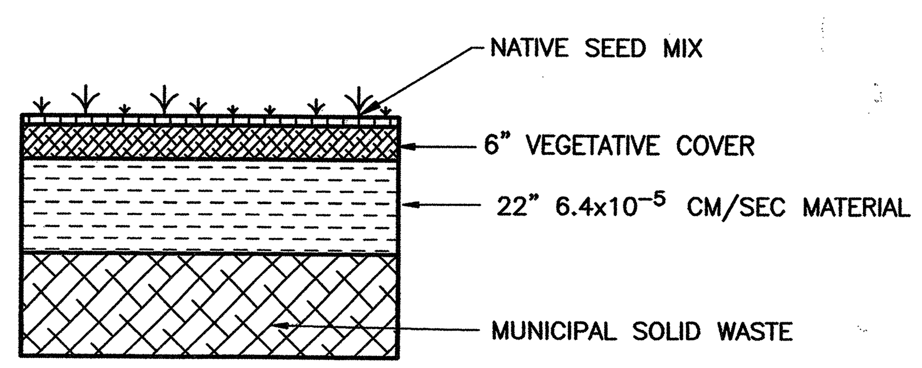
DOWNDRAIN INLET

SECTION 2 –
NTS



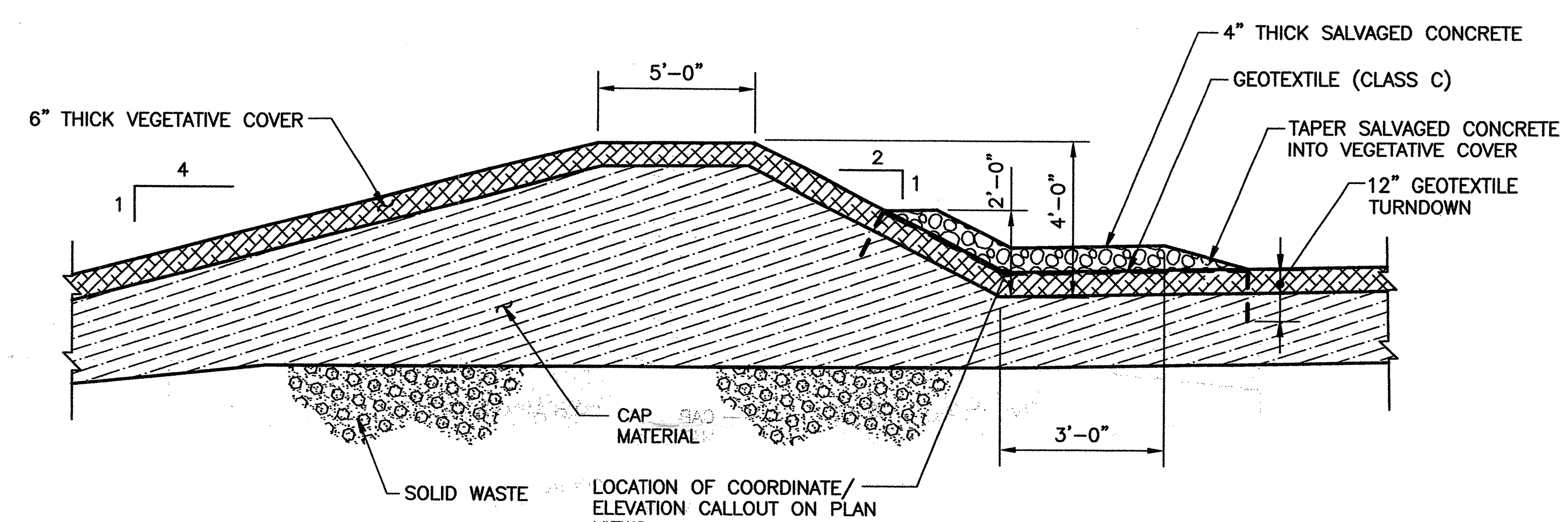
6 FOOT CHAIN LINK FENCE

DETAIL C C-1
NTS



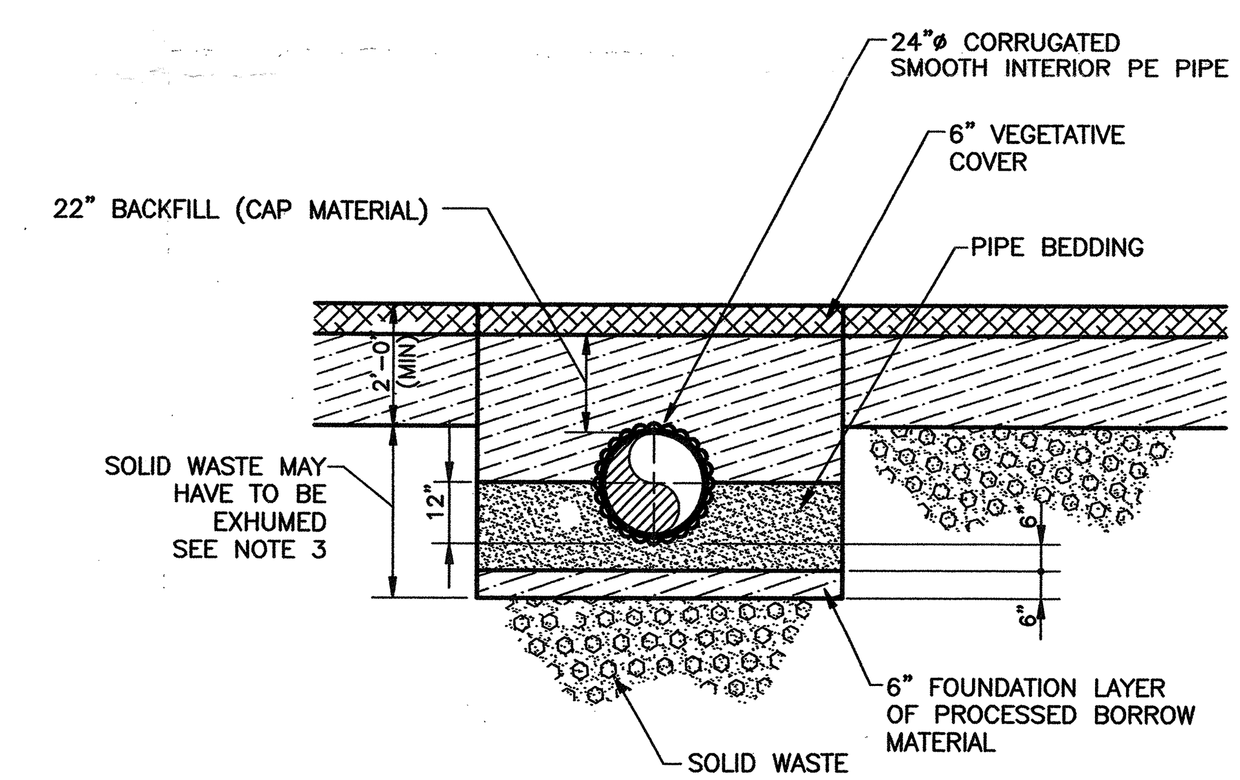
FINAL CAP DETAIL EXISTING SITE

DETAIL B C-1
NTS



SIDESLOPE BERM

SECTION 3 C-1
3/8" = 1'-0"



NOTES:

1. TRENCH CONSTRUCTION TO BE IN ACCORDANCE WITH SECTION 206 OF NMSH & TD SPECIFICATIONS.
2. PE PIPE SHALL BE IN ACCORDANCE WITH SECTION 570 OF THE NMSH&TD STANDARD SPECIFICATION. PIPE MUST WITHSTAND AN H-20 WHEEL LOADING WITH TWO FOOT COVER.
3. ALL SOLID WASTE EXHUMED DURING CLOSURE CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN ACCORDANCE WITH A SOLID WASTE EXCAVATION PLAN APPROVED BY NMED.

DOWN DRAIN PIPE SECTION

SECTION 4 –
NTS

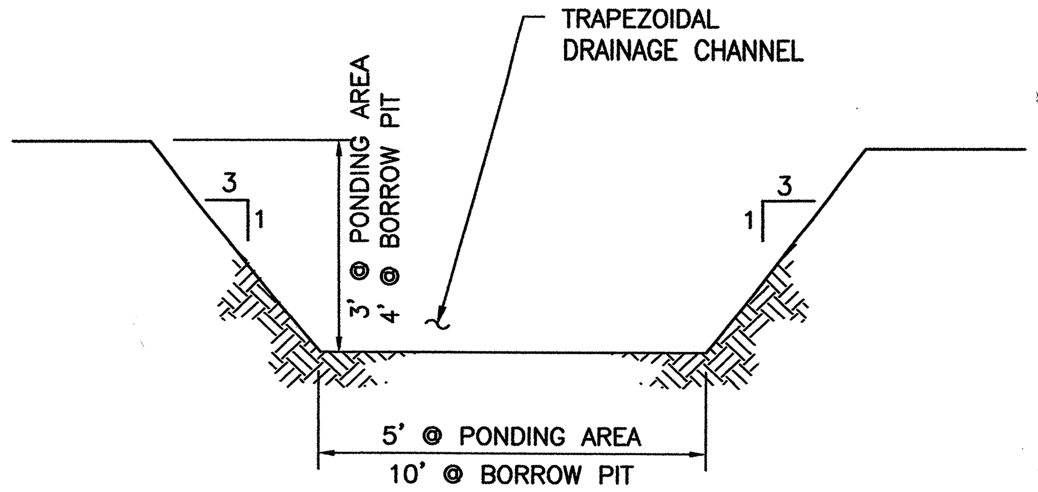
THOMAS D. PARKER NEW MEXICO 11272 REGISTERED PROFESSIONAL ENGINEER

S:\8501\41913\sheets\ CSTDDTC1 10/10/05 10:42 polmerrs XREFS: xtbcdmlogo, x-border22X34, x-border

CDM consulting . engineering . construction . operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

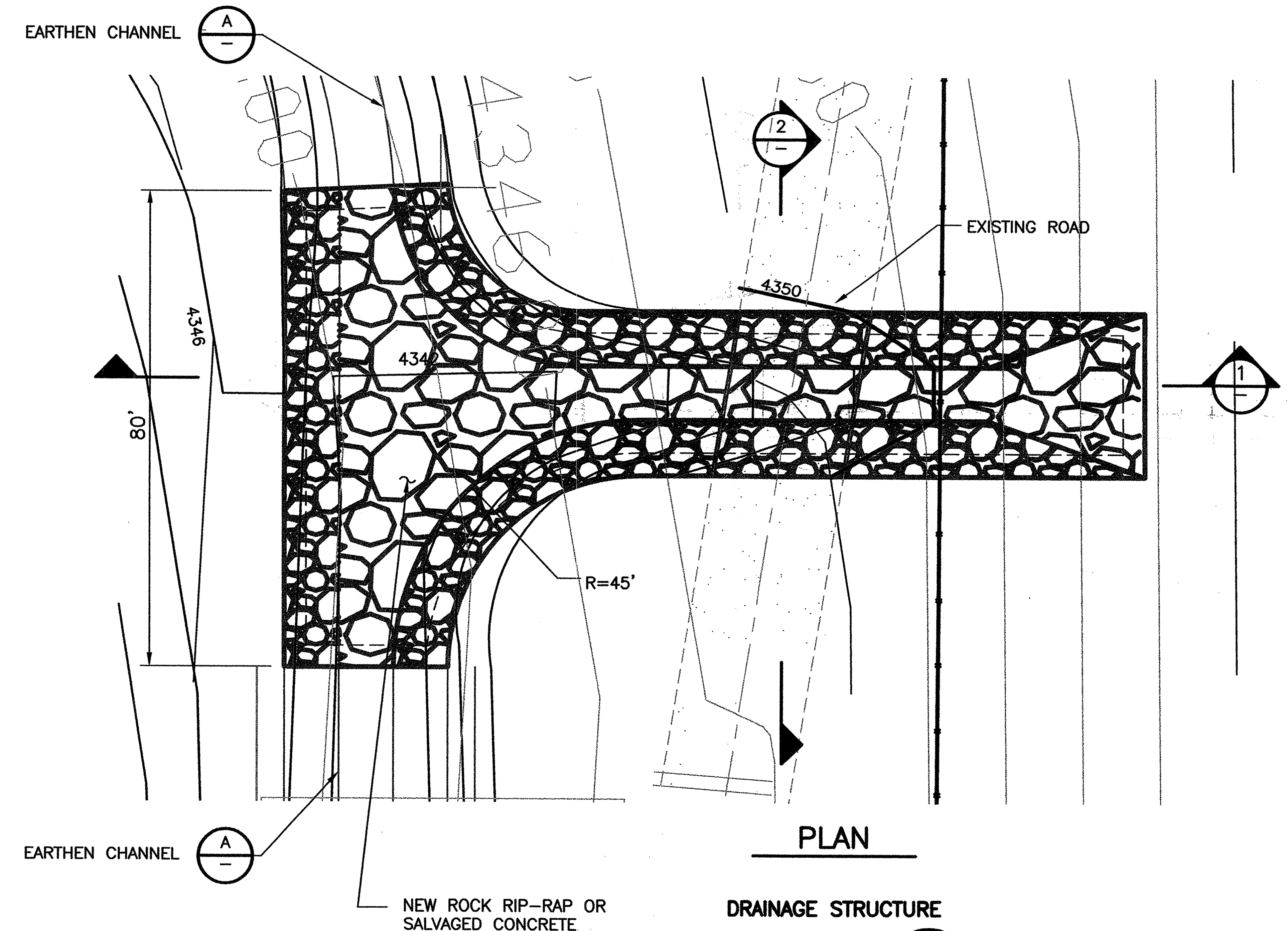
PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Sheet No. CD–1
SITE DETAILS – 1



EARTHEN CHANNEL

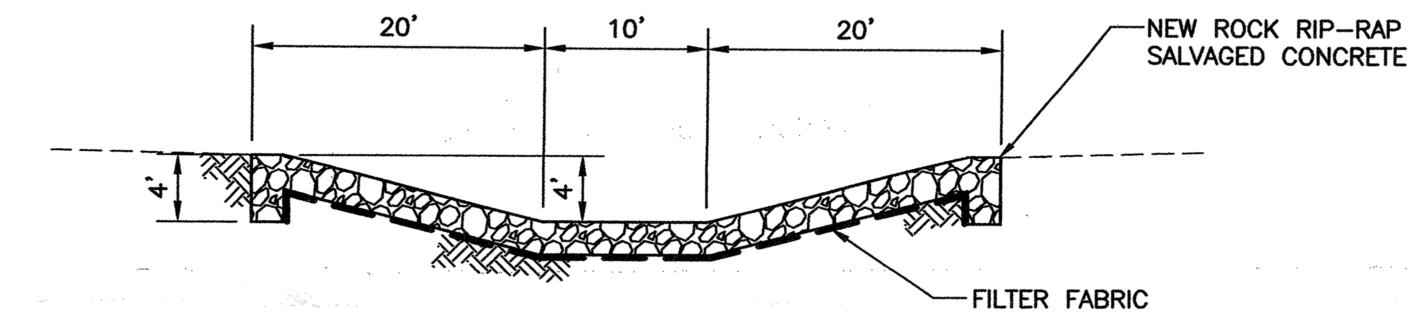
DETAIL A
NTS



PLAN

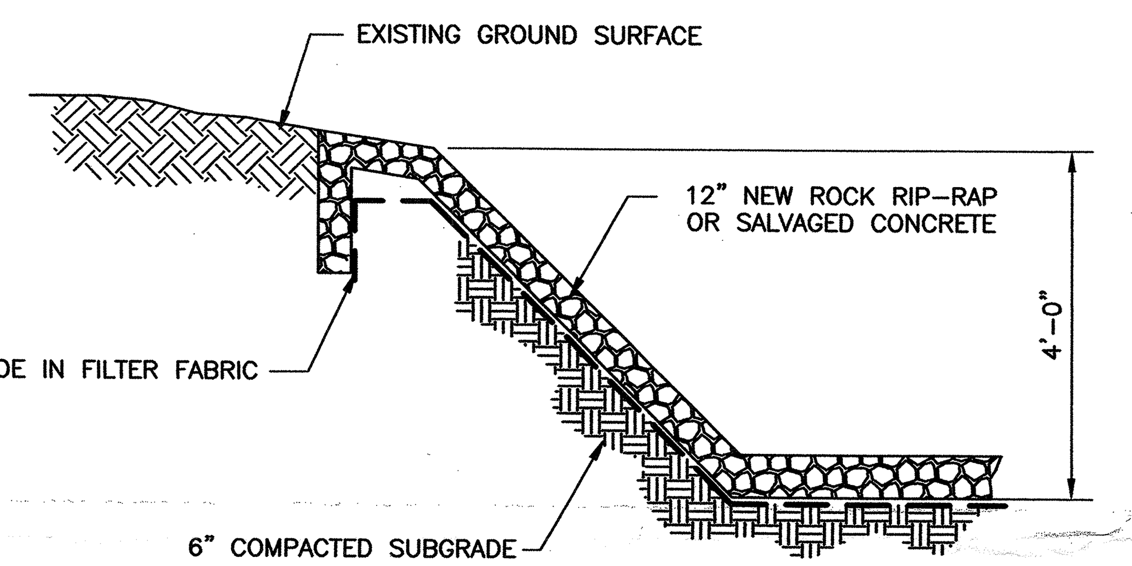
DRAINAGE STRUCTURE

DETAIL C
SCALE 1" = 40'
C-1



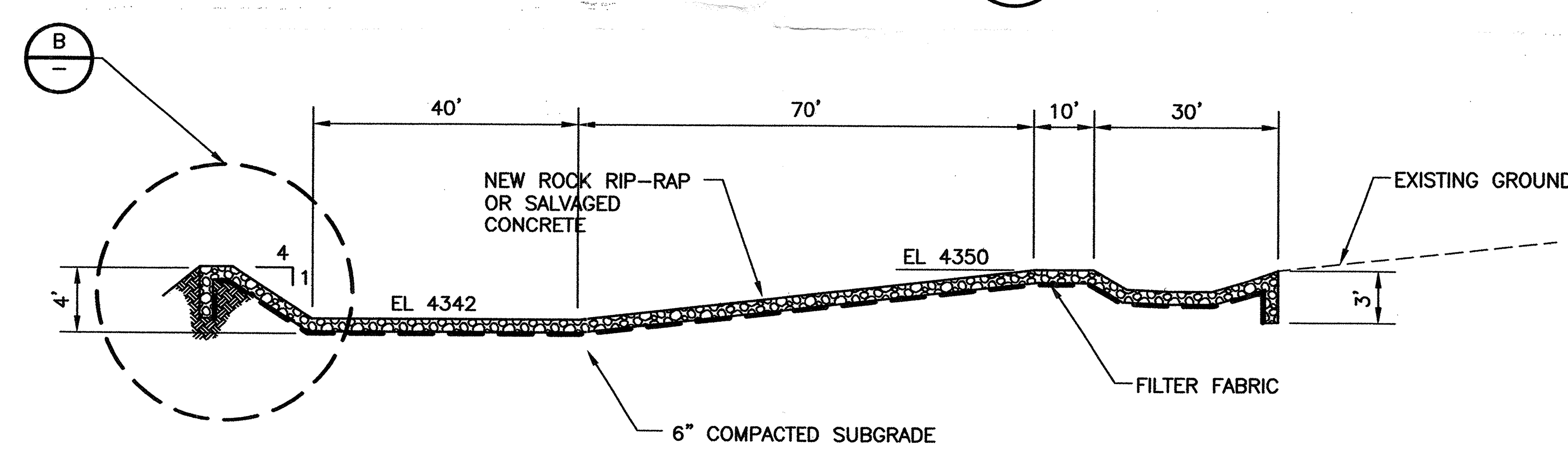
TYPICAL @ ALL ROAD CROSSINGS

SECTION 2
SCALE: 1"=20'

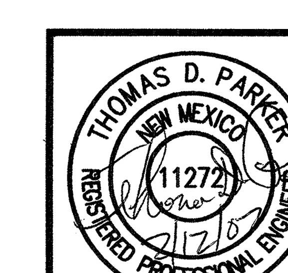


TYPICAL SALVAGED CONCRETE CHANNEL

DETAIL B
NTS



SECTION 1
SCALE 1" = 40'

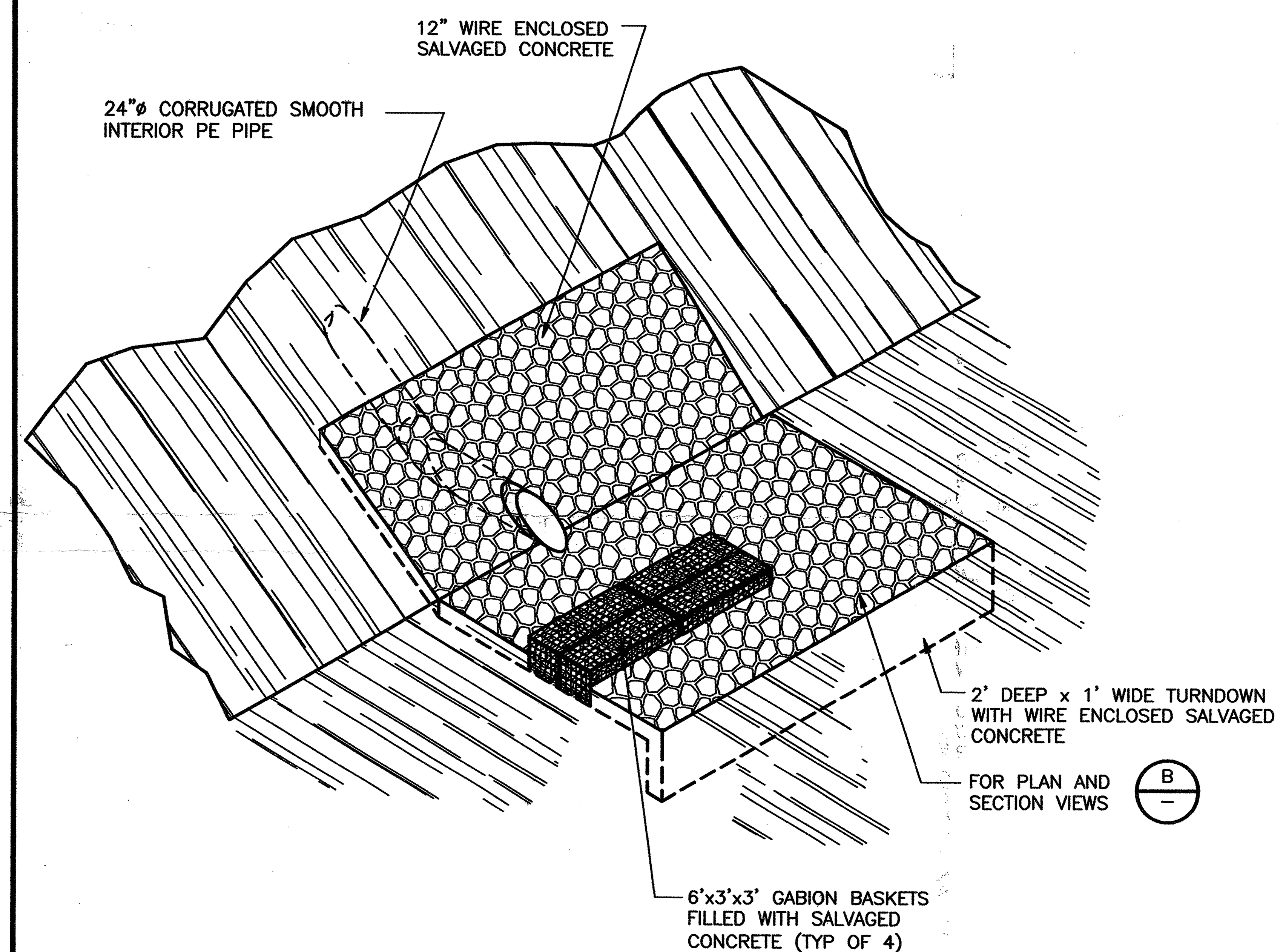


S:\8501\41913\sheets\ CSTDDTC2 07/29/04 10:48 palmerrs XREFS: x-border, xtbcdmlogo, CGRAPL01, x-survey, X-DESIGN, x-border22X34

CDM
consulting. engineering. construction. operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

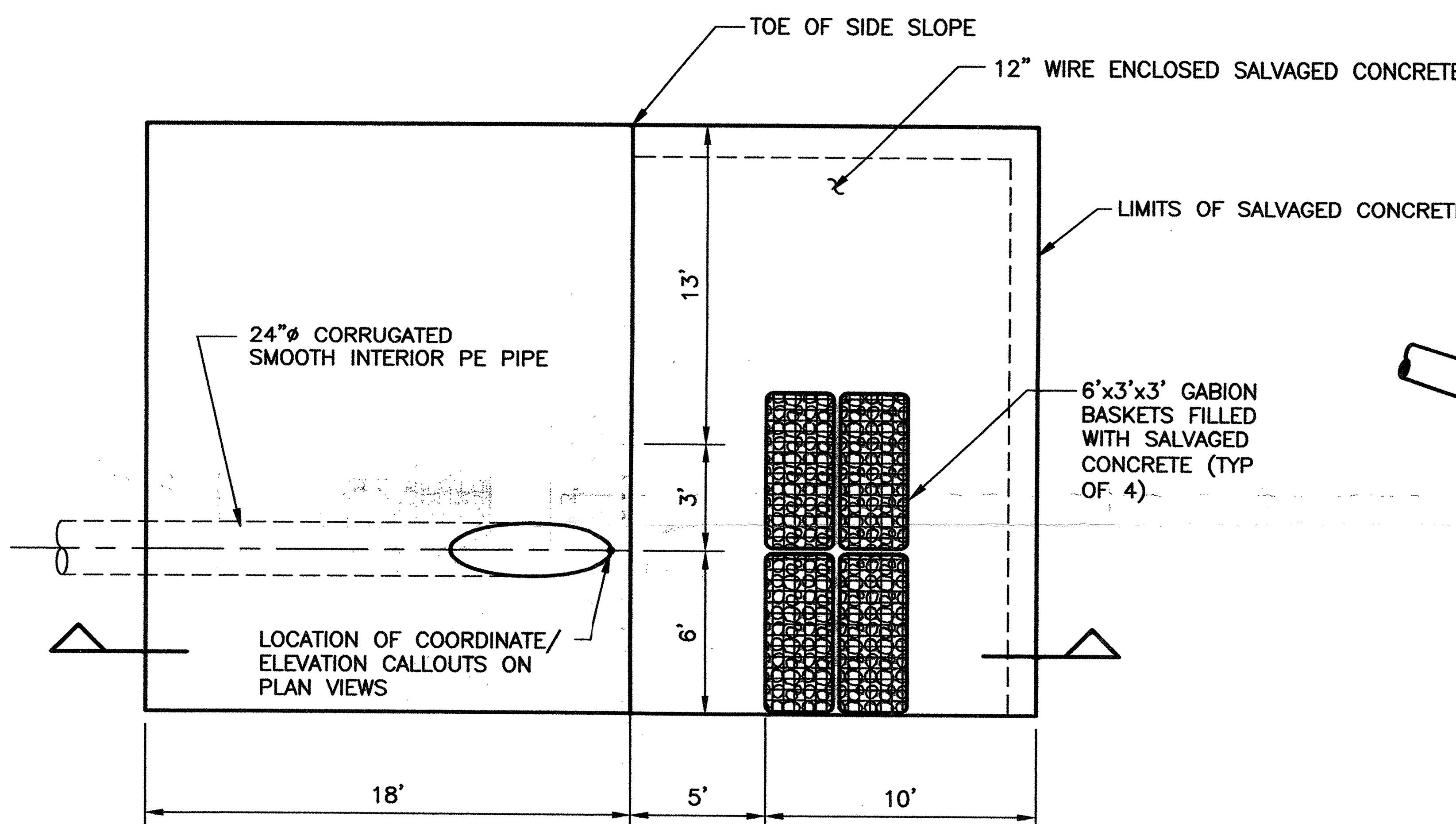
PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Sheet No. CD-2
SITE DETAILS – 2

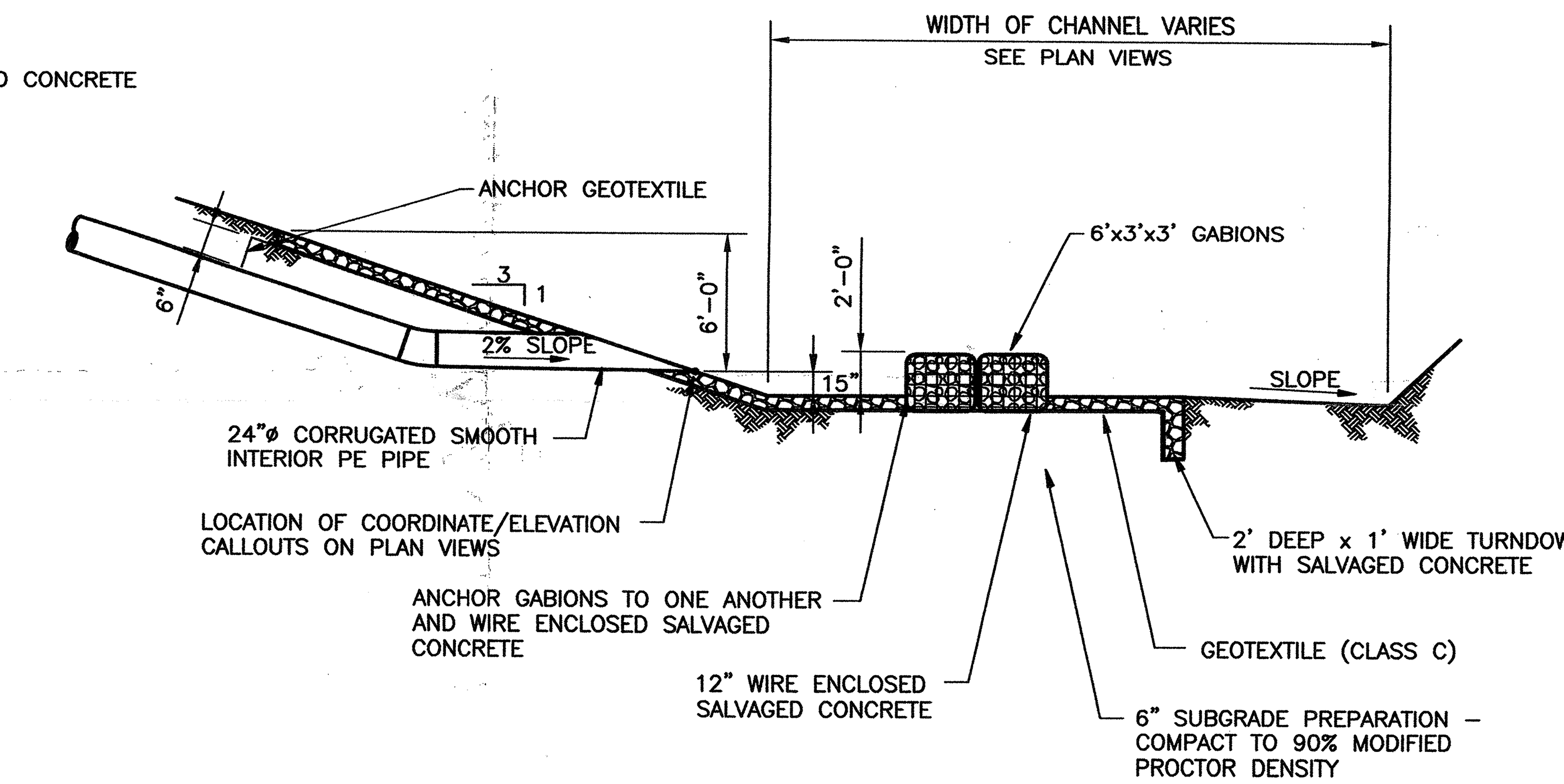


DOWNDRAIN OUTLET

DETAIL A
NTS
C–1



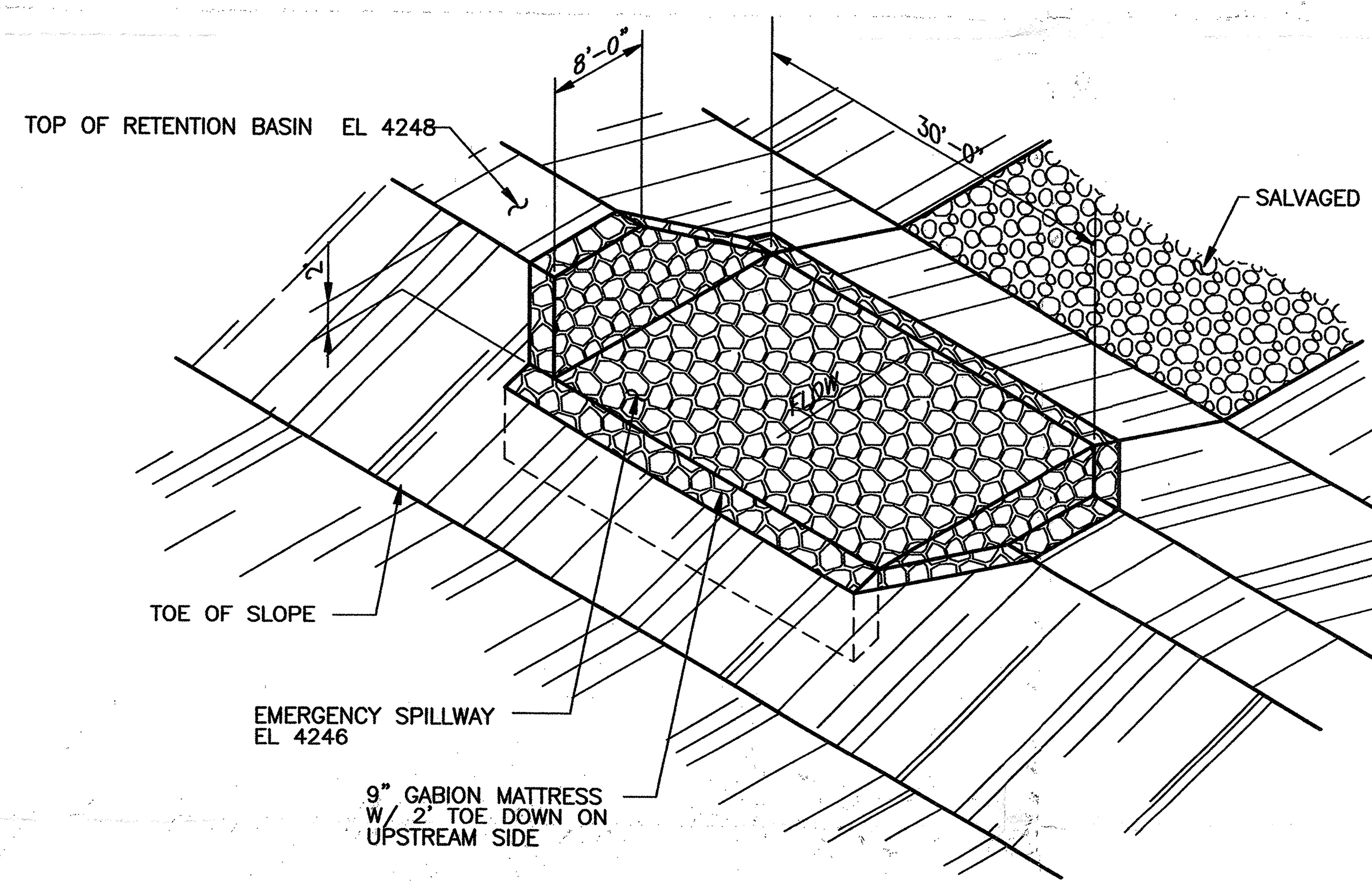
PLAN



SECTION

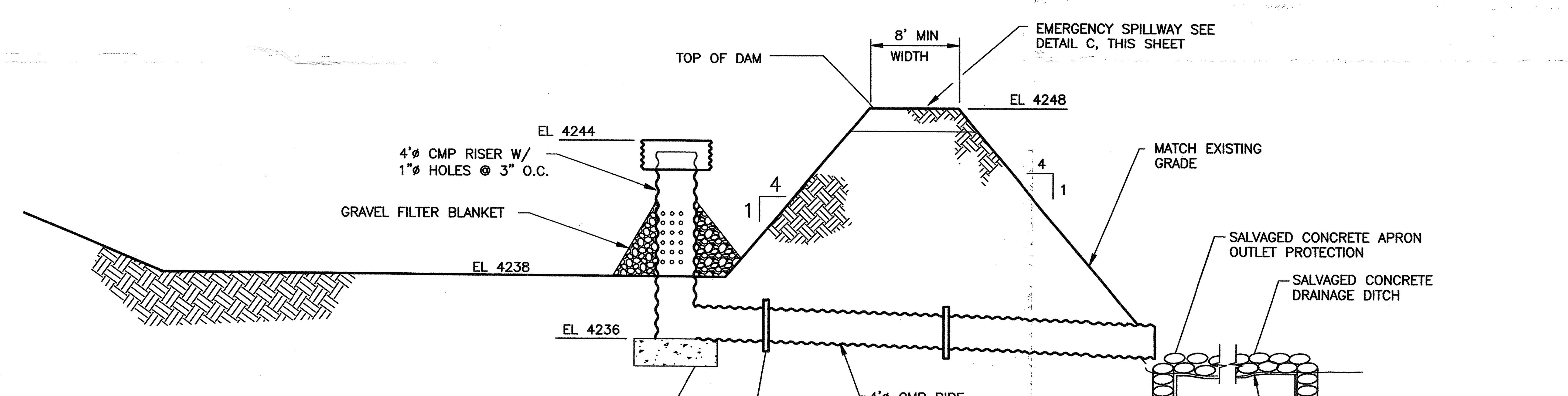
DOWNDRAIN OUTLET

DETAIL B
NTS
–



EMERGENCY SPILLWAY

DETAIL C
NTS
C–1



NOTES:

1. SEDIMENT POND SHALL BE CLEANED OF SILT ON A YEARLY BASIS, OR WHEN SILT ACCUMULATION REACHES 4 FEET, WHICH EVER OCCURS FIRST.
2. ALL FILL MATERIAL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY

SEDIMENTATION POND

DETAIL D
NTS
C–1

THOMAS D. PARKER
NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER

CDM
consulting . engineering . construction . operations
4110 RIO BRAVO DRIVE, SUITE 201
EL PASO, TEXAS 79902
TEL: 915 544-2340 FAX: 915 544-1345

PUBLIC WORKS
City of Las Cruces
NEW MEXICO

Sheet No. CD–3
SITE DETAILS – 3

S:\8501\41913\sheets\ CSTDDTC3 07/29/04 08:11 palmerrs XREFS: x-border, xtbadmlogo, x-border22X34