

**ADDENDUM NO. 2
CITY OF SANTA FE
BID No. '17/09/P**

**METHANE ASSESSMENT AND SITE PLAN
PASEO DE VISTA CLOSED LANDFILL
August 2, 2016**

TO ALL PROSPECTIVE BIDDERS:

Receipt of this Addendum must be acknowledged on the Bid Form.

GENERAL:

1. The bids are due 2:00 pm local time, on September 1, 2016 at City of Santa Fe, Purchasing Office, 2651 Siringo Road, Bldg. H, Santa Fe, NM 87505, (505) 955-5711.

REQUEST FOR BID DOCUMENTS/QUESTIONS AND ANSWERS:

Question: Did the New Mexico Environment Department (NMED) ever issue a Notice of Violation(S)/Compliance Report(s) related to the probes and landfill gas?

Answer: NMED only issued a Methane Exceedance letter, (see attached)

Question: Does the City have as built documents for the four monitoring probes?

Answer: The as built design can be found within the Post Closure Plan.

Question: Can the City provide previous probe monitoring results?

Answer: We will provide three years of monitoring results, (see attached)

Question: Does the City have design information for the landfill such as based grades, limits of fill?

Answer: Some of this information can be found within the Post Closure Plan.

Question: Does the City have closure cap design information?

Answer: The as built design can be found within the Post Closure Plan.

Question: Does the City have any previously prepared landfill gas generation models?

Answer: No

Question: What is meant by the term Landfill H-4 mentioned on page 3 of the RFP?

Answer: This was a typo it should have been CH-4 which is meant as Methane Gas

Question: Can the City provide the Exceedance Letter dated 4/20/16?

Answer: Yes see attached

Attachments: Post Closure Care Plan
Exceedance Letter dated 4/20/16
Three years monitoring results (Reports)

Santa Fe Landfill (OLD)
(Paseo de Vista)
Closure Plan – Folder 1 of 2
Santa Fe County



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1

Section One

1.0 INTRODUCTION

The closure of an active disposal site is currently regulated by both federal and state statutes. The federal legislation for solid waste management, including closure and post closure activity, is covered by the Resource Conservation and Recovery Act (RCRA), enacted in 1976. The United States Environmental Protection Agency (USEPA) issued the Subtitle "D" regulations in October 1991. Subtitle "D" establishes the criteria for municipal solid waste (MSW) landfills with respect to:

- Location restrictions;
- Facility design and operation;
- Groundwater monitoring requirements;
- Methane gas monitoring requirements;
- Closure requirements;
- Post-closure requirements.

The State of New Mexico solid waste management regulations (SWMR-4) present the general format for closure plans, and requirements for the long-term care and post-closure activities.

This document presents the city's plans for closure and post-closure of the City of Santa Fe Landfill.

2.0 HISTORICAL BACKGROUND

2.1 Age and Waste Inventory

The existing City of Santa Fe Landfill is owned and operated by the City and began receiving solid waste in 1969. It is located on approximately 110 acres of land in the northwest part of the city, bounded by the Arroyo de las Trampas to the north, Buckman Road to the east and Paseo de Las Vistas to the south. See Figure 2-1 for a location map. Since the landfill occupies a long and narrow parcel which slopes from Paseo de las Vistas down to the Arroyo de las Trampas, the method of operation has relied primarily on filling the wedge-shaped space between the road and the arroyo. Over the years of operation, solid waste has been placed in these "wedges" along the slope which results in a thick layer of waste near the arroyo, decreasing in thickness as it approaches the road. In the past few years, due to diminishing virgin land on which to place solid waste, the City has excavated deep waste disposal trenches. These pits have enabled the City to extend the life of the landfill until a new Regional landfill is opened.

Recent subsurface work performed at the landfill, including a seismic refraction survey and borings through the solid waste, has indicated that the depth of solid waste in the landfill varies from 60 feet to 3 feet deep. The total volume of solid waste in the landfill is uncertain, since scales have only been used since 1989 to record incoming loads. Annual estimates of incoming waste prior to 1989 were made through a calculation of Santa Fe population and daily per capita waste generation rates. (See Table 2-1.) After the pre- and post-1989 figures were totaled, an in-place compaction of 1,000 pounds per cubic yard was assumed and a 10 percent volume addition for daily cover was included. The total waste inventory is approximately 5,621,000 cubic yards.

2.2 Subsurface Investigations

A subsurface investigation was performed at the existing landfill in the autumn of 1994. Holes were bored through the trash and samples recovered to determine the moisture content of the waste and of the soil for up to ten feet below the waste/soil interface. Such moisture content tests will indicate the extent of leachate accumulation in the waste and soil layers.

The soil beneath the waste was also tested for hydraulic conductivity, grain size distribution, and Atterberg limits. The native soil beneath the landfill was classified as a silty sand (SM) to a poorly graded sand (SP) with an average moisture content of approximately six (6) percent by weight. The hydraulic conductivities for this material ranged from 4.06×10^{-5} cm/sec to 5.3×10^{-5} cm/sec. The relatively low moisture content values measured where the native soil contacts the refuse is indicative of natural conditions and does not indicate large quantities of leachate accumulation.

There are currently three groundwater monitoring wells adjacent to the landfill. The depth to groundwater beneath the landfill ranges from 247 feet to 340 feet. The regional groundwater flow is in a north to northwesterly direction. The local groundwater flow is in a northerly direction. See Figure 2-2 for the location of various borings, vents, wells, and groundwater flow direction.

The soil at the base of the landfill was also analyzed for inorganic and organic constituents typically found in leachate. Indicators of leachate (nitrate, chloride, and ammonia) were minimal or not detected. A copy of the subsurface investigation report is included in Appendix A.

Table 2-1 Schedule of Landfill Receipts (Tons/Year)			
Year	Estimated Amount	Year	Estimated Amount
1968	0	1982	90,600
1969	73,000	1983	91,900
1970	74,400	1984	93,300
1971	75,700	1985	94,600
1972	77,000	1986	96,000
1973	78,400	1987	97,300
1974	79,800	1988	98,700
1975	81,000	1989	100,000
1976	82,500	1990	101,400
1977	83,800	1991	102,700
1978	85,200	1992	104,000
1979	86,500	1993	105,400
1980	87,900	1994	106,800
1981	89,200	1995	108,100
		TOTAL	2,445,200



Section
Three

3.0 CLOSURE

3.1 Introduction

A closure plan for an active disposal area is intended to ensure that the following criteria are met:

- That the landfill is closed according to applicable federal, state and local regulations.
- That the appropriate controls are in place for the minimization/management of leachate, landfill gases, and stormwater.
- That the approved final land use for the area is achieved.

These closure criteria are successfully met through the application of such design considerations as:

- Final cover contours
- Selection of appropriate cap system
- Design and construction of adequate stormwater collection and conveyance system
- Design and construction of gas mitigation and management system

The following sections present a discussion of these items, and provide the basis for the closure plan for the City of Santa Fe Municipal Solid Waste Landfill which will meet the criteria set forth in the New Mexico Solid Waste Regulations (SWMR-4), Part V: Closure and Post - Closure Requirements.

3.2 Final Cap

3.2.1 Cap System Design

The final cap is designed to protect the landfill from wind and water erosion. In addition, the final cap is designed to minimize infiltration of moisture through the solid waste layers. The final cap for the City of Santa Fe Landfill, designed to meet the New Mexico Solid Waste Regulation requirements, consists of the following (listed in order from bottom to top):

- A layer of daily cover soil consisting of native soils, varying in depth from six to twelve inches, to prepare the final lift of solid waste for capping.
- An 18-inch layer of soil with a permeability less than or equal to 1×10^{-5} cm/sec;

- A final 6-inch protective layer of native soil intermixed with chipped green waste, capable of sustaining plant growth;
- A layer of stones or cobbles, or other material, will be placed on the soil to protect against wind erosion;
- A seed mix of native species will be used to seed the top layer of soil prior to placement of the stones.

A profile of the cap design is shown in Figure 3-1.

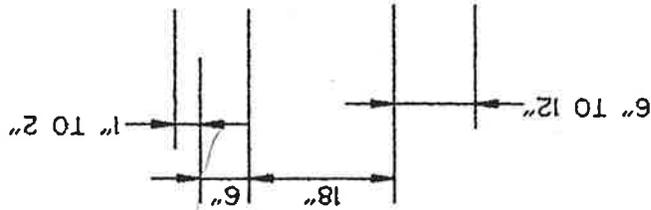
The City will use soil from the north side of the Arroyo de las Trampas for the 18-inch layer of low permeability soil. This soil has been tested for permeability and meets the minimum regulatory requirements. See Appendix A for soil test results. The eighteen inches of 1×10^{-5} cm/sec. material will be transported with a scraper or belly dump truck and the material will be spread using a dozer. The material will then be compacted using a sheepsfoot roller. A water truck will provide water to achieve the specified compaction.

A vegetative cover is critical to maintaining the integrity of the final layer, protecting it from excessive wind and water erosion. Cover vegetation with a shallow root system is preferable to hold the final layer in place because the roots will not penetrate the infiltration layer below, thus violating the integrity of the cap. The six-inch vegetative cover will be a mixture of soil (4 parts), sludge (1 part), and wood chips (2 parts). The decontaminated sludge will be transported from the wastewater treatment plant to the landfill and placed in an area where it will be mixed with the soil and wood chips. The wood chips are generated from the Maxi-grinder machine at the landfill which chips all wood waste brought to the landfill. The six-inch vegetative cover will be placed using a dozer and evenly spread over the eighteen inches of low-permeability soil.

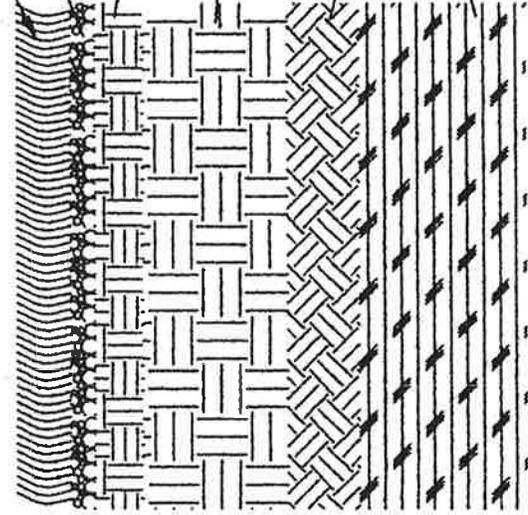
A mix of drought resistant vegetation will be established at the site and a layer of gravel will be placed over selected areas for wind and water erosion protection. A geosynthetic erosion control fabric consisting of curled wood excelsior sandwiched between biodegradable plastic mesh could be substituted for the gravel layer. After the six-inch vegetative cover soil has been placed, seeds will be drilled to a depth of 1/2 inch. The distance between the drilled furrows not be more than eight inches. All seeded areas will be mulched using hay at a rate of 2.5 tons per acre. The seed mix and planting rate to be used are as follows:

<u>Species</u>	<u>Pounds Pure Live Seed per Acre</u>
Blue Grama	2.0
Sideoats Grama	4.0
Galleta	3.0
Western Wheatgrass	4.0
Blue Flax	1.0
Firewheel	1.0
TOTAL	15.0

No fertilizer will be required. Seed will be planted July 1 through August 31. A dump truck will deliver the gravel to the site and a dozer will apply it evenly over the vegetative layer as an



NATIVE GRASSES
 EROSION PROTECTION LAYER *Stone layer*
 VEGETATIVE LAYER *typical*
 SOIL LAYER W/ 1×10^{-5} cm/sec PERMEABILITY
 INTERMEDIATE COVER
 REFUSE



CITY OF SANTA FE

LANDFILL CLOSURE SOIL CAP

erosion control measure. If the erosion control fabric is used in place of the gravel, it will be delivered to the site in rolls, unrolled across the vegetative layer, and secured using fasteners.

3.2.2 Final Cover Contours

An optimum final cover contour plan must balance the following factors: It must provide an adequate depth to final cover material while conforming to the existing topography wherever feasible to minimize soil volume requirements; it must employ cross- and side-slopes in accordance with regulatory requirements, minimizing erosion potential and maximizing stormwater runoff.

New Mexico solid waste regulations require final contours to have a minimum slope of 2 percent and a maximum slope of 25 percent. This range is used to promote surface water runoff while minimizing erosion. The slopes across the top of the closed City of Santa Fe Landfill have been designed between 2 and 5 percent. However, a portion of the existing sideslopes, particularly along the Arroyo de las Trampas exceed the maximum sideslope requirement of 25 percent. In a letter report to NMED dated July 18, 1995, three options were studied which address the violation of the sideslope criteria:

- (1) Relocation of the Arroyo de las Trampas;
- (2) Relocation of the waste material;
- (3) Existing slopes to remain, with erosion control measures

Due to the excessive engineering and construction expense of Options 1 and 2, and the potential health and safety dangers posed by option 2, the NMED was petitioned in the letter report to grant a variance on the sideslope requirement to allow for the implementation of option 3 (see Appendix B for letter report).

To date, no final cap has been placed over any part of the landfill. The proposed final contours are shown in Figure 3-2. The contours represent the top of the intermediate cover prior to installation of the 24-inch final cap. Should the regional landfill opening be delayed, an additional 10 foot lift would be placed across the southwest portion of the landfill (see Figure 3-2).

3.3 Stormwater Collection and Conveyance System

The AHYMO Method was used to determine the volume and peak stormwater flows generated from the drainage basins across the closed landfill site, and to analyze the flows in the Arroyo de las Trampas.

To minimize travel distance and velocity of stormwater across the closed landfill, and control erosion, the surface is divided into four smaller drainage areas. Each area slopes to swales which convey the stormwater to strategically-placed down-drain structures along the bank to the Arroyo de las Trampas. The arroyo will be armored with rip rap along the toe of the landfill to

minimize erosion, and special outlet structures will convey stormwater from the down-drains into the arroyo (see Figure 3-3).

3.4 Gas Control

Landfill gases are generated at most landfills in sufficient quantities to present a potential gas migration problem. If these gases are not managed properly, they could migrate laterally across subsurface soils until they reach the atmosphere. The gases could migrate harmfully close to populated areas, vegetative areas, or buildings. Methane gas, a common component of landfill gases, can destroy vegetation by displacing the oxygen from the plant's root zone. Landfill gases can also accumulate in underground pockets in quantities great enough to cause distortion, or worse, failure of the landfill capping system.

*need additional
exploratory
wells when
ground up*

Four gas monitoring wells were installed along the perimeter of the site. See Figure 3-4 for a detail of the gas monitoring well. These wells and buildings within 500 feet of the limits of waste will be monitored regularly during the post-closure period as discussed in Section Four. All buildings on the landfill will be removed in conjunction with the closure.

3.5 Landfill Security

As of this date, the final land use planned for the closed landfill will be as open space. Surrounding the existing site is a 6-foot high chain link fence topped with barbed wire. A portion of this fence along Paseo de las Vistas will be replaced with a 4-foot high wood fence. The wood fence complements the residential nature of the neighborhood and still prevents vehicle access to the landfill. Limited access will be provided to hikers and for post closure inspection activities.

3.6 Schedule of Closure Activities

The City of Santa Fe plans to stop accepting solid waste by December 31, 1996, when the new Santa Fe regional landfill is scheduled to open. A schedule of closure activities is shown on Figure 3-5.

3.7 Final Land Use

The final land use, as approved by the City of Santa Fe Council, is open space. In the future, the council may approve alternative uses for the site. All future use plans will be submitted to NMED authorities for review, comment and approval.

"Stonehenge" site

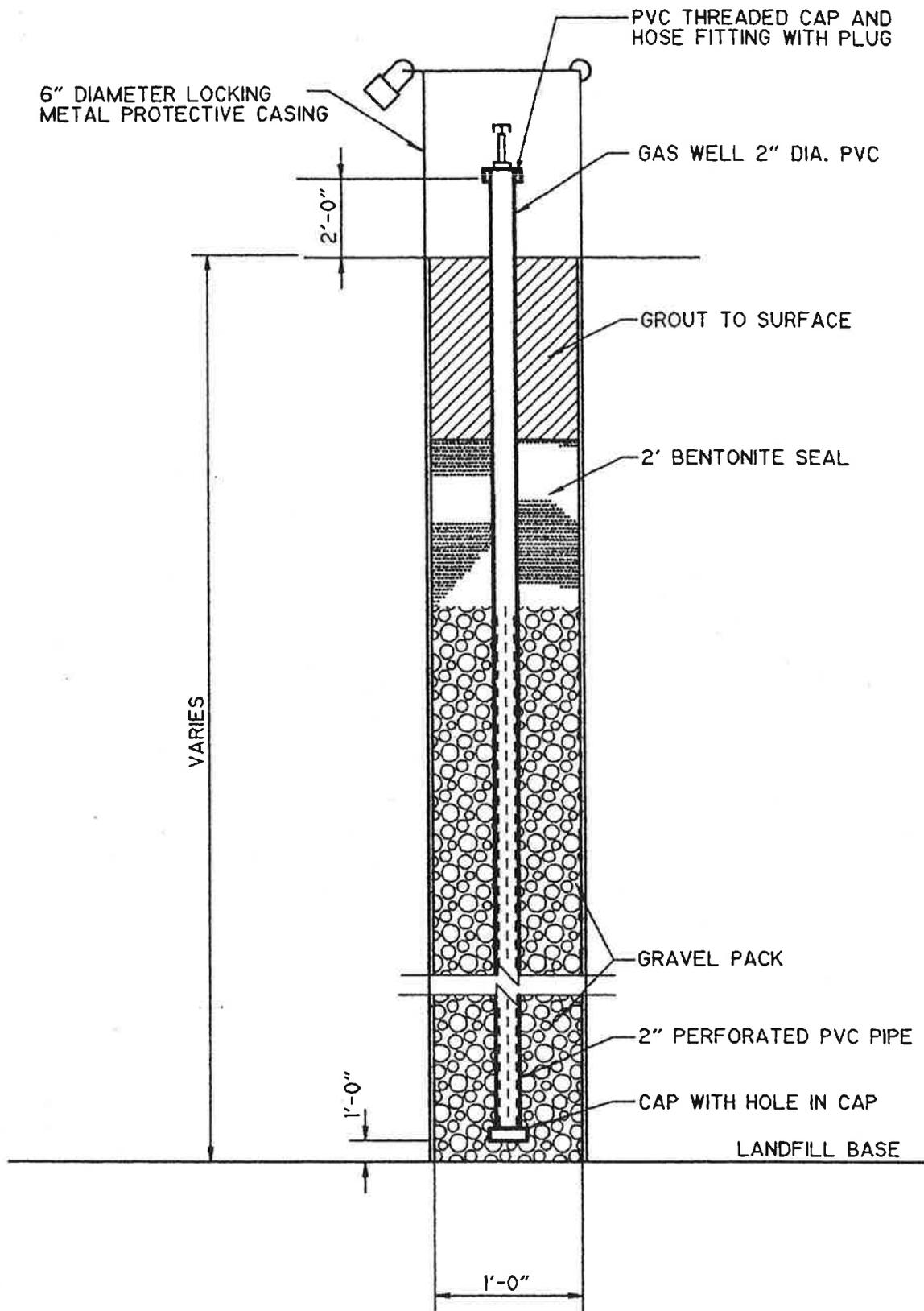
M. KUEHN

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FIG 3-4

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CITY OF SANTA FE LANDFILL

TYPICAL GAS MONITORING WELL



environmental engineers, scientists,
planners, & management consultants

Figure No. 3-4

4

Section
Four

4.0 POST-CLOSURE

4.1 Introduction

Post-closure care of the closed landfill is necessary to maintain the integrity of the final cap, to monitor the groundwater quality and to monitor methane generation. Post-closure care will be conducted for 30 years, unless reduced by the Secretary of the NMED.

The primary elements of this post-closure plan are:

- Inspection and maintenance of final cover
- Inspection and maintenance of stormwater control structures
- Adherence to gas monitoring program
- Adherence to a groundwater monitoring program

The following is a summary for each post-closure item.

4.2 Inspection and Maintenance of Final Cover

The entire site will be inspected quarterly for the 30-year post-closure period. Formal inspection records will be retained for examination. In particular, the final cover will be inspected for damage from settlement, wind and water erosion, or any other events. These inspections will be particularly critical following major storm events in the area, and will be conducted in addition to the regularly scheduled inspections. If damage is discovered, repairs such as regrading, stabilizing or revegetating will be made immediately to the affected area.

Fencing around the site will be maintained, and any trails through the site will be minimized. Trail inspection and repair will be included as a part of the inspection program.

4.3 Inspection and Maintenance of Stormwater Control Structures

Stormwater control structures will be inspected concurrently with the cover system. Stormwater control structures will be inspected for damage due to erosion, settlement and reduction in flow capacity due to the deposition of sediment and debris. Damaged areas will be identified, repaired as necessary, and noted on the inspection report.

4.4 Inspection and Maintenance of Leachate Collection System

The City of Santa Fe landfill does not have a leachate collection system. The results of the subsurface investigations, as shown in Appendix A, indicate that leachate generation is negligible. Therefore, no measures will be taken to collect leachate.

4.5 Groundwater Monitoring Program

The City of Santa Fe landfill has three groundwater monitoring wells at the site. Two existing groundwater monitoring wells are located downgradient (MW-2, MW-3) and will be used to detect groundwater problems at the site. Although an existing monitoring well (MW-1) is located upgradient to the existing landfill and has supplied background data for the facility in the past, it is too close to the old Frank Ortiz Landfill to be reliable and an additional upgradient well will be installed. If contaminants are detected in the groundwater at the existing downgradient monitoring wells, an additional downgradient monitoring well will be installed. Existing groundwater monitoring well locations are shown on the Final Grading Plan Drawing in Figure 3-2. A groundwater monitor well detail is shown in Figure 4-1.

All monitoring and testing parameters will follow the requirements of Section 803, and 804 of Part VIII of the NMED Solid Waste Regulations (SWMR-4). Given the background data obtained from the existing monitoring well, the post-closure monitoring program will address the detection monitoring requirements of Section 804. The monitoring wells will be inspected as a part of the site inspections, and if maintenance of the monitoring wells is required, it will be carried out immediately.

4.6 Gas Monitoring Program

Methane gas generation and migration will be monitored on a quarterly basis for the first two years following closure, thereafter semi-annually (depending on test results) using a combustible gas meter. The four gas monitoring wells installed at the perimeter of the site will be monitored as part of the overall monitoring program. A complete record will be kept of all gas monitoring activity and results. The gas monitor wells will be inspected for damage and repaired as necessary. Damaged gas monitor wells and necessary repairs will be noted on the inspection report and repaired immediately.

If methane concentrations greater than twenty-five percent (25%) of the lower explosive limit (LEL) for the gases are detected within the facility, or if the concentrations of methane gas exceed the lower explosive limit for the gases at the facility boundary, the following measures will be taken:

- Notify the Secretary of NMED and take immediate steps to ensure protection of public health, welfare and the environment;
- Within seven (7) days of detection, record methane gas levels and submit description of steps taken to protect public health, welfare and the environment to the Secretary;

- Within 60 days of detection, implement a remediation plan for the methane gas releases and notify the Secretary that the plan has been implemented.

4.7 Final Land Use

It is proposed that the closed landfill be returned to open space status. By restricting landfill access to foot traffic, a final cap consisting of a 24-inch protective layer of soil and native vegetation which meets state regulations can be installed. If the City of Santa Fe selects another land use in the future, such as soccer or baseball fields, the proposal will be submitted to NMED authorities for review, comment, and approval. A future "active" use plan may require the installation of an irrigation system, or the strengthening of the final cover with additional soil layers, or the addition of a synthetic liner. All such revisions to the plan would be submitted to the NMED.

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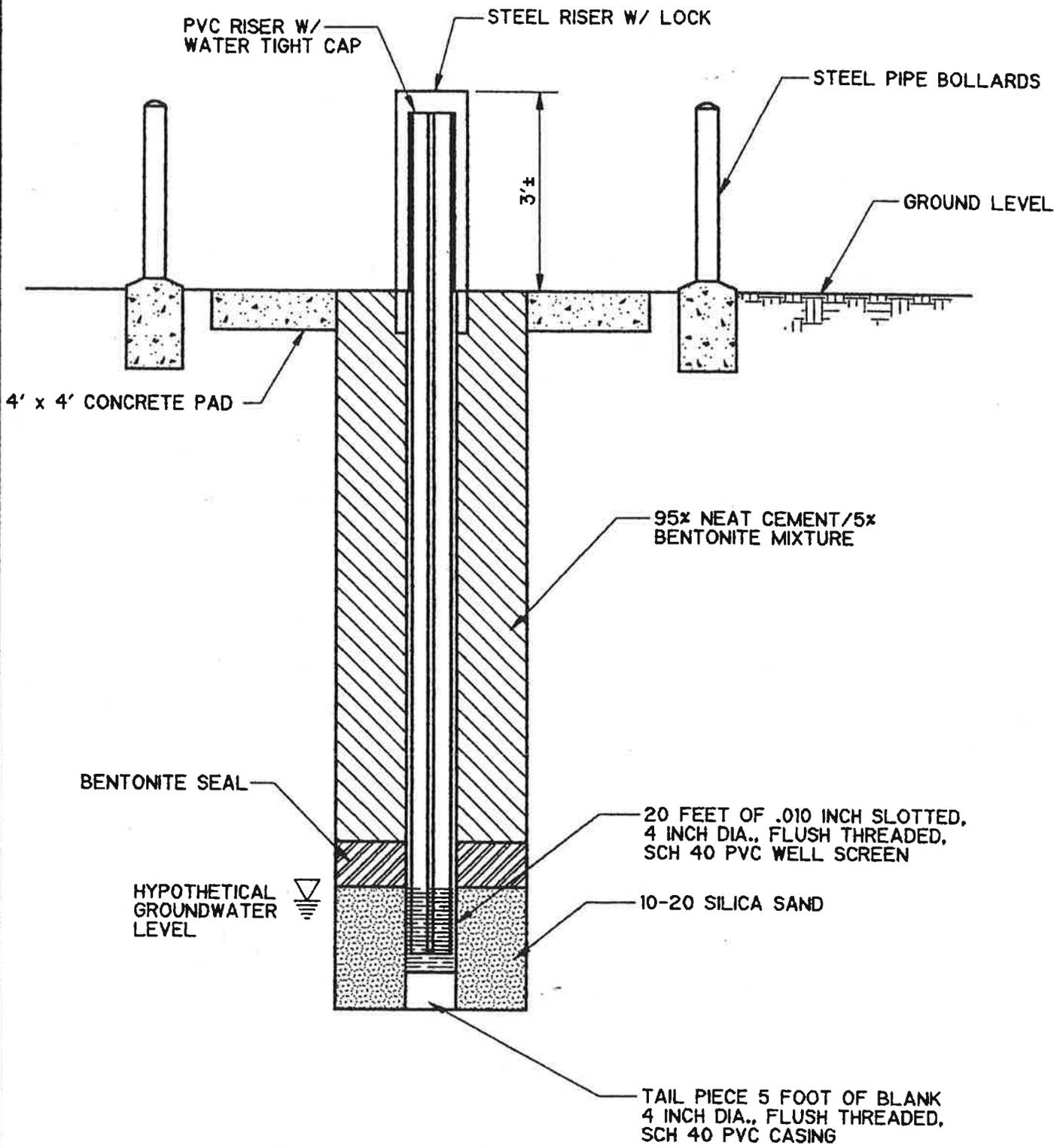
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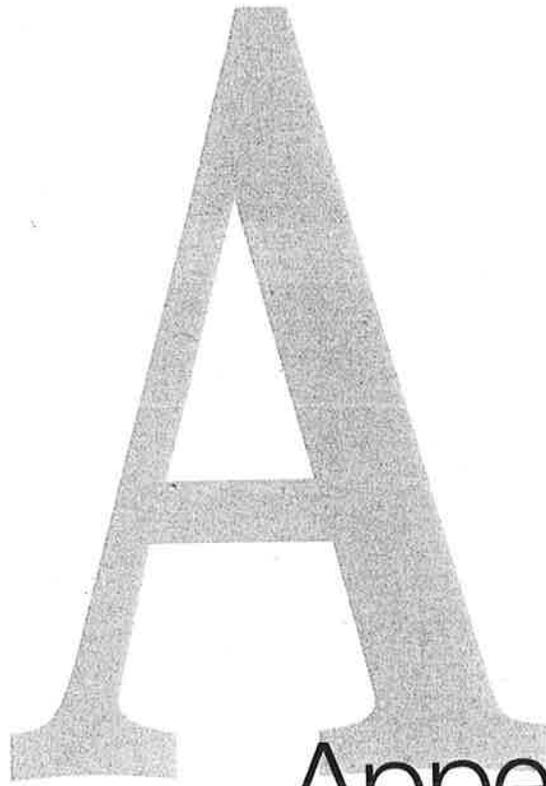
FIG4-1

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CITY OF SANTA FE LANDFILL

TYPICAL GROUNDWATER MONITORING WELL



Appendix
A

**APPENDIX A
SUBSURFACE INVESTIGATION REPORT**

CITY OF SANTA FE LANDFILL
CLOSURE - SUBSURFACE INVESTIGATION

AUGUST 1995

CDM Project No. 1257-121-CP-CPLAN

Prepared For:

City of Santa Fe
Environmental Services Division
P.O. Box 909
1142 Siler Road
Santa Fe, New Mexico 87504-0909

Prepared by:

Camp Dresser & McKee Inc.
2400 Louisiana Blvd NE
AFC #5, Suite 740
Albuquerque, New Mexico 87110
(505) 881-3077

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- B SHALLOW SEISMIC REPORT
- C MATERIALS TESTING ANALYSIS DATA
- D SOIL CHEMISTRY ANALYSIS DATA

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The City of Santa Fe's Municipal Landfill is nearing final phases of use and has been subjected to characterization and assessment pursuant to the New Mexico Solid Waste Management Regulations (NMSWMR). Camp Dresser & McKee Inc. (CDM) has been under contract with the City to complete a subsurface investigation at the City of the Santa Fe Landfill. The subsurface investigation was conducted to characterize subsurface conditions and provide information on the potential for generation of leachate at the base of the landfill and thickness of landfill material which will subsequently provide design criteria for landfill closure activities.

This report describes the physical setting of the City of Santa Fe Landfill and the investigative methods used. Data collected during the advancement of test borings, gas monitoring well installation, soil chemical analysis, geotechnical soils analyses and the seismic investigation are used to define the subsurface in the vicinity of the landfill.

1.2 GENERAL DESCRIPTION OF STUDY AREA

The City of Santa Fe Municipal Landfill is presently an active landfill facility located in Sections 15 and 22, Township 17 North, Range 9 West, Santa Fe County, New Mexico. The site is developed with three landfill operational structures: a scale house, maintenance facility, and an office support facility.

To the northwest of the landfill and oriented northwest to southwest is the Arroyo de las Trampas which is considered to be a major watercourse. Private residences are located in the hills surrounding the landfill. Frank Ortiz Park, an abandoned (closed) landfill is located directly northeast of the municipal landfill.

1.3 PREVIOUS WORK

During the Preliminary Site Assessment (PSA) conducted during the Spring of 1993, nine soil borings were advanced in which three borings were subsequently completed as compliance groundwater monitoring wells. These wells were installed to determine the background and

downgradient groundwater quality and flow direction beneath and immediately surrounding the landfill area. Groundwater analyses were conducted on samples from wells and were utilized to determine that groundwater quality had not been affected by the landfill. Semi-annual groundwater sampling events are currently being conducted on the compliance monitoring wells. Groundwater analyses indicate high concentrations of various metals. These high metal concentrations are considered to be naturally occurring.

H₂O levels have dropped in MW-1 & MW-2

The groundwater levels occur above the screened intervals in downgradient monitoring wells MW-2 and MW-3. This condition, supported by the original water levels measured when the wells were initially installed, suggests the presence of a semi-confined aquifer. This observation is supported by recognizing that the calculated groundwater elevations are not consistent with the regional northwesterly groundwater flow direction reported by Mourant (1980). The current groundwater elevations are identified to be in the range of 245 feet to 345 feet below surface grade.

flow now is to the N.

(depth)

The soils physical properties were identified through geotechnical materials testing performed from the soil retrieved from the soil borings. The soils testing included in the collection of Atterberg Limits, moisture content, total organic carbon, (TOC), grain size analyses, and hydraulic conductivities.

2.0 AREA AND SITE HYDROGEOLOGY

The landfill area is physiographically situated within the southern margin of the Espanola Basin. The Espanola Basin is a north-to-northwest trending and plunging, asymmetric faulted synclinal sag (Baltz,1978), filled to an undetermined depth with semi-consolidated to unconsolidated Tertiary and Quaternary age sediments. The Espanola Basin is one of the series of basins that constitute the Rio Grande depression of New Mexico and Southern Colorado.

The southern margin of the Espanola Basin is defined by several physical features. To the south, the basin is bounded by the Cerrillos uplift. The La Bajada Fault trends northwest across the southwestern edge of the basin. The La Bajada Fault and the sequence of faults surrounding it have uplifted the Espanola Basin relative to the Santo Domingo Basin to the south (McAda & Wasiolek, 1988).

The Santa Fe Group of sediments in the Espanola Basin area are comprised of the Tesuque, Puye and Ancha Formations of Tertiary age (Manley,1978). These formational units are unique to the Basin area, although the term Santa Fe Group is applied to basin fill deposits throughout the Rio Grande depression in central New Mexico.

The Tesuque Formation of the Santa Fe Group is the principal aquifer in the Santa Fe area. Tesuque sediments are composed of several thousand feet of pinkish-tan, soft, arkosic, silty sandstone and minor conglomerate and siltstone (Spiegel and Baldwin,1963). The Tesuque Formation was deposited mainly as coalescing alluvial fan deposits derived mainly from the highlands to the north and east. The thickness of the Tesuque sediments is unknown; however, is estimated to range from 4,000 to 10,000 feet in the deepest areas. The Tesuque sediments dip westward as much as 25 degrees along the west flank of the Sangre de Cristo Mountains and have a general westward dip of between 4 to 10 degrees throughout the eastern half of the basin.

The Ancha Formation of the Santa Fe Group is a Tertiary high pediment gravel deposited unconformably on the Tesuque Formation (Spiegel and Baldwin, 1963). The Ancha Formation is present at locations mainly south and west of Santa Fe as well as underlying the City itself. In general, the Ancha Formation can be described as pinkish-tan, angular to subangular, fine to coarse pebble gravels that are mostly derived from granite and are interbedded with minor amounts of silt and sand. The Ancha Formation is estimated to be approximately 300 feet thick.

In most areas, the Ancha Formation is above the water table and supplies little water to wells, though where saturated, it is generally a more permeable aquifer than the Tesuque Formation. Where the Ancha Formation overlies impermeable beds of the Tesuque Formation, perched water of limited extent may occur. The Ancha Formation is not hydraulically connected to the Tesuque Formation.

East of the Rio Grande and north of the Santa Fe River, groundwater enters the aquifer system mainly as mountain front recharge through fractured bedrock of the Sangre de Cristo Mountains, outcrops of the Tesuque Formation exposed along the edge of the mountains, and through permeable alluvium of stream beds draining those uplands (McAda,1988). Groundwater flows west-northwest through the Tesuque Formation to the Rio Grande. Most of the groundwater discharges to the Rio Grande as springs and seepage.

3.0 FIELD INVESTIGATION

In conjunction with the subsurface investigation, ten shallow investigatory borings were advanced within the area of the solid waste boundaries to depict the thickness of fill. Four landfill gas monitoring wells were installed outside of the solid waste boundaries to monitor potential gas which may be generated within the landfill. The locations of the boreholes and gas monitoring wells are indicated in the Site Plan (Figure 1).

Materials testing was conducted on selected soil samples retrieved from the boreholes to identify the soil's physical properties. Chemical analyses were performed on the collected soil samples to identify the in situ soil chemistry which may have elevated indicator parameters due to the possible presence of leachate. A site survey was completed at the site to establish the locations of the soil borings and the gas monitoring wells.

3.1 TEST BORINGS

In October 1994, ten shallow investigatory borings were advanced within the current landfill facility to determine the depth of the fill and to identify conditions which may indicate that if leachate has been generated at the base of the landfill. The test borings were drilled using a high-torque CME-75 hollow stem auger drill rig operated by Precision Engineering Inc. of Las Cruces, New Mexico. The borings were advanced using a 4-1/4 inch, inside diameter hollow stem auger.

Sampling of refuse material and underlying native soil material was accomplished using a combination of split spoon, California sampler and continuous sampling methodologies. Sampling and drilling tools were decontaminated prior to mobilization to the site, and between soil borings to prevent possible cross contamination of the samples. Solid waste was generally encountered from a depth of two (2) feet to a maximum of 49 feet below surface grade. Solid waste materials encountered were typical of municipal refuse and included construction debris and general household wastes.

Each boring was lithologically logged by a qualified CDM hydrogeologist as the drilling progressed based upon collected samples and auger cuttings, according to the Unified Soil

Classification System (USCS) ASTM D2487-84 (Visual-Manual Procedure). Graphical logs of these borings are provided in Appendix A.

In conjunction with borehole drilling, representative native soil samples (beneath the fill) were collected and submitted for geotechnical evaluation. Native soil samples were also collected and analyzed for inorganic and organic constituents typically expected to indicate the presence of leachate being generated from landfill waste material. Soils encountered beneath the landfill area were classified as silty to poorly graded sands (SM to SP) and in slightly moist condition. Upon completion of drilling and sampling, each boring was abandoned with a bentonite chip from the total depth of the boring to surface grade. Bentonite chips were placed through the auger as it was withdrawn, and then hydrated with potable water to minimize infiltration of meteoric waters.

3.2 GAS MONITORING WELLS

Four landfill gas monitoring wells were installed in selected areas around the existing landfill to monitor the possible migration of landfill gasses from within the landfill area (Figure 1). These wells, designated GV-10 through GV-13, were installed to depths of 15 to 80 feet below surface grade. The gas wells were constructed using 2-inch diameter, Schedule 40, flush-threaded PVC casing and 0.020 inch, factory-slotted well screen. The well screen and casing were connected by flush threaded ends without the use of glues or solvents. The annulus of each well was sand packed with clean 10-20 silica sand (approximately three (3) inches of filter pack surrounding the well screen) to a depth approximately two (2) feet above the well screen. A one (1) to two (2) foot thick well seal (bentonite plug) was installed immediately above the sand pack and hydrated using deionized water. Grout was placed immediately above the bentonite seal to approximately one (1) foot below the surface grade.

The PVC casing was installed approximately 2.5 feet above surface grade. Each well was secured with a two (2)-inch diameter locking plug and equipped with keyed-alike padlocks (keys are accessed through the landfill foreman). Steel standpipes were installed securing the surface access of the wells and mounted in a three (3) foot by three (3) foot, formed concrete pad. Well completion diagrams are provided in conjunction with the soil boring logs included in Appendix A. Well completion data for all newly installed gas monitoring wells are summarized in Table 3-1. No methane gas was detected during installation of the four wells.

Well No.	Total Depth	Screened Interval	Sand Interval	Seal Interval
GV-10	47	10 - 47	6 - 47	4 - 6
GV-11	80	20 - 80	11 - 80	9 - 11
GV-12	15	5 - 15	3 - 15	2 - 3
GV-13	29.5	5 - 29.5	3 - 29.5	2 - 3

3.3 SITE WELL/BORING LOCATION SURVEY

A gas monitoring well and soil boring location survey was conducted to establish horizontal locations of the newly-installed landfill gas monitoring wells and soil borings by Surveying Services of Santa Fe, New Mexico. Boring and well locations were surveyed to the nearest 0.01 foot and these coordinates are summarized in Table 3-2.

Description	Northing	Easting
LF-1	1707817.42	1721487.99
LF-2	1707302.67	1722081.01
LF-3	1708569.05	1722446.32
LF-4	1708305.43	1722779.69
LF-5	1709637.59	1723218.69
LF-6	1709297.67	1723628.01
LF-7	1710627.67	1724143.01
LF-8	1710374.33	1724580.29
LF-9	1710783.67	1724991.01
LF-10	NS	NS
GV-10	1708041.49	1723182.09
GV-11	1710022.38	1724350.42
GV-12	1708078.41	1721181.86
GV-13	1707191.22	1721143.58
NS - NOT SURVEYED		

4.0 SEISMIC INVESTIGATION

A shallow seismic refraction survey was performed at the City of Santa Fe Municipal Landfill by Charles B. Reynolds & Associates (Reynolds). The purpose of the shallow seismic survey was to aid in defining the natural alluvial strata/refuse contact beneath the landfill in conjunction with the soil boring investigation. The seismic survey consisted of the completion of two linear traverses, SFL-1 and SFL-2, totalling 6,120 feet in length (Figure 1). The shallow Seismic Survey Report can be reviewed in Appendix B.

The investigation utilized an EG&G Geometrics ES2401 multi-channel seismograph with 100-decibel dynamic range and frequency filters. The receiver array consisted of 12 Mark Products L-28A-1 8-Hz refraction geo-phones placed 20 feet apart. The seismic energy source utilized consisted of a patented, dropped soft-weight source.

The produced seismic data identified two (2) velocity zones are identified within the landfill itself. The first, shallowest layer averages approximately ten (10) feet thick, has a mean primary wave velocity of about 790 ft/sec, and is considered to be relatively uncompacted landfill material. The second, deeper layer varies from zero to about 55 feet in thickness, has a mean velocity of approximately 1,310 ft/sec, and is considered to be relatively more compacted landfill material. *> 9/2*

A third velocity layer was identified with a depth ranging from zero to 60 feet and was interpreted as probably natural alluvial strata underlying or outside the landfill material. This unit was measured to have a mean calculated velocity of about 2,490 ft/sec. This unit contains very good refractors and is considered to be essentially flat lying.

max 9/2 A buried ridge was identified at the base of the landfill and is interpreted to plunge, discontinuously, from a location in the northeast part of the landfill to the area of the office/scale house complex (to the south). To the northwest of the ridge, the base of the landfill apparently slopes irregularly down toward the Arroyo de las Trampas. A relatively narrow, deep, discontinuous trench is interpreted to run along the southeast edge of the landfill past the area of the scale house, where it may then turn westward toward the southwest corner of the landfill. The trench lies between the interpreted ridge and the steep face cut into the natural soil along

the southeast side of the landfill and may locally be filled as deep as 60 feet. No geophysical evidence of faults was observed in the seismic data for the area underlying the landfill.

5.0 MATERIAL TESTING

In order to confirm the field classification and conditions of the encountered borehole materials and to determine their physical properties, materials testing of selected soils and refuse samples was conducted. The testing included the following:

- grain size distribution;
- Atterburg limits;
- bulk density;
- moisture content; and
- permeability analysis.

Results of the materials testing performed by Precision Engineering Inc. are summarized in Table 5-1 and is included in Appendix C.

In general, the native soil beneath the landfill was classified as a silty sand (SM) to a poorly graded sand (SP) with an average moisture content of approximately six (6) percent by weight. Undisturbed soil samples were collected from beneath the landfill to determine this material's saturated hydraulic conductivities. The hydraulic conductivities measured for this material ranged from 4.06×10^{-3} cm/sec to approximately 5.3×10^{-5} cm/sec.

These relatively low moisture content values observed at the native soil/refuse contact is generally indicative of natural conditions and not significant evidence of leachate being generated and migrating downward. The average moisture content of the solid waste in the range of 16 percent by weight, is also indicative of published data indicating a condition below refuse field capacity (a condition above which liquids will drain under gravity).

Additional materials testing was performed in the borrow area, near the proposed transfer station. This material is used for daily cover and will be used for final cap and closure. The hydraulic conductivities measured for this material ranged from 1.4×10^{-5} cm/sec to 5.0×10^{-5} cm/sec.

**TABLE 5-1
Summary of Materials Testing Results
City of Santa Fe Municipal Landfill**

	Type of Sample	% Moisture (by wt)	Permeability (cm/sec)	Dry Unit Weight (PCF)	Wet Unit Weight (PCF)	Soil Classification
Boring LF-1						
SS-1	R	8.6				
SS-2	R	27.5				
SS-3	R	26.6				
SS-5	R	13.3				
SS-7	R	4.5	0.00114	98.7	103.1	SM
CS-1	S	3.3				SM
SS-8	S	2.6				
	avg % moisture of trash	16.1				
	avg % moisture of soil	2.95				
Boring LF-2						
SS-1	C	7.4				
SS-2	R	27.9				
SS-3	R	17.7				
SS-5	S	7.3	0.0000528	130.2	121.3	SM
SS-8	S	6.1				SP-SM
CS-1	S	5.3				
	avg % moisture of trash	22.8				
	avg % moisture of soil	5.7				

1.14 x 10⁻³

5.387 x 10⁻⁵
10⁻⁴

7/20/04
12-26-04

TABLE 5-1
Summary of Materials Testing Results
City of Santa Fe Municipal Landfill

	Type of Sample	% Moisture (by wt)	Permeability (cm/sec)	Dry Unit Weight (PCF)	Wet Unit Weight (PCF)	Soil Classification
Boring LF-3						
SS-2	R	29.2				
SS-3	R	21.8				
SS-4	R	8.2				
SS-6	R	28.2				
SS-9	S	6	0.00406	109	102.8	SP-SM
CS-1	S	5.6				SP-SM
	avg % moisture of trash	21.85				
	avg % moisture of soil	5.8				
Boring LF-4						
SS-1	MR/C	8.2				
SS-2	R	21.2				
SS-3	R	11.5				
SS-4	S	9.2				
SS-5	S	12.3				SM
CS-3	S	2.4				SP-SM
	avg % moisture of trash	16.35				
	avg % moisture of soil	7.97				

TABLE 5-1
Summary of Materials Testing Results
City of Santa Fe Municipal Landfill

	Type of Sample	% Moisture (by wt)	Permeability (cm/sec)	Dry Unit Weight (PCF)	Wet Unit Weight (PCF)	Soil Classification
Boring LF-5						
SS-1	C	10.2				
SS-2	MR	13.5				
SS-3	R	10.8				
SS-4	R	13.7				SM
CS-1	S	7.9				SM
CS-2	S	4.8				
	avg % moisture of trash	12.67				
	avg % moisture of soil	6.35				
Boring LF-6						
SS-1	C	20.5				
SS-2	R	23.2				
SS-3	R	21.3				
	avg % moisture of trash	22.25				
Boring LF-7						
SS-1	C	9.8				
SS-2	R	7.5				
CS-1	S	6.1				SM
CS-2	S	6.4				SP-SM
CS-3	S	5				
	avg % moisture of trash	7.5				
	avg % moisture of soil	5.83				

TABLE 5-1
Summary of Materials Testing Results
City of Santa Fe Municipal Landfill

	Type of Sample	% Moisture (by wt)	Permeability (cm/sec)	Dry Unit Weight (PCF)	Wet Unit Weight (PCF)	Soil Classification
Boring LF-8						
SS-1	R	9.9				
SS-2	R	10.7				
SS-3	R	9.8				
SS-4B (new hole)	R	6.6				
SS-5B	S	4.8				SP-SM
CS-2B	S	6.6				SP-SM
	avg % moisture of trash	9.25				
	avg % moisture of soil	5.7				
Boring LF-9						
SS-1	S	4.6				SP-SM
SS-2	S	6.7				
SS-3	S	6				SP-SM
no refuse encountered						
	avg % moisture of soil	5.77				

TABLE 5-1
Summary of Materials Testing Results
City of Santa Fe Municipal Landfill

	Type of Sample	% Moisture (by wt)	Permeability (cm/sec)	Dry Unit Weight (PCF)	Wet Unit Weight (PCF)	Soil Classification
Boring LF-10						
SS-1	C	7.9				
SS-2	MR	12.7				
SS-3	S					SP-SM
SS-4	S	10.3				
CS-1	S	8.1				SM
CS-2	S	4.8				
	avg % moisture of trash	12.7				
	avg % moisture of soil	7.73				
Borrow Area						
5-7'	S	2.2	0.00005	136.8		SC
7-9'	S	3.1	0.000014	135.6		SC
9-10.5'	S					SM
C = cover S = soil R = refuse MR = mixed refuse PCF = pounds per cubic foot						

6.0 SOIL CHEMISTRY DATA

Laboratory analyses of the native soil samples collected from beneath the native soil/refuse contact were performed and included the following parameters:

- Metals (EPA Test Method 6010/7471)
- Petroleum Hydrocarbons (EPA Test Method 418.1)
- Volatile Organic Compounds (VOCs) (EPA Test Method 8240)
- Nitrate, Chloride, and Ammonia (EPA Test Methods 353.3, 355.2 and 350.2)
- Uranium (by laser-induced kinetic phosphorimetry method)

These laboratory analyses were conducted to identify if possible leachate generation has occurred within the landfill and accumulated in the underlying native soils. The results of the metals, nitrate, chloride, ammonia, and uranium analyses are summarized in Table 6-1. These analytical results have been compared to published mean concentrations of elements in soils from the western United States (Shacklette and Boangen, 1984), as listed in the right-hand column of the table. The concentrations are geometric means which represent a log normal distribution of element concentrations.

The results of these analyses indicate that only two elements exceed the western United States mean soil concentration for calcium and manganese. This condition exists for only one sample for calcium, LF-4 SS5, and for all samples for manganese except LF-5 SS4. The reported concentrations suggest naturally occurring conditions of the geologic formation since the other of leachate indicators (nitrate, chloride, and ammonia) were either of minimal or undetected concentrations. Petroleum hydrocarbons, volatile organic compounds, and uranium were also not detected in any of the soil samples collected for analyses. The laboratory reports are included in Appendix D.

The compiled soil chemistry results for the natural soils beneath the landfill do not demonstrate conditions indicative of leachate contamination as compared to mean western United States soil element contaminations.

Table 6-1
 Summary of Soil Analytical Results
 City of Santa Fe Municipal Landfill
 (Concentration is Mg/Kg)

Sample Location	LF-8 SS-5B	LF-10 CS-2	LF-7 SS-3	LF-3 SS-8	LF-2 SS-4	LF-2 SS-7	LF-1 SS-7	LF-4 SS-5	LF-5 SS-4	Mean Soil Concentration Western U.S. (in mg/kg)
Depth of Sample	41-42.3	20-25	18-19	48-49	29.5-31.5	36.5-37.8	46-48	33-34.5	25-26.5	+
Aluminum	1500	2880	2180	1610	3850	1190	1010	9470	4340	58,000
*Ammonia(mg/L)	<0.03	<0.03	<0.03	0.03	0.03	<0.03	0.05	<0.03	<0.03	NA
Antimony	<3	<3	<3	<6	<3	<3	<3	<3	<3	NA
Arsenic	<5	<5	<5	<10	<5	<5	<5	<5	<5	5.5
Barium	24.8	46.6	40.9	51.6	239	27.8	112	107	32.9	580
Beryllium	<0.3	<0.3	<0.3	<0.3	0.3	0.3	<0.3	1.0	0.4	.68
Boron	<5	<5	<5	<10	<5	<5	<5	<5	<5	NS
Cadmium	<0.3	<0.3	<0.3	<0.6	<0.3	<0.3	<0.3	<0.3	<0.3	NA
Calcium	23400	32700	1080	40900	44700	21200	19100	18400	9200	18,000
*Chloride (mg/L)	0.6	<0.5	3.5	9.0	5.3	2.8	<0.5	23.0	<0.5	NA
Chromium	2.0	3.8	2.4	2.2	5.4	1.7	1.6	8.0	4.6	41
Cobalt	1.1	1.8	1.0	1.0	1.8	0.9	1.2	4.9	2.1	7.1
Copper	2.7	4.7	4.4	5.8	14.1	4.2	2.6	8.7	9.0	21
Iron	2230	4790	2780	2610	5400	1880	3930	9010	4880	21,000
Lead	<5	<5	<5	<10	<5	<5	<5	13	<5	17
Magnesium	1030	1430	1360	1100	1540	751	793	5450	1920	7,400
Manganese	171	282	193	246	285	147	286	434	139	380
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	.046
Molybdenum	<1	<1	<1	<2	<1	<1	<1	<1	<1	.85
Nickel	1.7	2.8	2.6	12.1	6.4	4.7	2.8	9.3	4.3	.5
*Nitrate + Nitrite (mg/L)	<0.06	<0.06	0.23	<0.06	<0.06	<0.06	<0.06	0.13	<0.06	NA

Table 6-1
 Summary of Selected Analytical Results
 City of Santa Fe Municipal Landfill
 (Concentration is Mg/Kg)

Sample Location	LF-8 SS-5B	LF-10 CS-2	LF-7 SS-3	LF-3 SS-8	LF-2 SS-4	LF-2 SS-7	LF-1 SS-7	LF-4 SS-5	LF-5 SS-4	Mean Soil Concentration Western U.S. (in mg/kg)
Depth of Sample	41-42.3	20-25	18-19	48-49	29.5-31.5	36.5-37.8	46-48	33-34.5	25-26.5	+
Potassium	230	260	280	200	520	170	160	2290	740	18,000
Selenium	<5	<5	<5	<10	<5	<5	<5	<5	<5	23
Silver	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<0.5	<0.5	NA
Sodium	54	175	67	263	91	104	29	366	128	9,700
Thallium	<5	<5	<5	<10	<5	<5	<5	<5	<5	NA
Uranium (ug/g)	0.79	1.16	0.39	1.423	0.769	0.644	0.45	0.523	0.545	2.5
Vanadium	6.2	13	7.1	9.2	10.7	5.2	14.7	19.2	13.2	70
Zinc	8.5	12	9.4	15	23	9.8	8.1	27.9	15.9	55

* These parameters analyzed for leachate indicators and are reported in mg/L
 NS - No Standard
 + Mean concentrations published in Shacklette and Boermgan, 1984

7.0 CONCLUSIONS

Based upon the data compiled to date for the City of Santa Fe Municipal Landfill, the following conclusions have been developed.

- The test borings performed within the confines of the solid waste area did not identify leachate accumulation at the soil/refuse contact beneath the landfill based upon visual inspection and moisture content;
- The depth of the refuse appears to vary over the site between two (2) feet to sixty (60) feet below surface grade;
- Landfill gas does not appear to migrate off of the site in the areas of the newly installed gas monitoring wells;
- In situ soils at the soil/refuse contact have hydraulic conductivities in the range of 1×10^{-3} to 1×10^{-5} cm/sec;
- Soils at the soil/refuse contact are generally a silty sand to poorly graded, slightly silty sand;
- Soils at the soil/refuse contact characteristically have relatively high naturally occurring metal concentrations;
- Leachate indicators of nitrate, chloride, and ammonia are virtually non detected in the soils beneath the landfill;
- Groundwater levels occur above the screened intervals in monitoring well MW-2 and MW-3, suggesting the presence of a semi-confined aquifer;
- There does not appear to be a sufficient number of monitoring wells to accurately evaluate the uppermost aquifer characteristics (i.e., groundwater flow, direction, rate, and quality). Monitoring well MW-1 is downgradient of a closed landfill; therefore, groundwater may not be indicative of upgradient quality (non-affected).

8.0 RECOMMENDATIONS

CDM recommends that the City implement the action enumerated below:

- Submit a copy of this report to the New Mexico Environment Department (NMED), Solid Waste Bureau;
- Install an additional upgradient and downgradient groundwater monitoring well to more fully define groundwater conditions/characteristics. Once these conditions and characteristics are defined, one of the existing monitoring wells may be abandoned upon NMED approval; and
- To assist in obtaining an alternate constituent list and monitoring frequency, the City of Santa Fe should perform a limited aquifer test at the site to calculate the hydraulic conductivity of the aquifer in order to request approval of an alternate sampling frequency.
- The City of Santa Fe may want to pursue a groundwater variance to eliminate groundwater monitoring or reduce monitoring events. To acquire a groundwater variance, the City must demonstrate that there is no potential for migration of hazardous constituents from the landfill to the uppermost aquifer for the active life of the landfill and post-closure care period. The demonstration should be based upon:
 - a) Site specific field measurements, sampling, and analysis of physical, chemical, and biological processes affecting contaminant fate and transport; and
 - b) Contaminant fate and transport predictions (Multi-Med) that maximize contaminant migration and consider impacts on public health, welfare, and environment.

Having served as Project Manager, Project Hydrogeologist, and Principal Scientist for the described subsurface investigation activities for the City of Santa Fe Municipal Landfill, we are personally familiar with the data described herein.

CAMP DRESSER & McKEE INC.



Thomas D. Parker, P.E.
Project Manager



Bill W. Whaley
Project Hydrogeologist



Steven L. Brewer, C.P.G.S.
Principal Scientist

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APPENDIX A

BORING LOGS AND GAS MONITORING WELL COMPLETION DETAILS

LANDFILL BORING NO. LF-1

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL	Ground Level
5	TR	TRASH, black, paper, wood, cloth	SS-1	0-2			5			
10		TRASH, tyvek, paper, glass, battery trace metal	SS-2	10-12		27	10			
15		TRASH, metal, paper, plastic, car brakes					15			
20		TRASH, newspaper, formica, plastic sand	SS-3	20-22		126	20			
25		TRASH, black, paper, plastic, wire, trace sand					25			
30		TRASH, plastic, wood, trace glass in soil	SS-4	30-32		8	30			
35		farm wastes, hay and manure					35			
40		glass, gravel, metal and soil TRASH, compressed paper	SS-5	40-42		165	40			
45	SM	GRAVEL, metal, wood reddish brown sand, nail TRASH 1st 2"; sand, fine to medium w/5% gravel	SS-6	45-46		3.0	45			
50		SAND, fine to medium w/5% gravel	CS-1	48-50		0.0	50			
55		SAND, medium to coarse, poorly to well graded				0.0	55			
60		SAND, medium to coarse, poorly to well graded	SS-8	55-55.5		0.0	55			
60		TD 55.5'					60			

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/9/94 Well No.: LF-1
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 55.5' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: LEL: 4% @ 35'; LEL: 6% @ 40'
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG

CDM

environmental engineers, scientists
planners, & management consultants

CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure
No.
A-1

Mark Slucky

0:40:26

11/16/94 14:03:37

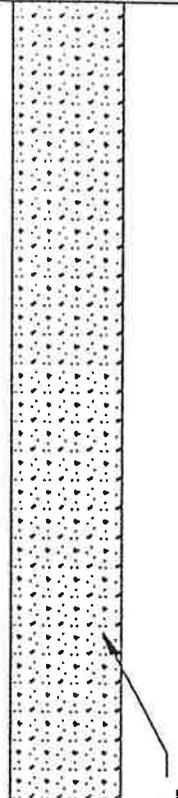
BRLOGLF1

1257-121

LANDFILL BORING NO. LF-2

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL (USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
5		Top cover, trash, paper, wood, plastic	SS-1	0-2		2.9	5		
10	TR	TRASH, wood, gypsum, cloth trace metal	SS-2	10-12		67	10		
15							15		
20		GLASS, clay, silty sand, paper	SS-3	20-22		18	20		
25							25		
30	SM	TRASH					30		
30	CL	SAND, medium, well graded w/10% silt	SS-4	29.5-31.5			30		
35	SM	SILTY CLAY, w/sand intermixed w/med to coarse, well graded	SS-5	32-33.5			35		
35		SAND, fine, medium, coarse, well graded	CS-1	33.5-34.5		2.6	35		
40		SAND, medium, well graded, red to brown	SS-6	35-36.5		3.0	40		
45		SAND, medium, well graded, red to brown	SS-7	36.5-37.8		1.3	45		
45		SAND, medium grained w/5% gravel, red to brown	SS-8	41.0-42.3		0.0	45		
50		T.D. 42.5'					50		
55							55		
60							60		



Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/9/94 Well No.: LF-2
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 42.50' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: _____
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG



CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-2

Mark Slucky
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 11/17/94 10:13:51
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LANDFILL BORING NO. LF-3

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
		TRASH, wood, black organics	SS-1	0-2		0.0			
5		WOOD, trees, wire, soil, paper					5		
10		TRASH, paper, wood, soil	SS-2	10-12		24	10		
15		TRASH, wood, cloth, plastic, tire pieces, paper					15		
20		TRASH, popcorn, styrofoam, plastic film	SS-3	20-22		70	20		
25		CONCRETE					25		
		GRAVEL, paper, wood							
30		CONCRETE, asphalt, cloth, silt, clayey sand	SS-4	28-30		7	30		
35		TRASH, paper, plywood, plastic, silty sand	SS-5	30-32		26	35		
40		TRASH, black wood, paper, silty gravel	SS-6	35-35.5		21	40		
45		TRASH, wood, plastic, metal, cloth	SS-7	40-42		153	45		
50		TRASH, wood, plastic, metal, cloth to 48.4', sand, medium coarse well graded w/10% gravel	SS-8	48-49			50		
55	SM	SAND, medium grain, well graded, red to brown	SS-9	49-50		0.0	55		
		SAND, fine to coarse w/gravel	CS-1	53.5-55		0.0			
		SAND, medium to coarse w/10% gravel, red to brown	SS-10	56-56.5		4.6			
60		T.D. 56.5'					60		

Ground Level

BENTONITE BACKFILL

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/8/94 Well No.: LF-3
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 56.50' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: _____
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG

CDM

environmental engineers, scientists
planners, & management consultants

CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-3

Mark Slucky

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11/17/94 10:50:20

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C.V.

LANDFILL BORING NO. LF-4

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL	Ground Level
5		SAND, brown, well graded TRASH, black	SS-1			0.0	5			
10		TRASH, paper & fibrous, moist, brown TRASH, paper, wood, sand, cloth	SS-2	7-9		0.0	10			
20		6" SAND, medium brown 6" TRASH	SS-3	20-22		0.0	20			
30		4" SAND, brown, medium, trash	SS-4	30-31.5		0.0	30			
35		SILT, 75% w/sand 15%, clay 10%	SS-5	33-34.5			35			
40	SM	SILT, brown w/sand SAND, medium, brown, trace gravel	CS-1	35-40			40			
45		moisture sample SAND, medium to coarse, well graded, trace gravel	CS-2 CS-3	42-43 43-45			45			
50							50			
55							55			
60							60			

BENTONITE BACKFILL

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/4/94 Well No.: LF-4
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 45.00' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: _____
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG

CDM

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CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-4

Mark Slucky
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11/17/94 12:02:48
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LANDFILL BORING NO. LF-5

BORING COMPLETION DETAILS

Mark Stucky

11/2/24

11/18/94 08:13:29

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DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
	SC	CLAYEY SILT	SS-1	0-2					
5		CLAYEY SILT w/metal pieces, paper, wood				2.0			
10		CLAYEY SILT, metal, wood, cardboard, straw, paper, plastic	SS-2	10-12		43			
15		TRASH, medium sand, metal, wire, plastic	SS-3	13.5-15.1					
20		TRASH, paper, plastic, wood, sand							
25		TRASH, paper, wood, organics over clayey silt, fine sand	SS-4	25-26.5		0.0			
30	SM	SAND, fine, medium, red to brown well graded, 5% gravel	CS-1			0.0			
35		SAND, fine to coarse in layers, well graded with silt interbedded	CS-2			0.0			
40		T.D. 34.7'							
45									
50									
55									
60									

Ground Level

BENTONITE BACKFILL

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/7/94 Well No.: LF-5
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 34.70' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: _____
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG



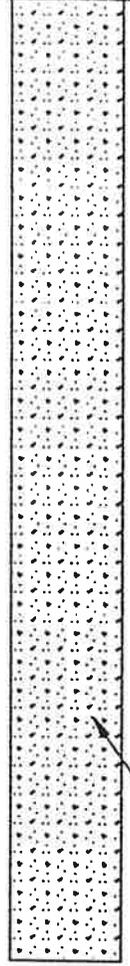
CITY OF SANTA FE
 LANDFILL
 SANTA FE, NEW MEXICO

Figure No. A-5

LANDFILL BORING NO. LF-6

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL (USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
0									Ground Level
5		SILTY SAND, medium grain, trash, paper, plastic, wood	SS-1	0.8-2		28	5		
10		TRASH, sand, plastic, cloth, burnt cloth					10		
15		black cloth, paper, burn area?					15		
20		TRASH, burnt paper, unburnt paper, silty sand, wood	SS-2	15-17		28	20		
25		TRASH, burnt paper, unburnt paper, silty sand, wood					25		
30		DARK GRAY SAND, paper, wood mix					30		
35		TRASH, shoes, tires, paper, plastic, sand mix					35		
40		TRASH, hair, wood, plastic, paper, silty sand, metal, ceramics	SS-3	30-32		17	40		
45	SM	Native contact Hard formation. No samples					45		
50		T.D. 46.5' caved					50		
55		T.D. drilled 50'					55		
60							60		



BENTONITE BACKFILL

Mark Stucky

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Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/7/94 Well No.: LF-6
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 50.00' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: _____
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG

CDM

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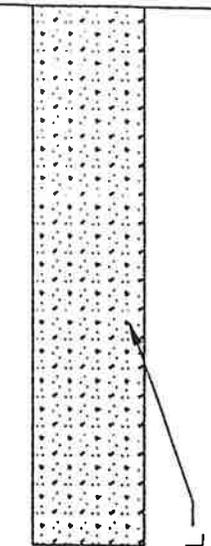
CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure
No.
A-6

LANDFILL BORING NO. LF-7

BORING COMPLETION DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
		SILTY to fine sand	SS-1	0-2		0.0			
5		SAND, organic material, wood					5		
10		SAND, metal, wood, paper, plastic, cloth					10		
15		No cuttings 10-15					15		
		TRASH, steel, wood, concrete	SS-2	15-17			15		
20		SAND, trash medium well graded, red to brown	SS-3	18-19		0.0	20		
25	SW	SAND, coarse to medium, 10% silt	CS-1	19-20			25		
		SAND, coarse w/gravel, well graded	CS-2	22-23		0.0	25		
	SW	SAND, coarse to medium coarse w/minor clay, 10% silt	CS-3	25-28		0.0	30		
30		T.D. 28'					30		
35							35		
40							40		
45							45		
50							50		
55							55		
60							60		



BENTONITE BACKFILL

Mark Stucky

01/15/13

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Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/6/94 Well No.: LF-7
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 28.00' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: _____
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG



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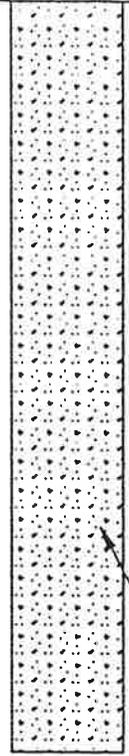
CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-7

LANDFILL BORING NO. LF-8

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
0									Ground Level
5		SAND, medium brown, well graded, subangular w/gravel TRASH					5		
10		TRASH, paper, aluminum, wood, interbedded w/sand	SS-1	5-7		58	10		
15		TRASH, paper, concrete, sand, plastic, fiberglass, wood	SS-2	15-17		33	15		
20							20		
25		TRASH, plywood, paper, small amount sand mixed	SS-3	25-27		23	25		
30							30		
35		WOOD, plastic, sand, paper, mixed from cuttings					35		
40		T.D. 39'					40		
45							45		
50							50		
55							55		
60							60		



BENTONITE BACKFILL

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/5/94 Well No.: LF-8
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 39.00' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: AUGER REFUSAL @ 39'
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG



CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-8

Mark Slucky

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LANDFILL BORING NO. LF-8B

BORING COMPLETION DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
5		SAND, dark brown, paper, cloth, wood mixture, dry to moist					5		Ground Level
10						10			
15						15			
20					7	20			
25		WOOD, paper, sand mixture, trace metal				25			
30						30			
35		WOOD, sand, paper, cloth, mixture, brown				35			
40	SW	TRASH, wood, tire, sand	SS-4B	40-41		24	40		BENTONITE BACKFILL
45	SP	SAND, well graded, medium, coarse 20% gravel	SS-5B	41-42.3		0.3	45		
50	SW	SAND, medium coarse, poorly graded	CSB 2	43-44		1.0	45		
50			CSB 1	44-45			50		
55		SAND, medium coarse, well graded reddish brown, 20% gravel	CSB 3				50		
55		SAND, medium coarse, well graded reddish brown, 20% gravel	SS-6B	47-47.5		0.0	55		
60		T.D. 49.5'	SS-7B	48-49.5			60		

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/5/94 Well No.: LF-8B
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 49.50' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: NO SAMPLES TO 40'
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG



CITY OF SANTA FE
 LANDFILL
 SANTA FE, NEW MEXICO

Figure No.
 A-8B

Mark Stucky

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LANDFILL BORING NO. LF-9

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL	Ground Level
0										
5	SW	SAND, medium, well graded, brown	SS-1	0-2		0.0	5			
		SAND, coarse to medium, well graded, red to brown 10% gravel	SS-2	5-7		0.6				
10		SAND, coarse to medium, well graded, red to brown 10% gravel	SS-3	10-12		0.0	10			
12		T.D. 12'					15			
15							20			
20							25			
25							30			
30							35			
35							40			
40							45			
45							50			
50							55			
55							60			
60										

BENTONITE BACKFILL

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/5/94 Well No.: LF-9
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 12.00' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: NO TRASH
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG



CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-9

Mark Slucky

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LANDFILL BORING NO. LF-10

BORING COMPLETION
DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	ORGANIC VAPOR CONC. (PPM)	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL	Ground Level
0-5		BOULDERS, clayey sand, some metal	SS-1	0-2			0-5			
5-10		METAL, car parts, oil, filters, glass					5-10			
10-15		SILTY, clayey sand, trace brick & metal	SS-2			0.0	10-15			
15-16.5	SW	SILTY, clayey sand, well graded.	SS-3	15-16.5			15-16.5			
16.5-17.8		SILTY, clayey sand, well graded.	SS-4	16.5-17.8			16.5-17.8			
17.8-20	SP	COARSE SAND, red to brown	CS-1	17.8-20		0.0	17.8-20			
20-25		SILTY to fine sand, poorly graded brown				0.0	20-25			
25-25'		SILTY to medium sand w/gravel in lenses, well graded	CS-2			0.0	25-25'			
25-30		T.D. 25'					25-30			
30-35							30-35			
35-40							35-40			
40-45							40-45			
45-50							45-50			
50-55							50-55			
55-60							55-60			

BENTONITE BACKFILL

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 10/5/94 Well No.: LF-10
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 25.00' Casing Type & Size: N/A Slot Size: N/A Drilling Method: HSA
 Comments: _____
 Driller: PRECISION ENGINEERING Logged by: IAN GILLIS

SOIL BORING LOG



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CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure
No.
A-10

Mark Slucky

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GAS VENT NO. GV-10

GAS VENT WELL COMPLETION DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	METHANE %	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
-5		SAND w/gravel, poorly graded, dry, few cobbles, brown		NONE COLLECTED	DRY	N/D	-5		
-10	SP	SAND w/gravel, gravel < 2x - 1/2" trace clay, brown, s.h. moist					-10		
-15							-15		
-20	SC	CLAYEY SAND, med to coarse, brown					-20		
-25	SP	SAND, med to coarse w/gravel lense 25-26, brown					-25		
-30							-30		
-35	GP	GRAVEL, cemented w/ silica, gravel < 1"					-35		
-40	SP	SAND same as 23-33, cemented w/ calcite ?					-40		
-45	GP	SAND w/ gravel, poorly graded GRAVEL, coarse, losing circulation some lenses pea - gravel no returns					-45		
-50							-50		
-55		TD - 52'		-55					
-60				-60					

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 11/8/94 Well No.: GV-10
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 47.00' Casing Type & Size: 2" SCH 40 PVC Slot Size: .020 Drilling Method: HSA
 Comments: DRILLED W/ AIR ROTARY 37 - 52' (T.D.)
 Driller: POOL ENVIRONMENTAL DRILLING Logged by: FUQUA

SOIL BORING LOG



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CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-11

Pete Sindone

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GAS VENT NO. GV-12

GAS VENT WELL COMPLETION DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	METHANE %	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
2.5	SC	SANDY CLAY, w/ minor caliche, dry, light brown		NONE COLLECTED	DRY	N/D	2.5		Ground Level Locking Cap Plug Monitor Well Riser GROUT CHIPS BENTONITE SEAL 10/20 SAND PACK T.D. 15'
5	CL	CLAY, w/ trace caliche, dark brown	5						
7.5	SC	CLAYEY SAND, poorly graded, angular, ankosic, med. brown, dry	7.5						
10	SP	SAND, w/ gravel, minor clay, med. brown, stt. moist	10						
12.5	GW	GRAVEL w/ sand < 2", dry, brown, well graded	12.5						
15	SP	SAND, med. grained, poorly graded	15						
17.5			17.5						
20			20						
22.5			22.5						
25			25						
27.5			27.5						
30			30						

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 11/7/94 Well No.: GV-12
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 15.00' Casing Type & Size: 2" SCH 40 PVC Slot Size: .020 Drilling Method: HSA
 Comments: _____
 Driller: POOL ENVIRONMENTAL DRILLING Logged by: FUQUA

SOIL BORING LOG



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CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure No.
A-13

Emilio Cresphn - 001301, Camp

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C:\

GAS VENT NO. GV-13

GAS VENT WELL
COMPLETION
DETAILS

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLE NO.	SAMPLING INTERVAL	MOISTURE	METHANE %	DEPTH, FT.	STRATIGRAPHY	WATER LEVEL
2.5	SP	SILTY SAND w/ gravel, dry, yellow - brown		↓	↓	↓	2.5	[Pattern]	
5	SW	CLAYEY SAND, w/ gravel, dry, light tan		↓	↓	↓	5	[Pattern]	
10	SP	SAND, coarse to fine, medium brown, dry, local lenses, coarse gravel		↓	↓	↓	10	[Pattern]	
12.5				↓	↓	↓	12.5	[Pattern]	
15				↓	↓	↓	15	[Pattern]	
17.5				↓	↓	↓	17.5	[Pattern]	
20				↓	↓	↓	20	[Pattern]	
22.5				↓	↓	↓	22.5	[Pattern]	
25				↓	↓	↓	25	[Pattern]	
27.5				↓	↓	↓	27.5	[Pattern]	
30				↓	↓	↓	30	[Pattern]	

T.D. 29.5'

Client: CITY OF SANTA FE Job No.: 1257-121-CP-SUBS Date Drilled: 11/9/94 Well No.: GV-13
 Site: CITY LANDFILL Top of Casing Elevation: N/A
 Total Depth: 29.50' Casing Type & Size: 2" SCH 40 PVC Slot Size: .020 Drilling Method: HSA
 Comments: HOLE PLANNED FOR 30', RIGS DRIVE CHAIN BROKE AT 29.50'
 Driller: POOL ENVIRONMENTAL DRILLING Logged by: FUQUA

SOIL BORING LOG



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CITY OF SANTA FE
LANDFILL
SANTA FE, NEW MEXICO

Figure
No.
A-14

Emiljo Crespin - 001301, Comp
 0:40:22
 04/05/95 10:03:53
 BRLOGV13
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APPENDIX B
SHALLOW SEISMIC REPORT

FINAL REPORT

SHALLOW SEISMIC SURVEY
SANTA FE CITY LANDFILL
Santa Fe County, New Mexico

Survey carried out for:

Camp Dresser & McKee Inc.
2400 Louisiana Boulevard NE, Suite 740
American Financial Center - Building Five
Albuquerque, New Mexico 87110

Attention: Mr. Jack P. Chapelle

Survey carried out by:

Charles B. Reynolds & Associates Inc.
2824 Indiana Street NE
Albuquerque, New Mexico 87110

Attention: Mr. Charles B. Reynolds

Contract dated October 17, 1994.

November 30, 1994

Charles B. Reynolds & Associates, Inc.
Consulting Geophysicists & Geologists
2824 Indiana NE
Albuquerque, New Mexico 87110

November 30, 1994

SUMMARY
SHALLOW SEISMIC SURVEY
SANTA FE CITY LANDFILL
Santa Fe County, New Mexico

During the second half of October, 1994, a shallow seismic refraction survey was carried out for Camp Dresser & McKee Inc. at the existing Santa Fe City Landfill, Secs. 15 & 22, T17N, R9E, Santa Fe County, New Mexico. The survey consists of two seismic lines, SFL-1 and SFL-2, totalling 6,120 ft in length. The purposes of the project were to aid in mapping the base of the landfill and to obtain any other useful information regarding the landfill or the underlying beds which might develop from the data.

A buried ridge at the base of the landfill is interpreted to plunge, possibly discontinuously, from the northeast end of the landfill to the area of the office/scale complex. To the northwest of the ridge, the base of landfill apparently slopes irregularly down toward the Arroyo de las Trampas. A relatively narrow and deep trench or series of deeper landfill zones, again possibly discontinuous, is interpreted to run along the southeast edge of the landfill past the area of the office/scale complex, where it may turn westward toward the southwest corner of the landfill. This possible trench lies between the interpreted ridge to the northwest and the steep face cut into the natural soil along the southeast side of the landfill, and may locally be filled as deep as about 60 feet.

Two velocity zones are recognized within the landfill body. The first, shallowest or surface layer averages about 10 ft thick, has a mean primary wave velocity of about 790 ft/sec, and is considered to be relatively uncompacted landfill material. The second or deeper zone varies from zero to about 55 ft in thickness, has a mean velocity of about 1,310 ft/sec, and is thought probably to be relatively compacted landfill material.

The top of the third or deepest velocity layer ranges from the surface to about 60 ft in depth. This unit has a mean calculated velocity of about 2,490 ft/sec, and is regarded as probably natural alluvial strata underlying the landfill. An interesting feature is that it contains good refractors, probably beds of different lithology or degree of cementation, which apparently are essentially flat-lying.

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November 30, 1994

SHALLOW SEISMIC SURVEY
SANTA FE CITY LANDFILL
Santa Fe County, New Mexico

INTRODUCTION - A shallow refraction seismic survey was recorded at the Santa Fe City Landfill during the period beginning October 17th and ending October 30, 1994, for Camp Dresser & McKee Inc.

Purpose - The purposes of the survey were (1) to aid in mapping the base of the emplaced landfill, that is, the base of refuse or top of underlying natural material, and (2) to obtain any other potentially useful information which might result regarding the landfill or the underlying material.

Seismic Lines - The project consists of two shallow seismic refraction lines (see Enclosure 1). The longer of these, Line SFL-1, extends from southwest to northeast through the length of the landfill property, and is 40 profiles or 4,920 ft long. The shorter line, Line SFL-2, lies approximately at right angles to SFL-1 in the southwestern third of the area and is 1,200 ft in length. The location of Line SFL-2 was suggested by Mr. Bob Kennedy of the landfill staff, to investigate a report of an early deep pit southeast of the office area.

Area Description - The landfill and study area occupy the west side of a ridge in Secs. 15 and 22, T17N, R9E, Santa Fe County, New Mexico. The ridge lies between Arroyo de las Trampas to the northwest and Arroyo Torreon to the southeast, both of which flow southwestward. The natural vegetation of the area consists of bunchgrass, cholla and other cacti, chamisa and sagebrush and scattered juniper and pinon, with some small cottonwoods along the arroyos.

The surface of the landfill itself is largely barren, with older areas having some bunchgrass and low desert brush development. Several active roads extend from the entrance, office and scale complex and equipment yard in the southeast part of the landfill to various active pits. The largest active pit at the time of writing is near the northeast end of the property. Large piles of earth are scattered through the area.

Operating Conditions - The first day of the survey was lost to unworkable conditions caused by mud resulting from a heavy rainfall the night before. Subsequently the weather was good, with only occasional intervals of higher winds causing some seismic noise. The principal problem encountered was that of seismic noise produced by the many trucks and cars bringing refuse to the landfill, which often required waiting for gaps in the traffic before recording. The staff of the landfill were very pleasant and helpful throughout the survey.

METHOD - The seismic field and office system used is described in the Appendix of this report.

RESULTS - The general quality of the refraction data from the Santa Fe City Landfill area is surprisingly good for data recorded in an active landfill, although many records show some wind or vehicle noise. Most of the reciprocal time differences were within acceptable limits (0.005 sec), but in a few locations, especially in the arroyo which crosses Line SFL-1 at Station R11SW, reciprocal time differences remained greater than 0.005 sec, regardless of many repeats of recording.

INTERPRETATION - The interpretation of the refraction records was done with the aid of the SIPIK/SIPIN/SIPT2 program set.

Seismic Depth Sections - Enclosure 2 shows the seismic depth sections for Lines SFL-1 and SFL-2. The horizontal and vertical scales of the sections are the same, one inch equals 100 ft. The calculated refractors are shown as solid lines with calculated P-wave velocity values in ft/sec below them. The seismic reflector/phantom horizon interpreted as the base of the landfill is highlighted with red. The horizon is most questionable in the vicinity of the intersection of the two seismic lines; the depth used here was determined by using data on Line SFL-1 only.

Velocity Units - Three velocity units are recognized (see Enclosure 2). The first of these, the surface layer, averages about 10 ft thick and has a mean primary wave velocity, as measured, of about 790 ft/sec. This very low velocity, close to the velocity of sound in air at this altitude, is fairly typical of the surface layer in a recent landfill. It evidently indicates material at the surface which is not sufficiently compacted to exhibit velocities within the normal soil velocity range (1200-1800 ft/sec).

The second layer varies greatly in calculated thickness, from zero to about 55 ft. Its mean velocity, as measured by this study, is about 1,310 ft/sec. It is interpreted as being landfill material which has been significantly compacted by machines and the weight of the overlying material. This unit is apparently not present in the northern third of Line SFL-1, where the very-low-velocity surface layer seems to lie directly on natural material at very shallow depth. The highest-velocity area of this unit appears to be on the southeast half of Line SFL-2.

The third and deepest layer is interpreted as being natural alluvial material underlying the landfill, below buried refuse. The mean of velocities measured from this unit, both from its top and from refractors within it, is about 2,490 ft/sec. The top of this layer is interpreted as probably the approximate base of the landfill. The depth to the top of the third layer is interpreted as varying from zero to about 60 ft in the survey area.

Strata Below the Landfill - An interesting and possibly meaningful aspect of the third or deepest unit is that, in stretches of Lines SFL-1 and SFL-2, the refraction from the top of the third unit appears to have been overshadowed by more powerful refractions from refractors within the third layer (see Enclosure 2).

These refractors may be beds of different lithology and/or greater cementation, and appear to be flat-lying. Where this refraction overshadowing has occurred (in about 40% of the length of the seismic lines) tracing the base of the landfill or top of the underlying third layer has required drawing a phantom horizon connecting the nearest interpreted base of landfill refractors.

Depth Contour Map - Enclosure 3 is a depth map with contours on the seismic refractor/phantom horizon interpreted as the base of landfill or top of underlying natural material. The scale of the map is one inch equals 200 ft, and the contour interval is 10 ft. Both the seismic data and information from the LF-1 to LF-10 drill holes were used in constructing this map.

Most of the landfill area appears to have 20 feet or more of refuse beneath the surface, and much of the area more than 40 feet. An especially deep trough or trench of refuse, possibly discontinuous, seems to run along the southeast side of the landfill. This trench apparently turns westward, in its southern part, toward Drill Hole LF-1. The depth of the line of zones of deep refuse may be as great as about 60 feet in places. Two local areas of apparently shallower refuse are interpreted on Line SFL-1, on either side of the intersection with Line SFL-2; these appear possibly related to the locations of the landfill office/scale complex and the maintenance yard.

Elevation Contour Map - Enclosure 4 is a map with elevation contours drawn on the base of landfill, as interpreted from the seismic data and drill holes. It was made by contouring the seismic and drill hole data expressed as elevations, rather than depths. The scale is one inch equals 200 ft and the contour interval is 10 ft. Elevations are in feet above sea level.

One of the dominant features of the map is an interpreted buried ridge plunging southwestward from near Drill Hole LF-7, through LF-6 and LF-4, to the vicinity of the small highs which appear to correspond to the office/scale complex and the maintenance yard. The ridge is not data-defined between Drill Holes LF-6 and LF-4, and might be discontinuous there.

To the northwest of this ridge the base of the landfill evidently slopes irregularly down toward the Arroyo de las Trampas. On the other side of the ridge is the possible line of areas of thick refuse mentioned earlier, running along the southeast side of the landfill property, and turning westward toward Drill Hole LF-1. This possible narrow trench or line of refuse deeps is bounded on the northwest by the buried ridge and on the southeast by the steep face cut into the natural soil. It might, therefore, be of importance in studies of the hydrology of the landfill. Only Drill Holes LF-8 and LF-1 were drilled in the trench.

Faulting Not Observed - No suggestion of faults within the landfill or the underlying strata was observed in the seismic data.

CONCLUSIONS - The following conclusions are believed to be justified by the geological and geophysical evidence:

A. A possibly discontinuous buried ridge at the base of landfill is interpreted to plunge southwestward from the vicinity of Drill Hole LF-7 through LF-6 and LF-4 to the position of the office/scale complex.

B. The thickness of the landfill may be as great as about 60 feet locally in a possibly discontinuous line of relatively narrow, deep zones of refuse between the interpreted ridge of A above and the steep cut face along the southeast edge of the landfill. South of the office/scale complex, this trench or line of deeps may turn westward toward Drill Hole LF-1.

C. On the northwest side of the interpreted ridge of A above, the base of the landfill appears to slope irregularly down toward the Arroyo de las Trampas.

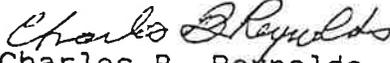
D. Three velocity units are recognized in the area: (1) a surface layer averaging about 10 ft thick, with an average velocity of about 790 ft/sec, considered to be relatively uncompacted fill; (2) a second layer from zero to about 55 ft thick, with a mean velocity of about 1,310 ft/sec, thought to be compacted fill; and (3) a third, deepest unit, with a mean velocity of about 2,490 ft/sec, believed probably the natural alluvial material underlying the landfill.

E. Individual refractors, present within what is interpreted as the underlying natural alluvial material, appear to suggest that these deeper natural beds are essentially flat-lying.

RECOMMENDATION - The following suggestion is respectfully submitted for consideration:

A. If the possible narrow trough or line of refuse deeps along the southeast side of the landfill is regarded as of importance, the drilling of test holes near the southeast landfill boundary between Drill Holes LF-8 and LF-6 and between LF-6 and LF-4, should be considered.

Respectfully submitted,


Charles B. Reynolds
Registered Geophysicist (CA)
Registered Geologist (AR)


Irene Reynolds
Registered Geologist (AR)
Certified Prof. Geologist

Acknowledgements - The assistance of Bill Whaley and Anne Urenda of CDM, and Bob Kennedy and several other members of the landfill staff, is gratefully acknowledged.

APPENDIX

SEISMIC SYSTEM USED

Field Vehicles and Personnel - The field recording system used is primarily a one-vehicle operation, though a second vehicle is taken to the field to help carry equipment and as a backup vehicle for safety. The personnel complement consists of two people, a seismologist/instrument operator and a seismic source operator.

Field Equipment - The seismic energy source consists of a patented dropped "soft" weight. This weight, which is a heavy leather bag containing lead birdshot, closed by an iron support clamp, weighs a total of 550 pounds (250 kg). It is suspended from an A-frame mounted in the rear of the seismic truck, which is a one-ton Dodge Powerwagon with all-wheel drive. The weight is raised by an electric winch operated by the seismic source operator and is dropped, using a helicopter cargo release hook, a distance of 6.5 feet (2 meters) to the ground. This dropped-weight source has the advantage of not bouncing, and thus produces a relatively clean and repeatable seismic energy pulse, with broad frequency content.

The receiver array is made up of 12 Mark Products L-28A-1 8-Hz refraction geophones emplaced 20 feet apart along the line. The geophones are at distances (offsets) of 20, 40, 60, 80...240 feet from the weight drop impact point. These distances are measured with a surveyor's tape, and the geophone positions marked with pin-flags. The geophones, which are mounted on short-spike tripods, are buried to reduce wind and other environmental noise. Each geophone is connected to the seismic cable by two electrical leads with alligator clips. Both alligator clips and cable connections (takeouts) are color-coded to help prevent their being connected wrongly.

The seismic instrument used is an EG&G Geometrics ES2401 multi-channel seismograph with 100 Db dynamic range and frequency filters, which is mounted in the cab of the seismic truck. The filters used are 0-500 Hz, with one-half millisecond sample rate and one-half second recording. Both analog (paper) and digital (micro-disk) recordings are taken.

Field Procedure - After the positions of the twelve geophones are measured and marked, the cable is laid out along the line and the geophones connected and buried. The truck is positioned at one end of the cable with the weight hanging over a position 20 feet from the nearest geophone, and the cable plugged into the seismograph. The weight is then dropped and a recording taken. In this project, each successive drop of the weight initially produced shorter travel time than the preceding drop. This is considered to indicate that the surface soil compresses with each impact until reaching a point beyond which no further compression

occurs, whereupon the travel times stabilize. This process took from two to six drops at different source points in the area.

After stable travel times are achieved, both analog and digital recordings are taken, and the truck moved to the other end of the cable. A geophone is then emplaced and buried where the previous drop point had been. The weight drop and recording procedure is repeated until stable times are achieved. At this point the travel times from the two drop positions to the far geophones are compared. These reversed travel times, or reciprocal times, should in theory be equal. In practice, some small differences in the reciprocal times can be expected; the maximum difference normally accepted is 0.005 second. In some cases, however, such as in the arroyo at Station R11SW on Line SFL-1, repeated tries did not reduce the reciprocal times to this limit, and greater differences had to be accepted.

When recordings at both ends of the cable have been taken, and the appropriate field notes made, the geophones are disconnected from the cable and the cable from the seismograph, and the entire system moved forward one-half the spread length, or 120 feet. New locations are measured and marked for the next six geophone positions and the cable dragged forward and positioned. The twelve geophones are again connected and buried, and another set of recordings is made with the truck and weight drop at first one end and then the other. In this fashion recording proceeds along a given seismic line, advancing 120 feet at a time. The reason for the forward motion being only one-half the spread length is to obtain essentially continuous subsurface coverage.

Upon completion of recording of a spread (from both ends) a wooden stake bearing the line and source-point identification is driven into the ground at the rear drop position. The stake may, for example, bear the identification "SFL1 R5SW". This means that this is the drop position at the southwest end of the fifth spread of Line SFL-1.

Office Procedure - After the field work is finished, the data are brought to Albuquerque, where data processing, analysis and interpretation take place.

After preliminary examination of the paper records, the digital data are analyzed with the aid of a set of computer programs, either the REFRAN/WVFRNT system or the SIPIK/SIPIN/SIPT2 system. Each record of a reciprocal pair is examined on the computer monitor, the first breaks or first refraction arrivals are "picked", timed and assigned to one or more refraction events. Reciprocal time difference corrections are applied. The depth, form and velocity of each refractor in turn are calculated. When all the reciprocal pairs of a given refraction line have been analyzed in this fashion, a seismic depth section is plotted, showing the various refractors calculated.

When analysis of all the seismic lines of a refraction project has been completed, one or more subsurface contour maps, in depth

or elevation, may be constructed showing the form of refracting horizons as interpreted. In instances where borehole information is available, the two lines of evidence are integrated, yielding a more reliable interpretation than could be derived from either geophysical or drillhole data alone. The borehole data serves as a valuable control on the seismic interpretation, and the seismic data provides information between drill holes.

Lastly, a final report is produced, summarizing the seismic project and its interpretation.

APPENDIX C

MATERIALS TESTING ANALYSIS DATA

*W. Jones with the
South*

RECEIVED

DEC 05 1994

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

CAMP DRESSER & MCKEE INC.
ALBUQUERQUE

COEFFICIENT OF PERMEABILITY
Constant Head
ASTM D-2434

ATTN: ANNE URENDA
CAMP DRESSER MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFILL II
FILE NO.: 93-137

DATE OF REPORT: NOVEMBER 22, 1994

SAMPLE LOCATION: LF-1, SS-7

LAB NO.: 26972

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
COMPACTED AT MOISTURE CONTENT OF 4.5%
SATURATED AT BEGINNING OF TEST

DRY UNIT WEIGHT: 98.7 PCF % COMPACTION: N/A
WET UNIT WEIGHT: 103.1 PCF

PROCTOR INFORMATION:

MAXIMUM DRY DENSITY: N/A
OPTIMUM MOISTURE CONTENT: N/A

COEFFICIENT OF PERMEABILITY (cm/sec.): 1.14×10^{-3}

Remarks: THIS SAMPLE WAS COMPACTED BEFORE TESTING IN ORDER TO
SEAT THE MATERIAL MORE SECURELY.

Reviewed By

F

Reviewed By

Certified By

William H. King

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: ANNE UR
CAMP DRESSER &
2400 LOUISIANA
AFC #5, SUITE
ALBUQUERQUE, N

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
AFC #5, SUITE #740
ALBUQUERQUE, NM 87110

PROJECT: SANT
FILE NO.: 94-1

DATE OF REPOR
SAMPLE LOCATIO
LAB NO

DATE OF REPORT: NOVEMBER 17, 1994
SAMPLE LOCATION: LF-2, SS-5
LAB NO.: 26977

TEST SPECIMEN
WET UNIT WEIGH
DRY UNIT WEIGH

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 130.2 PCF % MOISTURE
DRY UNIT WEIGHT: 121.3 PCF % COMPACTION

PROCTOR INFORM
MAXIMU
OPTIMUM MOE

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY:
OPTIMUM MOISTURE CONTENT:

COEFFICIENT OF

COEFFICIENT OF PERMEABILITY (cm/sec.): $K_{20} = 5.2$

Remarks: ALL

Remarks: ALL PERMEABILITIES CORRECTED TO 20 C

Reviewed By:

F

Reviewed By:

F

Reviewed By:

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

COEFFICIENT OF PERMEABILITY
FALLING HEAD

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2400 LOUISIANA BLVD., N.E.
AFC #5, SUITE #740
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFILL II
FILE NO.: 94-137

DATE OF REPORT: NOVEMBER 17, 1994

SAMPLE LOCATION: LF-5, SS-4

LAB NO.: 26995

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:

WET UNIT WEIGHT: N/A PCF % MOISTURE: N/A
DRY UNIT WEIGHT: N/A PCF % COMPACTION: N/A

PROCTOR INFORMATION:

MAXIMUM DRY DENSITY:
OPTIMUM MOISTURE CONTENT:

COEFFICIENT OF PERMEABILITY (cm/sec.): N/A

Remarks: SAMPLE COMPOSED OF LOOSE ROCK, COULD NOT RUN.

Reviewed By:

J

Reviewed By:

Certified By:

Walter H. Knapley

PRECISION ENGINEERING, INC.
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COEFFICIENT OF PERMEABILITY
FALLING HEAD

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ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFILL II
FILE NO.: 94-137

DATE OF REPORT: NOVEMBER 17, 1994

SAMPLE LOCATION: LF-10, SS-3

LAB NO.: 27017

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 109.5 PCF % MOISTURE: 5.1
DRY UNIT WEIGHT: 104.2 PCF % COMPACTION:

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY:
OPTIMUM MOISTURE CONTENT:

COEFFICIENT OF PERMEABILITY (cm/sec.): $K_{20} = 3.52 \times 10^{-3}$

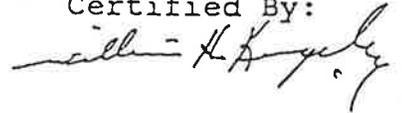
Remarks: ALL PERMEABILITIES CORRECTED TO 20 C

Reviewed By:



Reviewed By:

Certified By:



PRECISION ENGINEERING, INC.
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COEFFICIENT OF PERMEABILITY
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ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFILL II
FILE NO.: 94-137

DATE OF REPORT: NOVEMBER 17, 1994

SAMPLE LOCATION: LF-10, SS-3

LAB NO.: 27017

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 109.5 PCF % MOISTURE: 5.1
DRY UNIT WEIGHT: 104.2 PCF % COMPACTION:

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY:
OPTIMUM MOISTURE CONTENT:

COEFFICIENT OF PERMEABILITY (cm/sec.): $K_{20} = 3.52 \times 10^{-3}$

Remarks: ALL PERMEABILITIES CORRECTED TO 20 C

Reviewed By:

J

Reviewed By:

Certified By:

William H. Kuylenstierna

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-1, CS-1

UNIFIED SM AASHTO A-2-4

Lab No.: 26968

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	176.3	Dry + Container	152.1
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	176.3	Dry Soil Wt.	152.1

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
#4	.0	.0	100.0	
#10	1.5	.9	99.1	
#20	15.2	8.6	91.4	
#40	40.0	22.7	77.3	
#60	77.7	44.1	55.9	
#140	17.9	10.2	89.8	
#200	146.4	83.0	17.0	
PAN	150.9	85.6	14.4	
	151.9			

SOIL LOST= .20 PERCENT ERROR= .11

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Amigo

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
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BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-1, SS-7

UNIFIED SM AASHTO A-2-4

Lab No.: 26972

<u>BEFORE WASH</u>	<u>POST WASH</u>	
Dry + Container	410.8 Dry + Container	354.4
Container Wt.	0 Container Wt.	0
Dry Soil Wt.	410.8 Dry Soil Wt.	354.4

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"	.0	.0	100.0	
1/2"	7.0	1.7	98.3	
3/8"	10.2	2.5	97.5	
#4	28.9	7.0	93.0	
#10	51.3	12.5	87.5	
#20	95.6	23.3	76.7	
#40	182.4	44.4	55.6	
#60	246.8	60.1	39.9	
#140	338.6	82.4	17.6	
#200	352.1	85.7	14.3	
PAN	354.0			

SOIL LOST= .40 PERCENT ERROR= .10

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Kroyer

PRECISION ENGINEERING, INC.
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505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
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ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-2, SS-5

UNIFIED SM AASHTO A-1-b

Lab No.: 26977

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	720.5	Dry + Container	595.9
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	720.5	Dry Soil Wt.	595.9

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"	.0	.0	100.0	
1-1/2"	79.1	11.0	89.0	
1"	79.1	11.0	89.0	
3/4"	105.4	14.6	85.4	
1/2"	130.6	18.1	81.9	
3/8"	167.4	23.2	76.8	
#4	271.7	37.7	62.3	
#10	380.2	52.8	47.2	
#20	452.9	62.9	37.1	
#40	494.7	68.7	31.3	
#60	527.1	73.2	26.8	
#140	578.3	80.3	19.7	
#200	592.1	82.2	17.8	
PAN	595.4			

SOIL LOST= .50 PERCENT ERROR= .07

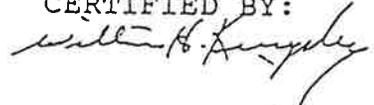
Remarks: NON-PLASTIC

LL:
PL:
PI:

REVIEWED BY:


REVIEWED BY:

CERTIFIED BY:



PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.: UNIFIED SP-SM AASHTO A-1-b
Sampled From: LF-2, SS-8
Lab No.: 26978

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	225.0	Dry + Container	201.2
Container Wt.		Container Wt.	0
Dry Soil Wt.	225.0	Dry Soil Wt.	201.2

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"	.0	.0	100.0	
3/8"	2.6	1.2	98.8	
#4	16.7	7.4	92.6	
#10	34.1	15.2	84.8	
#20	63.0	28.0	72.0	
#40	122.6	54.5	45.5	
#60	170.3	75.7	24.3	
#140	196.1	87.2	12.8	
#200	200.1	88.9	11.1	
PAN	200.9			

SOIL LOST= .30 PERCENT ERROR= .13

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. [Signature]

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-3, SS-9

UNIFIED AASHTO
SP-SM A-1-b

Lab No.: 26984

<u>BEFORE WASH</u>	<u>POST WASH</u>	
Dry + Container	679.3 Dry + Container	613.4
Container Wt.	0 Container Wt.	0
Dry Soil Wt.	679.3 Dry Soil Wt.	613.4

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"	.0	.0	100.0	
1/2"	20.1	3.0	97.0	
3/8"	25.0	3.7	96.3	
#4	30.8	4.5	95.5	
#10	57.1	8.4	91.6	
#20	113.4	16.7	83.3	
#40	239.5	35.3	64.7	
#60	412.6	60.7	39.3	
#140	522.3	76.9	23.1	
#200	599.8	88.3	11.7	
PAN	610.8	89.9	10.1	
	612.5			

SOIL LOST= .90 PERCENT ERROR= .13

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Angley

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-3, CS-1

UNIFIED AASHTO
SP-SM A-3

Lab No.: 26985

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	176.0	Dry + Container	159.8
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	176.0	Dry Soil Wt.	159.8

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2				
1				
3/4				
1/2				
3/8	.0	.0	100.0	
#4	.8	.5	99.5	
#10	3.3	1.9	98.1	
#20	16.9	9.6	90.4	
#40	44.3	25.2	74.8	
#60	95.0	54.0	46.0	
#140	153.4	87.2	12.8	
#200	158.5	90.1	9.9	
PAN	159.5			

SOIL LOST= .30 PERCENT ERROR= .17

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Kozley

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-4, SS-5
Lab No.: 26990

UNIFIED SM AASHTO A-4

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	210.4	Dry + Container	121.4
Container Wt.		0 Container Wt.	0
Dry Soil Wt.	210.4	Dry Soil Wt.	121.4

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
#4				
#10	.0	.0	100.0	
#20	5.2	2.5	97.5	
#40	11.1	5.3	94.7	
#60	25.1	11.9	88.1	
#140	55.8	26.5	73.5	
#200	99.8	47.4	52.6	
PAN	118.9	56.5	43.5	
	121.7			
SOIL LOST=		-.30 PERCENT ERROR=	-.14	

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Kopylov

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-5, SS-4

UNIFIED SM AASHTO A-4

Lab No.: 26995

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	496.4	Dry + Container	320.1
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	496.4	Dry Soil Wt.	320.1

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"	.0	.0	100.0	
1/2"	25.9	5.2	94.8	
3/8"	25.9	5.2	94.8	
#4	25.9	5.2	94.8	
#10	35.3	7.1	92.9	
#20	45.8	9.2	90.8	
#40	72.8	14.7	85.3	
#60	126.2	25.4	74.6	
#140	201.4	40.6	59.4	
#200	290.4	58.5	41.5	
PAN	314.6	63.4	36.6	
	319.4			

SOIL LOST= .70 PERCENT ERROR= .14

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Langley

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-5, CS-1

UNIFIED SM AASHTO A-2-4

Lab No.: 26996

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	353.8	Dry + Container	275.9
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	353.8	Dry Soil Wt.	275.9

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
#4	.0	.0	100.0	
#10	1.0	.3	99.7	
#20	6.7	1.9	98.1	
#40	25.4	7.2	92.8	
#60	78.3	22.1	77.9	
#140	161.8	45.7	54.3	
#200	258.3	73.0	27.0	
PAN	273.2	77.2	22.8	
	275.6			

SOIL LOST= .30 PERCENT ERROR= .08

Remarks:

LL:
PL:
PI:

REVIEWED BY:

F

REVIEWED BY:

CERTIFIED BY:

*William H. K...
[Signature]*

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-7, CS-1

UNIFIED SM AASHTO A-1-b

Lab No.: 27001

<u>BEFORE WASH</u>	<u>POST WASH</u>	
Dry + Container	451.4 Dry + Container	391.7
Container Wt.	0 Container Wt.	0
Dry Soil Wt.	451.4 Dry Soil Wt.	391.7

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"	.0	.0	100.0	
3/4"	12.0	2.7	97.3	
1/2"	12.0	2.7	97.3	
3/8"	17.7	3.9	96.1	
#4	36.3	8.0	92.0	
#10	73.8	16.3	83.7	
#20	146.6	32.5	67.5	
#40	257.3	57.0	43.0	
#60	337.1	74.7	25.3	
#140	381.5	84.5	15.5	
#200	389.7	86.3	13.7	
PAN	391.3			

SOIL LOST= .40 PERCENT ERROR= .09

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. K...ley

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-7, CS-2

UNIFIED AASHTO
SP-SM A-2-4

Lab No.: 27002

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	378.2	Dry + Container	338.1
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	378.2	Dry Soil Wt.	338.1

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
#4	.0	.0	100.0	
#10	3.2	.8	99.2	
#20	8.8	2.3	97.7	
#40	32.3	8.5	91.5	
#60	134.1	35.5	64.5	
#140	272.4	72.0	28.0	
#200	331.5	87.7	12.3	
PAN	336.9	89.1	10.9	
	337.9			

SOIL LOST= .20 PERCENT ERROR= .05

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

see H. K. [Signature]

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.: UNIFIED SP-SM AASHTO A-1-b
Sampled From: LF-8, SS-5B
Lab No.: 27010

<u>BEFORE WASH</u>	<u>POST WASH</u>	
Dry + Container	179.9 Dry + Container	161.8
Container Wt.	0 Container Wt.	0
Dry Soil Wt.	179.9 Dry Soil Wt.	161.8

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"	.0	.0	100.0	
3/8"	6.5	3.6	96.4	
#4	6.5	3.6	96.4	
#10	21.1	11.7	88.3	
#20	45.3	25.2	74.8	
#40	78.9	43.9	56.1	
#60	114.7	63.8	36.2	
#140	140.2	77.9	22.1	
#200	158.6	88.2	11.8	
PAN	161.4	89.7	10.3	
	162.0			

SOIL LOST= -.20 PERCENT ERROR= -.11

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Kozlowski

PRECISION ENGINEERING, INC.
 P. O. BOX 422, LAS CRUCES,
 NEW MEXICO 88004
 505-523-7674

Particle Size Analysis
 of Soils

ATTN: ANNE URENDA
 CAMP DRESSER & MCKEE, INC.
 2400 LOUISIANA BLVD., N.E.
 SUITE #740
 AMERICAN FINANCIAL CENTER
 BLDG. #5,
 ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
 File No.: 94-137
 Date: NOVEMBER 11, 1994

Soil Type and Class.:
 Sampled From: LF-8, CS-2B

UNIFIED AASHTO
 SP-SM A-2-4

Lab No.: 27011

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	346.3	Dry + Container	308.4
Container Wt.		0 Container Wt.	0
Dry Soil Wt.	346.3	Dry Soil Wt.	308.4

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
#4	.0	.0	100.0	
#10	4.3	1.2	98.8	
#20	17.4	5.0	95.0	
#40	59.0	17.0	83.0	
#60	140.4	40.5	59.5	
#140	232.3	67.1	32.9	
#200	300.4	86.7	13.3	
PAN	306.9	88.6	11.4	
	308.3			

SOIL LOST= .10 PERCENT ERROR= .03

Remarks:

LL:
 PL:
 PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

[Handwritten Signature]

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-9, SS-1

UNIFIED AASHTO
SP-SM A-1-b

Lab No.: 27012

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	519.8	Dry + Container	462.9
Container Wt.		0 Container Wt.	0
Dry Soil Wt.	519.8	Dry Soil Wt.	462.9

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"	.0	.0	100.0	
3/8"	21.0	4.0	96.0	
#4	40.6	7.8	92.2	
#10	67.7	13.0	87.0	
#20	127.4	24.5	75.5	
#40	222.3	42.8	57.2	
#60	321.3	61.8	38.2	
#140	399.9	76.9	23.1	
#200	451.9	86.9	13.1	
PAN	460.3	88.6	11.4	
	462.6			

SOIL LOST= .30 PERCENT ERROR= .06

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. K...

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-9, SS-3

UNIFIED AASHTO
SP-SM A-1-b

Lab No.: 27014

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	379.4	Dry + Container	342.9
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	379.4	Dry Soil Wt.	342.9

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"	.0	.0	100.0	
3/8"	13.6	3.6	96.4	
#4	21.2	5.6	94.4	
#10	45.5	12.0	88.0	
#20	92.2	24.3	75.7	
#40	168.7	44.5	55.5	
#60	233.2	61.5	38.5	
#140	283.9	74.8	25.2	
#200	333.2	87.8	12.2	
PAN	341.1	89.9	10.1	
	342.3			

SOIL LOST= .60 PERCENT ERROR= .16

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. King

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-10, SS-3

UNIFIED AASHTO
SP-SM A-1-b

Lab No.: 27017

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	389.5	Dry + Container	348.2
Container Wt.	0	Container Wt.	0
Dry Soil Wt.	389.5	Dry Soil Wt.	348.2

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"				
3/4"				
1/2"	.0	.0	100.0	
3/8"	4.5	1.2	98.8	
#4	8.0	2.1	97.9	
#10	25.4	6.5	93.5	
#20	66.4	17.0	83.0	
#40	14.5	3.7	96.3	
#60	216.5	55.6	44.4	
#140	287.5	73.8	26.2	
#200	338.8	87.0	13.0	
PAN	346.5	89.0	11.0	
	348.1			

SOIL LOST= .10 PERCENT ERROR= .03

Remarks:

LL:
PL:
PI:

REVIEWED BY:

J

REVIEWED BY:

CERTIFIED BY:

William H. Taylor

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Particle Size Analysis
of Soils

ATTN: ANNE URENDA
CAMP DRESSER & MCKEE, INC.
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER
BLDG. #5,
ALBUQUERQUE, NM 87110

Project: SANTA FE LANDFILL II
File No.: 94-137
Date: NOVEMBER 11, 1994

Soil Type and Class.:
Sampled From: LF-10, CS-1

UNIFIED SM AASHTO A-2-4

Lab No.: 27019

<u>BEFORE WASH</u>		<u>POST WASH</u>	
Dry + Container	338.6	Dry + Container	280.9
Container Wt.		Container Wt.	0
Dry Soil Wt.	338.6	Dry Soil Wt.	280.9

<u>SIEVE NUMBER</u>	<u>WT. RETAINED</u>	<u>% RETAINED</u>	<u>% PASSING</u>	<u>SPEC.</u>
3"				
2"				
1-1/2"				
1"	.0	.0	100.0	
3/4"	16.1	4.8	95.2	
1/2"	25.3	7.5	92.5	
3/8"	27.9	8.2	91.8	
#4	31.6	9.3	90.7	
#10	37.4	11.0	89.0	
#20	47.7	14.1	85.9	
#40	66.2	19.6	80.4	
#60	120.0	35.4	64.6	
#140	256.3	75.7	24.3	
#200	276.7	81.7	18.3	
PAN	280.5			

SOIL LOST= .40 PERCENT ERROR= .12

Remarks:

LL:
PL:
PI:

REVIEWED BY:

F

REVIEWED BY:

CERTIFIED BY:

William H. [Signature]

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFILL II
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF1	LF1	LF1	LF1	LF1
LAB NO.	26967	26968	26969	26970	26971
CDM NO.	SS-1	CS-1	SS-2	SS-3	SS-5
CAN + WET SOIL	87.93	81.99	376.20	515.90	494.20
CAN + DRY SOIL	82.14	79.78	341.50	451.60	460.70
CAN WT.	14.53	13.31	215.40	209.70	208.30
% H2O	8.6	3.3	27.5	26.6	13.3

BORING NO.	LF-1
LAB NO.	26973
CDM NO.	SS-8
CAN + WET SOIL	102.74
CAN + DRY SOIL	100.46
CAN WT.	14.11
% H2O	2.6

Reviewed By:

J

Reviewed By:

Certified By:

*William H. K...
-3*

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFIL
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF2	LF2	LF2	LF2	LF2
LAB NO.	26974	26975	26976	26977	26978
CDM NO.	SS-1	SS-2	SS-3	SS-5	SS-8
CAN + WET SOIL	76	285.50	644.70	79.90	71.14
CAN + DRY SOIL	71.72	269.50	579.90	75.37	67.81
CAN WT.	13.95	212.20	214.60	13.53	13.58
% H2O	7.4	27.9	17.7	7.3	6.1

BORING NO.	LF-2
LAB NO.	26979
CDM NO.	CS-1
CAN + WET SOIL	99.90
CAN + DRY SOIL	95.58
CAN WT.	14.63
% H2O	5.3

Reviewed By:

J

Reviewed By:

Certified By:

William H. K. [Signature]

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFIL
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF3	LF3	LF3	LF3	LF3
LAB NO.	26980	26981	26982	26983	26984
CDM NO.	SS-2	SS-3	SS-4	SS-6	SS-9
CAN + WET SOIL	402.50	342.30	93.96	687.60	87.75
CAN + DRY SOIL	359.60	318.90	87.95	583.10	83.61
CAN WT.	212.80	211.50	14.38	212	14.07
% H2O	29.2	21.8	8.2	28.2	6.0

BORING NO.	LF3
LAB NO.	26985
CDM NO.	CS-1
CAN + WET SOIL	85.20
CAN + DRY SOIL	81.45
CAN WT.	14.25
% H2O	5.6

Reviewed By:

J

Reviewed By:

Certified By:

Bill H. ...

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFIL
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF4	LF4	LF4	LF4	LF4
LAB NO.	26986	26987	26988	26989	26990
CDM NO.	SS-1	SS-2	SS-3	SS-4	SS-5
CAN + WET SOIL	81.46	527.70	528.90	80.41	84.67
CAN + DRY SOIL	76.26	465	483.80	74.87	76.93
CAN WT.	13.14	168.60	91.10	14.55	13.99
% H2O	8.2	21.2	11.5	9.2	12.3

BORING NO.	LF4
LAB NO.	26991
CDM NO.	CS-3
CAN + WET SOIL	81.72
CAN + DRY SOIL	80.16
CAN WT.	13.91
% H2O	2.4

Reviewed By:

J

Reviewed By:

Certified By:

William H. K. [Signature]

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFILL
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF5	LF5	LF5	LF5	LF5
LAB NO.	26992	26993	26994	26995	26996
CDM NO.	SS-1	SS-2	SS-3	SS-4	CS-1
CAN + WET SOIL	79.91	509.20	788.60	71.24	94.97
CAN + DRY SOIL	73.82	459.60	727.40	64.35	89.06
CAN WT.	14.37	92.50	158.80	14.08	14.23
% H2O	10.2	13.5	10.8	13.7	7.9

BORING NO.	LF5
LAB NO.	26997
CDM NO.	CS-2
CAN + WET SOIL	94.98
CAN + DRY SOIL	91.26
CAN WT.	14.31
% H2O	4.8

Reviewed By:

J

Reviewed By:

Certified By:

Walter H. King

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFIL
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF6	LF6	LF6
LAB NO.	26998	26999	27000
CDM NO.	SS-1	SS-2	SS-3
CAN + WET SOIL	567.40	504	584.30
CAN + DRY SOIL	497.70	426.30	497.50
CAN WT.	157.40	90.70	90.50
% H2O	20.5	23.2	21.3

BORING NO.	LF7	LF7	LF7	LF7	LF7
LAB NO.	27001	27002	27003	27004	27005
CDM NO.	CS-1	CS-2	CS-3	SS-1	SS-2
CAN + WET SOIL	89.55	106.25	92.59	79.59	71.35
CAN + DRY SOIL	85.17	100.69	88.80	73.65	67.33
CAN WT.	13.20	13.99	13.73	13.03	13.75
% H2O	6.1	6.4	5.0	9.8	7.5

Reviewed By:

[Signature]

Reviewed By:

Certified By:

[Signature]

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFIL
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF8	LF8	LF8	LF8	LF8
LAB NO.	27006	27007	27008	27009	27010
CDM NO.	SS-1	SS-2	SS-3	SS-4B	SS-5B
CAN + WET SOIL	462.80	529.40	481.40	1468.20	62.17
CAN + DRY SOIL	429.30	486.20	458	1390.30	59.93
CAN WT.	90.90	82.10	219.30	210.70	13.67
% H2O	9.9	10.7	9.8	6.6	4.8

BORING NO.	LF8
LAB NO.	27011
CDM NO.	CS-2B
CAN + WET SOIL	89.68
CAN + DRY SOIL	85.02
CAN WT.	13.97
% H2O	6.6

Reviewed By:

F

Reviewed By:

Certified By:

William H. King

PRECISION ENGINEERING, INC.
P. O. BOX 422, LAS CRUCES,
NEW MEXICO 88004
505-523-7674

Moisture Content Determination

ATTN: ANN URENDA
CAMP, DRESSER, MCKEE
2400 LOUISIANA BLVD., N.E.
SUITE #740
AMERICAN FINANCIAL CENTER, BLDG. #5
ALBUQUERQUE, NM 87110

PROJECT: SANTA FE LANDFIL
FILE NO.: 94-137
DATE: NOVEMBER 3, 1994

BORING NO.	LF9	LF9	LF9
LAB NO.	27012	27013	27014
CDM NO.	SS-1	SS-2	SS-3
CAN + WET SOIL	85.71	104.74	81.88
CAN + DRY SOIL	82.56	99.09	78.02
CAN WT.	14.80	14.78	13.82
% H2O	4.6	6.7	6.0

BORING NO.	LF10	LF10	LF10	LF10	LF10
LAB NO.	27015	27016	27018	27019	27020
CDM NO.	SS-1	SS-2	SS-4	CS-1	CS-2
CAN + WET SOIL	518	94.01	81.94	81.21	103.40
CAN + DRY SOIL	495.30	84.96	75.58	76.24	99.30
CAN WT.	207.90	13.66	13.99	14.58	13.89
% H2O	7.9	12.7	10.3	8.1	4.8

Reviewed By:

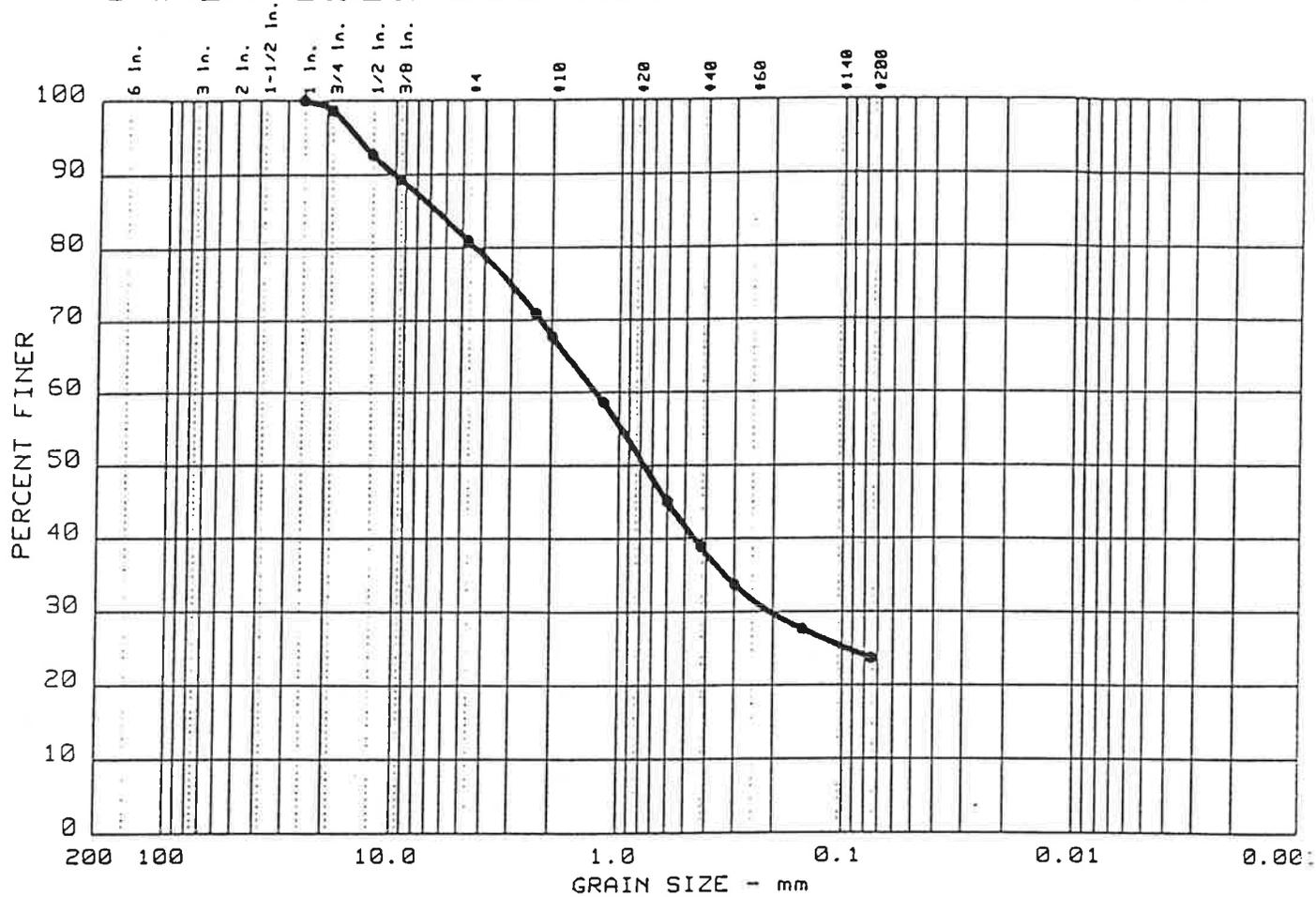
F

Reviewed By:

Certified By:

William H. K. [Signature]

GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 1	0.0	19.1	57.2	23.7	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● 31	13	6.53	1.26	0.76	0.207				

MATERIAL DESCRIPTION	USCS	AASHTO
● Clayey Sand w/Gravel	SC	A-2-6(0.3)

Project No.: 32441010
 Project: Santa Fe Landfill/CDM #1257121CP
 ● Location: Cuttings @ 5'-7'
 Date: December 8, 1994

Remarks:
 Sampled On 11-29-94
 Sampled By: Dan Fugual
 Submitted By: Anne Urenda
 Permeability = 5.0x10⁻⁵

MOISTURE-DENSITY TEST DATA

DATA FILE: 30

PROJECT DATA

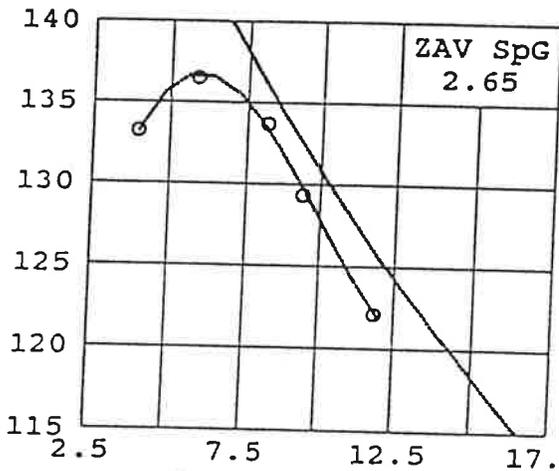
Date: December 8, 1994
 Project No.: 32441010
 Project: Santa Fe Landfill
 Location 1: Cuttings At 5' To 7'
 2:
 Remarks 1: Sampled On 11-29-1994
 2: Sampled By Dan Fugual
 3: CDM # 1257121 CP
 Material 1: Clayey Sand W/Gravel
 description 2:
 Elevation or depth: 5'- 7'
 Fig. No.: 1

SPECIMEN DATA

USCS classification: SC
 Natural moisture: 2.2
 Percent retained on 3/4 in sieve: 1.0
 Percent passing No. 200 sieve: 24.0
 Liquid limit: 33
 Plastic limit: 20
 Plasticity index: 13
 AASHTO classification: A-2-6
 Specific gravity: 2.65

TEST DATA AND RESULTS FOR CURVE C1

Type of test: Modified, ASTM D 1557-91 Method C (corrected)

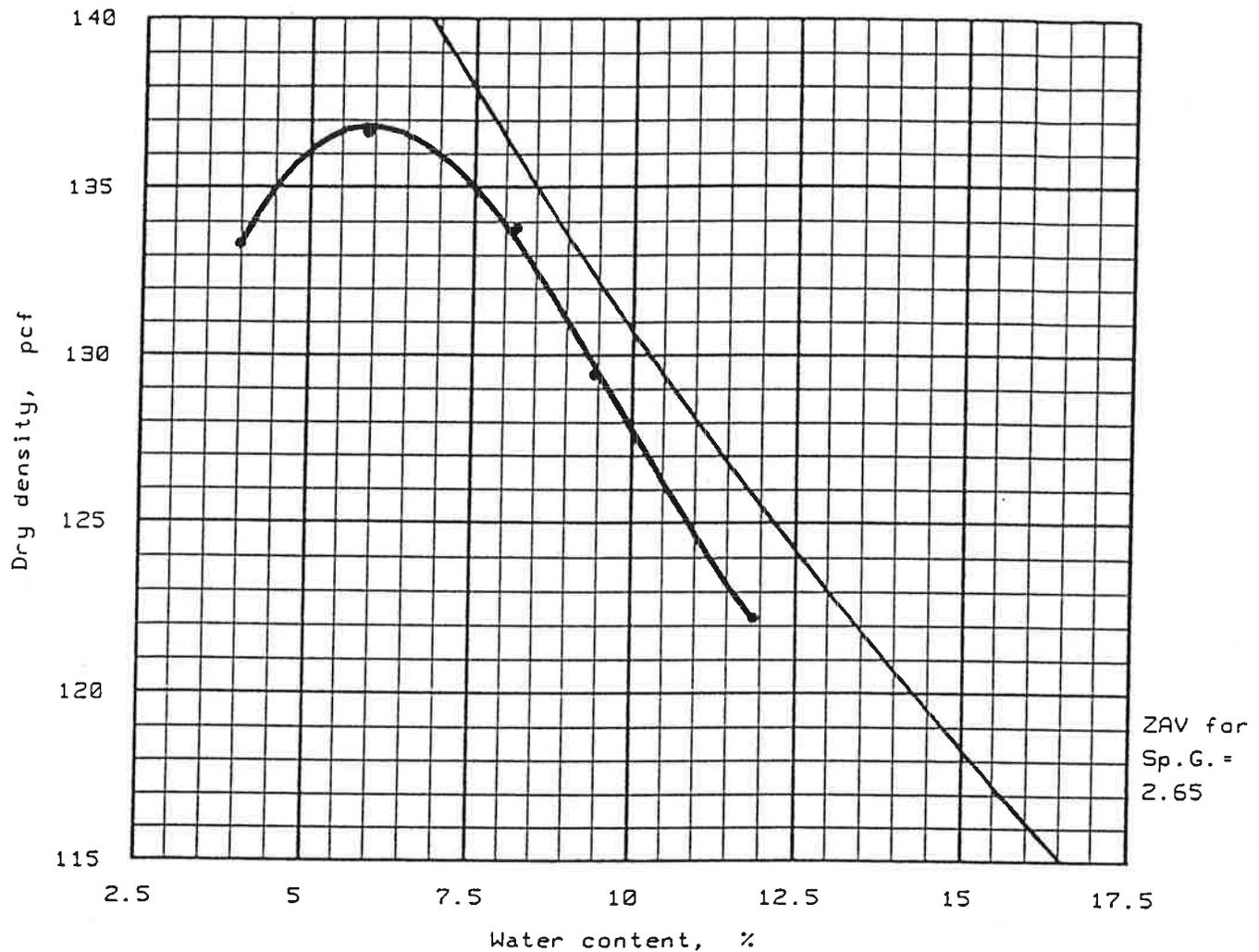


POINT NO.	1	2	3	4	5
WM + WS	11920	11923	11816	11650	11714
WM	7005	7005	7005	7005	7005
WW+T #1	554.90	626.60	544.20	643.20	717.70
WD+T #1	523.90	578.90	497.00	574.40	690.10
TARE #1	0.00	0.00	0.00	0.00	0.00
MOIST #1	5.9	8.2	9.5	12.0	4.0
MOISTURE	5.9	8.2	9.4	11.9	4.0
DRY DEN	136.6	133.8	129.4	122.3	133.4

Uncorrected Results: Max dry den= 136.8 pcf, Opt moisture= 5.9 %
 ASTM D 4718 Correction Data: Max dry den= 136.6 pcf, Opt moisture= 6.0 %

Bulk Specific Gravity of Oversize Material = 2.65
 Moisture of oversize material = 2.2 %
 ASTM D 4718 Correction Applied to Results Only

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 1557-91 Method C (corrected), Modified
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
5' - 7'	SC	A-2-6	2.2 %	2.65	33	13	1.0 %	24.0 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 136.8 pcf Optimum moisture = 5.9 %	Clayey Sand W/Gravel
Project No.: 32441010 Project: Santa Fe Landfill Location: Cuttings At 5' To 7' Date: December 8, 1994	Remarks: Sampled On 11-29-1994 Sampled By Dan Fugual CDM # 1257121 CP
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN TECHNOLOGIES, INC.	
Fig. No. 1	

MOISTURE-DENSITY TEST DATA

DATA FILE: 31

PROJECT DATA

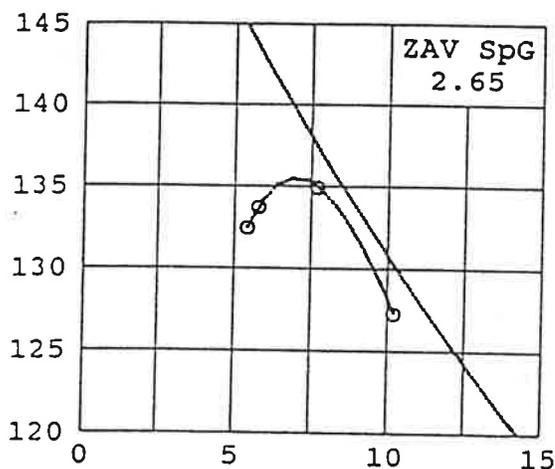
Date: December 8, 1994
 Project No.: 32441010
 Project: Santa Fe Landfill
 Location 1: Cuttings At 7' To 9'
 2:
 Remarks 1: Sampled On 11-29-1994
 2: Sampled By Dan Fugual
 3: CDM # 1257121 CP
 Material 1: Clayey Sand W/Gravel
 description 2:
 Elevation or depth: 7'- 9'
 Fig. No.: 2

SPECIMEN DATA

USCS classification: SC AASHTO classification: A-2-6
 Natural moisture: 3.1 Specific gravity: 2.65
 Percent retained on 3/8 in sieve: 8.0
 Percent passing No. 200 sieve: 23.0
 Liquid limit: 34 Plastic limit: 18 Plasticity index: 16

TEST DATA AND RESULTS FOR CURVE C2

Type of test: Modified, ASTM D 1557-91 Method B (corrected)



POINT NO.	1	2	3	4
WM + WS	6418	6480	6401	6390
WM	4308	4308	4308	4308
WW+T #1	316.70	361.00	431.20	336.80
WD+T #1	298.80	334.00	389.20	318.90
TARE #1	0.00	0.00	0.00	0.00
MOIST #1	6.0	8.1	10.8	5.6
MOISTURE	5.8	7.7	10.2	5.4
DRY DEN	133.9	135.1	127.4	132.6

Max dry den= 135.6 pcf, Opt moisture= 7.0 %
 Uncorrected Results: Max dry den= 135.6 pcf, Opt moisture= 7.0 %

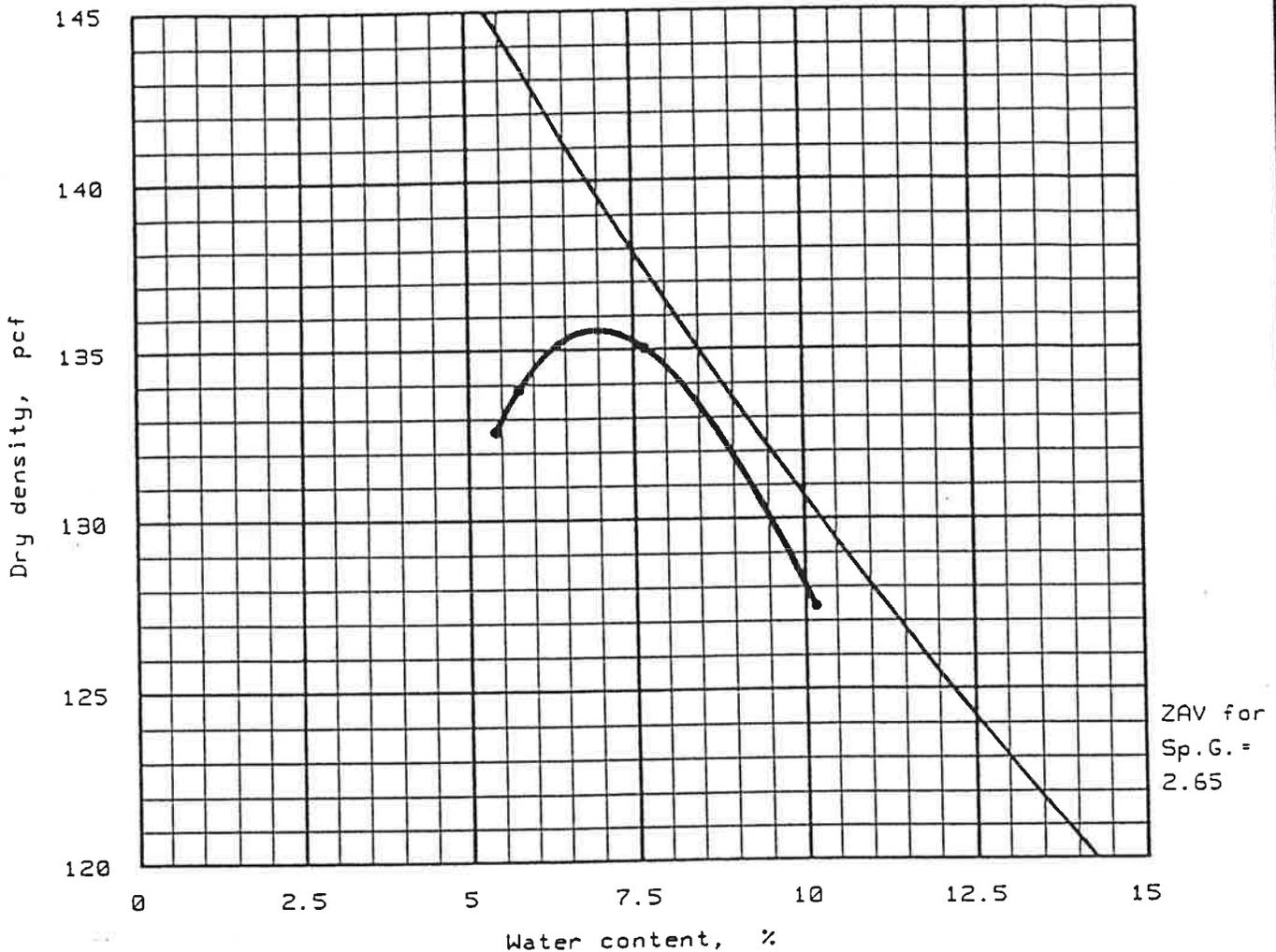
ASTM D 4718 Correction Data:

Bulk Specific Gravity of Oversize Material = 2.65

Moisture of oversize material = 3.1 %

ASTM D 4718 Correction Applied to Results Only

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 1557-91 Method B (corrected), Modified
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
7' - 9'	SC	A-2-6	3.1 %	2.65	34	16	8.0 %	23.0 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 135.6 pcf Optimum moisture = 7.0 %	Clayey Sand W/Gravel
Project No.: 32441010 Project: Santa Fe Landfill Location: Cuttings At 7' To 9' Date: December 8, 1994	Remarks: Sampled On 11-29-1994 Sampled By Dan Fugual CDM # 1257121 CP
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN TECHNOLOGIES, INC.	Fig. No. 2

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 1

Date: December 14, 1994
 Project No.: 32441010
 Project: Santa Fe Landfill/CDM #1257121CP

Sample Data

Location of Sample: Tube Sample @ 9'-10.5'
 Sample Description: Silty Sand
 USCS Class: SM
 AASHTO Class: A-1-b
 Liquid limit: N/A
 Plasticity index: N/A

Notes

Remarks: Sampled On 11-29-94 Sampled By: Dan Fugual
 Submitted By: Anne Urenda
 Fig. No.: 3

Mechanical Analysis Data

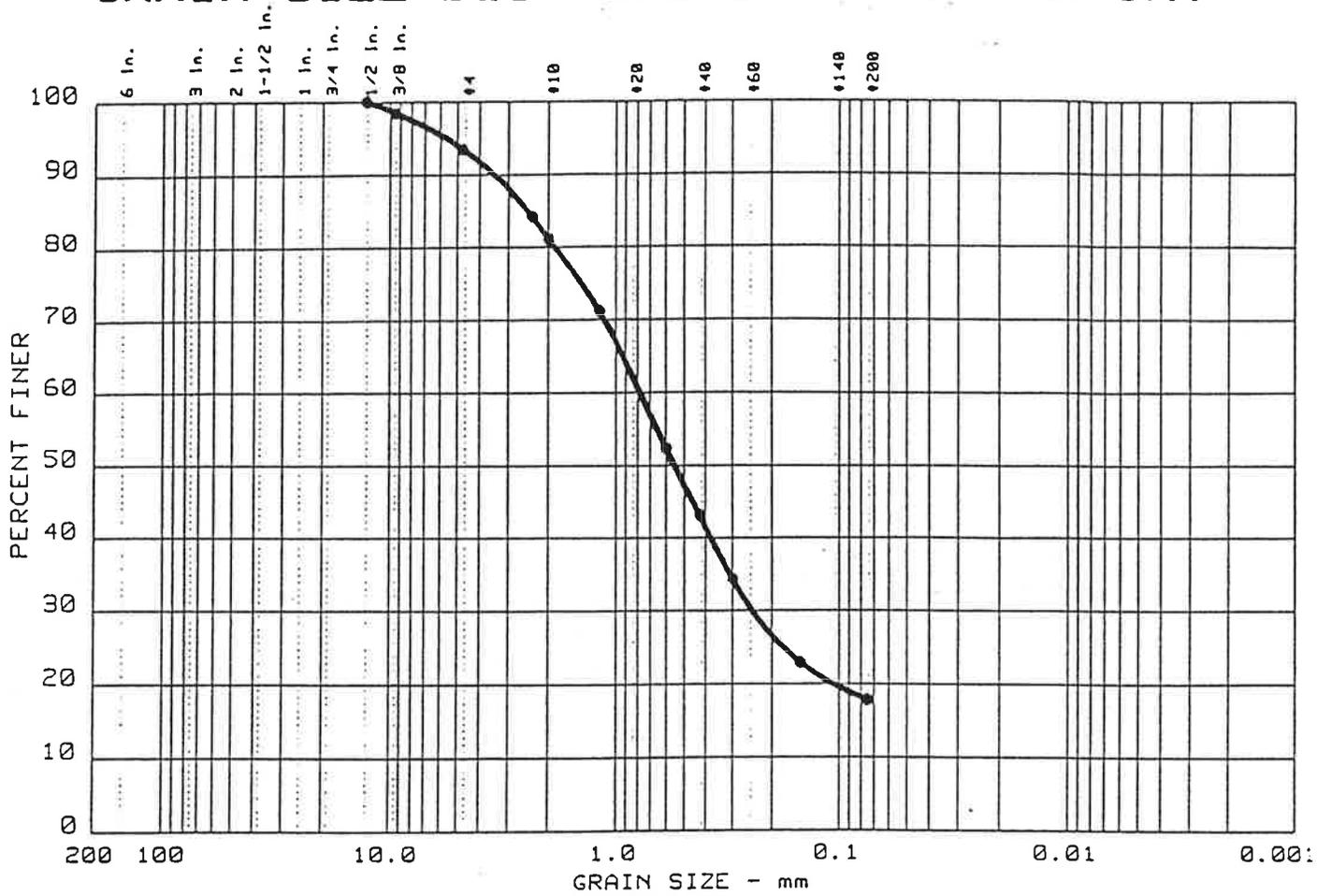
Sieve	Cumul. Wt. retained	Initial	Percent finer
Dry sample and tare=		784.50	
Tare =		0.00	
Dry sample weight =		784.50	
Tare for cumulative weight retained=	0		
0.5 inches	0.00		100.0
0.375 inches	12.00		98.5
# 4	51.20		93.5
# 8	124.20		84.2
# 10	148.20		81.1
# 16	226.20		71.2
# 30	373.60		52.4
# 40	446.80		43.0
# 50	515.30		34.3
# 100	605.00		22.9
# 200	644.00		17.9

Fractional Components

Gravel/Sand based on #4 sieve
 Sand/Fines based on #200 sieve
 % + 3 in. = 0.0 % GRAVEL = 6.5 % SAND = 75.6
 % FINES = 17.9

D85= 2.45 D60= 0.776 D50= 0.550
 D30= 0.2427

GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 1	0.0	6.5	75.6	17.9	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● N/A	N/A	2.45	0.78	0.55	0.243				

MATERIAL DESCRIPTION	USCS	AASHTO
● Silty Sand	SM	A-1-b

Project No.: 32441010 Project: Santa Fe Landfill/CDM #1257121CP ● Location: Tube Sample @ 9'-10.5' Date: December 14, 1994	Remarks: Sampled On 11-29-94 Sampled By: Dan Fugal Submitted By: Anne Urenda
---	---

APPENDIX D

SOIL CHEMISTRY ANALYSIS DATA



Analytical Technologies, Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. 410359

RECEIVED

NOV 11 1994

CAMP DRESSER & MCKEE INC.
ALBUQUERQUE

November 9, 1994

Camp, Dresser & Mckee, Inc.
2400 Louisiana Blvd. NE
AFC-5, Suite 740
Albuquerque, NM 87110

Project Name/Number: CITY OF SANTA FE LANDFILL 1257-121-CP-SUBS

Attention: Ann Uranda

On 10/10/94, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze non-aqueous samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

Uranium analyses were performed by Analytical Technologies, Inc., 225 Commerce Drive, Fort Collins, CO.

EPA Method 418.1 analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

All other analyses were performed by Analytical Technologies, Inc., 9830 S. 51st Street, Suite B-113, Phoenix, AZ.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski, Ph.D.
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure



Analytical Technologies, Inc.

CLIENT : CAMP, DRESSER & MCKEE, INC. DATE RECEIVED : 10/10/94
PROJECT # : 1257-121-CP-SUBS
PROJECT NAME : CITY OF SANTA FE LANDFILL REPORT DATE : 11/09/94

ATI ID: 410359

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	LF-3/SS-8	NON-AQ	10/08/94
02	LF-2/SS-4	NON-AQ	10/09/94
03	LF-2/SS-7	NON-AQ	10/09/94
04	LF-1/SS-7	NON-AQ	10/09/94

---TOTALS---

<u>MATRIX</u>	<u>#SAMPLES</u>
NON-AQ	4

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

GENERAL CHEMISTRY RESULTS

CLIENT : CAMP, DRESSER & MCKEE, INC. ATI I.D. : 410359
PROJECT # : 1257-121-CP-SUBS DATE RECEIVED : 10/10/94
PROJECT NAME : CITY OF SANTA FE LANDFILL DATE ANALYZED : 10/13/94

PARAMETER	UNITS	01	02	03	04
PETROLEUM HYDROCARBONS, IR	MG/KG	<20	<20	<20	<20

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : CAMP, DRESSER & MCKEE, ATI I.D. : 410359
 PROJECT # : 1257-121-CP-SUBS SAMPLE MATRIX : NON-AQ
 PROJECT NAME : CITY OF SANTA FE LANDFILL UNITS : MG/KG

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC.	% REC
PETROLEUM HYDROCARBONS	410364-01	<20	<20	NA	170	150	113

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$



Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 410359

CLIENT : CAMP, DRESSER AND MCKEE
PROJECT # : 1257-121-CP-SUBS
PROJECT NAME : CITY OF SANTA FE LANDFILL

DATE RECEIVED : 10/10/94

REPORT DATE : 11/09/94

PARAMETER	UNITS	01	02	03	04
CHLORIDE (IN LEACHATE)	MG/L	9	5.3	2.8	<0.5
DATE LEACHED		10/14/94	10/14/94	10/14/94	10/14/94
NITRATE/NITRITE IN LEACHATE	MG/L	<0.06	<0.06	<0.06	<0.06
AMMONIA (IN LEACHATE)	MG/L	0.03	0.03	<0.03	0.05



GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : CAMP, DRESSER AND MCKEE
PROJECT # : 1257-121-CP-SUBS
PROJECT NAME : CITY OF SANTA FE LANDFILL

ATI I.D. : 410359

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
CHLORIDE (IN LEACHATE)	MG/L	41035904	<0.5	<0.5	NA	10.3	10.0	103
NITRATE/NITRITE IN LEA	MG/L	41035904	<0.06	<0.06	NA	2.03	2.00	102
AMMONIA IN LEACHATE	MG/L	41035903	<0.03	<0.03	N/A	0.52	0.60	87

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$



Analytical Technologies, Inc.

LF-2

METALS RESULTS

ATI I.D. : 410359

CLIENT : CAMP, DRESSER AND MCKEE
PROJECT # : 1257-121-CP-SUBS
PROJECT NAME : CITY OF SANTA FE LANDFILL

DATE RECEIVED : 10/10/94

REPORT DATE : 11/09/94

PARAMETER	UNITS	01	02	03	04
SILVER (EPA 6010)	MG/KG	<1.0	<0.5	<0.5	<0.5
ALUMINUM (EPA 6010)	MG/KG	1610	3850	1190	1010
ARSENIC (EPA 6010)	MG/KG	<10	<5	<5	<5
BARIUM (EPA 6010)	MG/KG	51.6	239	27.8	112
BERYLLIUM (EPA 7031)	MG/KG	<0.3	0.3	0.3	<0.3
BORON (EPA 6010)	MG/KG	<10	<5	<5	<5
CALCIUM (EPA 6010)	MG/KG	40900	44700	21200	19100
CADMIUM (EPA 6010)	MG/KG	<0.6	<0.3	<0.3	<0.3
COBALT (EPA 6010)	MG/KG	1.0	1.8	0.9	1.2
CHROMIUM (EPA 6010)	MG/KG	2.2	5.4	1.7	1.6
COPPER (EPA 6010)	MG/KG	5.8	14.1	4.2	2.6
IRON (EPA 6010)	MG/KG	2610	5400	1880	3930
MERCURY (EPA 7471)	MG/KG	<0.1	<0.1	<0.1	<0.1
POTASSIUM (EPA 6010)	MG/KG	200	520	170	160
MAGNESIUM (EPA 6010)	MG/KG	1100	1540	751	793
MANGANESE (EPA 6010)	MG/KG	246	285	147	286
NIOBENUM (EPA 6010)	MG/KG	<2	<1	<1	<1
NIODIUM (EPA 6010)	MG/KG	263	91	104	29
NICKEL (EPA 6010)	MG/KG	12.1	6.4	4.7	2.8
LEAD (EPA 6010)	MG/KG	<10	<5	<5	<5
ANTIMONY (EPA 6010)	MG/KG	<6	<3	<3	<3
SELENIUM (EPA 6010)	MG/KG	<10	<5	<5	<5
THALLIUM (EPA 6010)	MG/KG	<10	<5	<5	<5
VRANIUM (EPA 6010)	MG/KG	9.2	10.7	5.2	14.7
ZINC (EPA 6010)	MG/KG	15.0	23.0	9.8	8.1

Soil tests not definitive



Analytical Technologies, Inc.

METALS - QUALITY CONTROL

CLIENT : CAMP, DRESSER AND MCKEE
 PROJECT # : 1257-121-CP-SUBS
 PROJECT NAME : CITY OF SANTA FE LANDFILL

ATI I.D. : 410359

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
SILVER	MG/KG	41035902	<0.5	<0.5	NA	18.0	25.0	72*
ALUMINUM	MG/KG	41035903	1190	1200	0.8	1770	500	116
ALUMINUM	MG/KG	41035902	3850	4180	8	4910	1000	106
ARSENIC	MG/KG	41035902	<5	<5	NA	42	50	84
BARIUM	MG/KG	41035902	239	252	5	763	500	105
BERYLLIUM (EPA 7091)	MG/KG	41035902	0.3	0.4	29	21.6	25.0	85
BORON	MG/KG	41035902	<5	<5	NA	37.4	50.0	75*
CALCIUM	MG/KG	41035902	44700	39000	14	45500	1000	80
CADMIUM	MG/KG	41035902	<0.3	<0.3	NA	20.2	25.0	81
COBALT	MG/KG	41035902	1.8	1.9	10	40.6	50.0	78*
CHROMIUM	MG/KG	41035903	1.7	1.7	0	48.5	50.0	94
CHROMIUM	MG/KG	41035902	5.4	5.8	7	47.6	50.0	84
COPPER	MG/KG	41035902	14.1	14.0	0.7	36.3	25.0	89
IRON	MG/KG	41035903	1880	2000	6	6970	5000	102
IRON	MG/KG	41035902	5400	5380	4	16100	10000	107
MERCURY	MG/KG	41066401	<0.1	<0.1	NA	2.3	2.5	92
POTASSIUM	MG/KG	41035903	170	160	6	2620	2500	98
POTASSIUM	MG/KG	41035902	520	500	4	1000	500	96
MAGNESIUM	MG/KG	41035903	751	756	0.7	2000	1250	100
MAGNESIUM	MG/KG	41035902	1540	1650	48	4030	2500	100
MANGANESE	MG/KG	41035902	285	273	4	794	500	102
MOLYBDENUM	MG/KG	41035902	<1	<1	NA	39	50	78*
SODIUM	MG/KG	41035902	91	100	9	561	500	94
NICKEL	MG/KG	41035902	6.4	8.1	23	48.8	50.0	85
LEAD	MG/KG	41035902	<5	<5	NA	42	50	84
ANTIMONY	MG/KG	41035902	<3	<3	NA	12	50	24*
SELENIUM	MG/KG	41035902	<5	<5	NA	39	50	78*
THALLIUM	MG/KG	41035902	<5	<5	NA	37	50	74*
VANADIUM	MG/KG	41035902	10.7	12.9	19	52.3	50.0	83
ZINC	MG/KG	41035903	9.8	9.8	0	57.6	50.0	96
ZINC	MG/KG	41035902	23.0	24.4	6	46.3	25.0	93

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

* Result out of limits due to sample matrix interference



Analytical Technologies, Inc.

GCMS - RESULTS

ATI I.D. : 41035901

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT : CAMP, DRESSER AND MCKEE
 PROJECT # : 1257-121-CP-SUBS
 PROJECT NAME : CITY OF SANTA FE LANDFILL
 CLIENT I.D. : LF-3/SS-8
 SAMPLE MATRIX : NON-AQUEOUS

DATE SAMPLED : 10/08/94
 DATE RECEIVED : 10/10/94
 DATE EXTRACTED : 10/21/94
 DATE ANALYZED : 10/22/94
 UNITS : MG/KG
 DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	<0.3
ACETONE	<0.50
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,2-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,2,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

DIBROMOFLUOROMETHANE (%)	106
BROMOFLUOROBENZENE (%)	107
TOLUENE-D8 (%)	100



Analytical Technologies, Inc.

ADDITIONAL COMPOUNDS (SEMI-QUANTITATED)

TEST : VOLATILE ORGANICS (EPA 8240)

ATI I.D. : 41035901

COMPOUNDS

RESULTS

NO ADDITIONAL COMPOUNDS



GCMS - RESULTS

ATI I.D. : 41035902

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT : CAMP, DRESSER AND MCKEE
 PROJECT # : 1257-121-CP-SUBS
 PROJECT NAME : CITY OF SANTA FE LANDFILL
 CLIENT I.D. : LF-2/SS-4
 SAMPLE MATRIX : NON-AQUEOUS

DATE SAMPLED : 10/09/94
 DATE RECEIVED : 10/10/94
 DATE EXTRACTED : 10/21/94
 DATE ANALYZED : 10/22/94
 UNITS : MG/KG
 DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	<0.3
ACETONE	<0.50
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,1-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,2,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLEETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

BROMOFLUOROMETHANE (%)	103
BROMOFLUOROBENZENE (%)	106
FLUORENE-D8 (%)	99



Analytical Technologies, Inc.

ADDITIONAL COMPOUNDS (SEMI-QUANTITATED)

TEST : VOLATILE ORGANICS (EPA 8240)

ATI I.D. : 41035902

COMPOUNDS

RESULTS

NO ADDITIONAL COMPOUNDS



Analytical Technologies, Inc.

GCMS - RESULTS

ATI I.D. : 41035903

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT	: CAMP, DRESSER AND MCKEE	DATE SAMPLED	: 10/09/94
PROJECT #	: 1257-121-CP-SUBS	DATE RECEIVED	: 10/10/94
PROJECT NAME	: CITY OF SANTA FE LANDFILL	DATE EXTRACTED	: 10/21/94
CLIENT I.D.	: LF-2/SS-7	DATE ANALYZED	: 10/22/94
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	<0.3
ACETONE	<0.50
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,2-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,2,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

BROMOFLUOROMETHANE (%)	104
BROMOFLUOROBENZENE (%)	106
TOLUENE-D8 (%)	100



Analytical Technologies, Inc.

ADDITIONAL COMPOUNDS (SEMI-QUANTITATED)

TEST : VOLATILE ORGANICS (EPA 8240)

ATI I.D. : 41035903

COMPOUNDS

RESULTS

NO ADDITIONAL COMPOUNDS



Analytical Technologies, Inc.

GCMS - RESULTS

ATI I.D. : 41035904

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT	: CAMP, DRESSER AND MCKEE	DATE SAMPLED	: 10/09/94
PROJECT #	: 1257-121-CP-SUBS	DATE RECEIVED	: 10/10/94
PROJECT NAME	: CITY OF SANTA FE LANDFILL	DATE EXTRACTED	: 10/21/94
CLIENT I.D.	: LF-1/SS-7	DATE ANALYZED	: 10/22/94
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	<0.3
ACETONE	<0.50
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,2-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,2,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

BROMOFLUOROMETHANE (%)	103
BROMOFLUOROBENZENE (%)	106
TOLUENE-D8 (%)	99



Analytical Technologies, Inc.

ADDITIONAL COMPOUNDS (SEMI-QUANTITATED)

TEST : VOLATILE ORGANICS (EPA 8240)

ATI I.D. : 41035904

COMPOUNDS

RESULTS

NO ADDITIONAL COMPOUNDS



GCMS - RESULTS

REAGENT BLANK

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT : CAMP, DRESSER AND MCKEE
PROJECT # : 1257-121-CP-SUBS
PROJECT NAME : CITY OF SANTA FE LANDFILL
CLIENT I.D. : REAGENT BLANK

ATI I.D. : 410359
DATE EXTRACTED : 10/21/94
DATE ANALYZED : 10/22/94
UNITS : MG/KG
DILUTION FACTOR : N/A

COMPOUNDS	RESULTS
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CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	<0.3
ACETONE	<0.50
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,2-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,1,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLEETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

DIBROMOFLUOROMETHANE (%)	105
DIBROMOFLUOROBENZENE (%)	107
PERFLUOROBENZENE-D8 (%)	99



Analytical Technologies, Inc.

QUALITY CONTROL DATA

ATI I.D. : 410359

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT : CAMP, DRESSER AND MCKEE
 PROJECT # : 1257-121-CP-SUBS
 PROJECT NAME : CITY OF SANTA FE LANDFILL
 REF I.D. : 41035901

DATE ANALYZED : 10/22/94
 SAMPLE MATRIX : NON-AQUEOUS
 UNITS : MG/KG

COMPOUNDS	SAMPLE CONC.		SPIKED SAMPLE	% REC.	DUP. SPIKED		RPD
	RESULT	SPIKED			SAMPLE REC.	% REC.	
1,1-DICHLOROETHENE	<0.05	2.5	2.3	92	2.4	96	4
TRICHLOROETHENE	<0.05	2.5	2.7	108	2.7	108	0
CHLOROBENZENE	<0.05	2.5	2.4	96	2.4	96	0
TOLUENE	<0.05	2.5	2.4	96	2.5	100	4
BENZENE	<0.05	2.5	2.3	92	2.3	92	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Spiked Sample Result} - \text{Duplicate Spike Sample Result})}{\text{Average of Spiked Sample}} \times 100$$



Analytical Technologies, Inc.

TOTAL URANIUM ANALYSIS RESULTS SUMMARY
By Laser-Induced Kinetic Phosphorimetry

Lab Name: Analytical Technologies, Inc. Date Collected: 10/08/94
Client Name: ATI-NM Date Analyzed : 10/19/94
Client Project ID: CDM -- 410359 Sample Matrix : Soil
Lab Sample ID Series: 94-10-106

Client Sample ID	Lab Sample ID	Total Uranium (ug/g)
LF-3/SS-8	10-106-01	1.423 ±0.022
LF-2/SS-4	10-106-02	0.769 ±0.012
LF-2/SS-7	10-106-03	0.644 ±0.010
LF-1/SS-7	10-106-04	0.450 ±0.007
Blank	10-106-B1	0.000 ±0.001

Reported Uncertainties are the Estimated Total Propagated Uncertainties (2σ).
See ATI SOP 743PC for details of TPU determinations.

Remarks:

No uranium was detected in blank.



Analytical Technologies, Inc.

TOTAL URANIUM BLANK SPIKE RESULTS SUMMARY
By Laser-Induced Kinetic Phosphorimetry

Lab Name: Analytical Technologies, Inc. Date Collected: 10/14/94

Client Name: ATI-NM Date Analyzed : 10/19/94

Client Project ID: CDM -- 410359 Sample Matrix : Soil

Lab Sample ID Series: 94-10-106

Lab Sample ID	Spike Conc. (ug/g)	Rep't Conc. (ug/g)
94-10-106-S1	12.50 ± 1.88	12.58 ± 1.70

Reported Uncertainties are the Estimated Total Propagated Uncertainties (2σ).
See ATI SOP 743FC for details of TPU determinations.

ATI sets control limits for KPA Uranium measurements as follows:
Blank Spike Control Limits = Known (μ) ± 0.15 * μ.

Matrix Spike Control Limits = Known (μ) + Native Concentration
± 0.25 * (μ + Native Concentration).

ATI uses these control limits for all KPA Uranium measurements

Acceptance Range for spike samples is the known value ± the
control limits stated above. The reported value, without the
uncertainty, should be compared to that range.



Analytical Technologies, Inc.

TOTAL URANIUM MATRIX SPIKE RESULTS SUMMARY
By Laser-Induced Kinetic Phosphorimetry

Lab Name: Analytical Technologies, Inc. Date Collected: 10/08/94

Client Name: ATI-NM Date Analyzed : 10/19/94

Client Project ID: CDM -- 410359 Sample Matrix : Soil

Lab Sample ID Series: 94-10-106

Lab Sample ID	Known Conc. (ug/g)	Rep't Conc. (ug/g)
94-10-106-M1	13.92 ± 3.48	12.56 ± 0.19

Reported Uncertainties are the Estimated Total Propagated Uncertainties (2σ).
See ATI SOP 743FC for details of TPU determinations.

ATI sets control limits for KPA Uranium measurements as follows:
Blank Spike Control Limits = Known (μ) ± 0.15 * μ .

Matrix Spike Control Limits = Known (μ) + Native Concentration
± 0.25 * (μ + Native Concentration).

ATI uses these control limits for all KPA Uranium measurements

Acceptance Range for spike samples is the known value ± the
control limits stated above. The reported value, without the
uncertainty, should be compared to that range.

Remarks:

Sample 94-10-106-M1 is a matrix spike of 94-10-106-01.

PROJECT MANAGER: **Ana Ursula**

COMPANY: **Camp Dresser & McKee Inc.**

ADDRESS: **2400 Louisiana Blvd NE # 740**

PHONE: **Albuquerque, NM 87113**

FAX: **(505) 887-3077**

BILL TO: **Same as Above**

COMPANY: _____

ADDRESS: _____

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
LF-3/SS-8	10/8/94	12:00	5016	01
LF-2/SS-4	10/9/94	8:55	4	00
LF-1/SS-7	10/9/94	10:45	1	00

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO: 12S7-121-CP-JUSS	NO. CONTAINERS: 10	RECEIVED INTACT: <input checked="" type="checkbox"/>	RECEIVED COLD: <input checked="" type="checkbox"/>
PROJ. NAME: City of Santa Fe Landfill/CUSTODY SEALS	RECEIVED BY: Heidi Hill	DATE: 10/10/94	TIME: 5:00
P.O. NO:	PRINTED NAME: Heidi Hill	DATE: 10/10/94	TIME: _____
SHIPPED VIA:	COMPANY: CDM	DATE: _____	TIME: _____
PRIORITY AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS		PRIORITY AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS	
(RUSH) <input type="checkbox"/> 24hr <input type="checkbox"/> 48hr <input type="checkbox"/> 72hr <input type="checkbox"/> 1 WEEK <input type="checkbox"/> 2 WEEK	Comments: COOL EX # 150		

ANALYSIS REQUEST

ANALYSIS REQUEST	DATE	TIME	MATRIX	LAB ID
Petroleum Hydrocarbons (418.1)	X			
(MOD 8015) Gas/Diesel	X			
Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	X			
BTXE/MTBE (8020)	X			
Chloride (SMD 3500 C1-B)	X			
Aromatic Hydrocarbons (601/8010)	X			
Chlorinated Hydrocarbons (602/8020)	X			
Aromatic Hydrocarbons (602/8020)	X			
SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	X			
SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	X			
Nitrate/Nitrite (EPA 353.3)	X			
Mn/As (EPA 6010/7471)	X			
Pesticides/PCB (608/8080)	X			
Herbicides (615/8150)	X			
Base/Neutr/Acid Compounds GC/MS (625/9270)	X			
Volatile Organics GC/MS (624/8240)	X			
Polynuclear Aromatics (610/8310)	X			
SDWA Primary Standards - Arizona				
SDWA Secondary Standards - Arizona				
SDWA Primary Standards - Federal				
SDWA Secondary Standards - Federal				
The 13 Priority Pollutant Metals				
RCRA Metals by Total Digestion				
RCRA Metals by TCLP (1311)				

SAMPLED & RELINQUISHED BY: **Heidi Hill** RELINQUISHED BY: **Heidi Hill**

RECEIVED BY: **CDM** RECEIVED BY: **CDM**

Signature: _____ Signature: _____

Printed Name: _____ Printed Name: _____

Company: _____ Company: _____

Signature: _____ Signature: _____

Printed Name: _____ Printed Name: _____

Company: _____ Company: _____



Analytical Technologies, Inc. Albuquerque, NM

Chain of Custody

DATE: 10/25/14 PAGE: 1 of 1

ANALYSIS REQUEST	
TOX	
ORGANIC LEAD	
SULFIDE	
SURFACTANTS (MBAS)	
532/532 MOD	
513/519 MOD	
510/5310	
XXXXX	CL, NH ₃ , NO ₂ , NO ₃
XXXXX	Metals, SO ₂ , FAX
XXXXX	8240
Diesel/Gasoline/BTEX/MTBEI (MOC 8015/8020)	
Volatile Organics GC/MS (E24:8240)	
NAME	
ASBESTOS	
300	
TOTAL COLIFORM	
FECAL COLIFORM	
GROSS ALPHA/BETA	
RADIUM 226/228	
AIR - O ₂ , CO ₂ , METHANE	
AIR/RESPIRABLE/STX/EI (MOC 8016/8020)	
NUMBER OF CONTAINERS	2

NETWORK PROJECT MANAGER: LETITIA KIKAKOWSKI

COMPANY: Analytical Technologies, Inc.
 ADDRESS: 2709-D Pan American Freeway, NE
 Albuquerque, NM 87107

CLIENT/PROJECT MANAGER: JJ

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
410359-01	10-8	1200	Water	1
-02	10-9	6855		2
-03	10-9	1045		3
-04	10-9	1640		4

PROJECT INFORMATION	SAMPLE RECEIPT	SAMPLES SENT TO	RELIQUISHED BY: 1.	RELIQUISHED BY: 2.
PROJECT NUMBER: 410359	TOTAL NUMBER OF CONTAINERS: 12	SAN DIEGO	Signature: D. Miller 1/30	Signature: [Blank]
PROJECT NAME: CDM	CHAIN OF CUSTODY SEALS: 4	FT. COLLINS	Printed Name: D. Miller 1/30	Date: [Blank]
QC LEVEL: (STD) IV	HITACT? 4	PERITON	Signature: Diane Miller 1/144	Date: [Blank]
QC REQUIRED: MS MSD BLANK	RECEIVED GOOD COND. COULD	PENNSCOLO	Printed Name: Analytical Technologies, Inc.	Date: [Blank]
TAT: (STANDARD) RUSH	LAB NUMBER 410359	PONTIAC	Company: Albuquerque	RECEIVED BY: (LAB) 2
DUE DATE: 10/25		PHOENIX	Signature: [Blank]	Signature: Rosalinda 1008
RUSH SURCHARGE: 0		PUBLIC/COMMIT	RECEIVED BY: (LAB) 1.	Printed Name: Rosalinda 1008
CLIENT DISCOUNT: 10%			Signature: [Blank]	Date: [Blank]
			Printed Name: [Blank]	Company: AFTT



Analytical Technologies, Inc. Albuquerque, NM

Chain of Custody

44-161-1063

DATE 10/11/94 PAGE 1 OF 1

NETWORK PROJECT MANAGER: LETITIA KIRAKOWSKI

COMPANY: Analytical Technologies, Inc.
 ADDRESS: 2709-D Pan American Freeway, NE
 Albuquerque, NM 87107

CLIENT PROJECT MANAGER:

ANALYSIS REQUEST

TOX	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	XXXXXXXXXXXXXXXXXXXX	632/632 MOD	619/619 MOD	610/6310	8240 TCLP 1311 ZHE	Diesel/Gasoline/STX/MTSEI (MOD 8015/8020)	Volatile Organics GC/MS (624/824)	NAME	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/223	AIR - O2, CO2, METHANE	Air/Diesel/Gasoline/STX/ (MOD 6015/6020)	NUMBER OF CONTAINERS	
																					1
																					1
																					1
																					1

PROJECT INFORMATION		SAMPLE RECEIPT		SAMPLES SENT TO:		RELINQUISHED BY: 1.		RELINQUISHED BY: 2.	
PROJECT NUMBER: 4110359	TOTAL NUMBER OF CONTAINERS: 4	SAH DIEGO		Signature: D. Little	Time: 1730	Signature:	Time:	Signature:	Time:
PROJECT NAME: C.D.M	CHAIN OF CUSTODY SEALS: NA	FT. COLLINS		Printed Name: D. Little	Date: 10/11/94	Printed Name:	Date:	Printed Name:	Date:
QC LEVEL: SID IV	INITIALS: NJ	RENTON		Signature: D. Little	Date: 10/11/94	Signature:	Date:	Signature:	Date:
QC REQUIRED: MS MSD BLANK	RECEIVED GOOD COND: COLD	PENSACOLA		Company: Analytical Technologies, Inc.	Albuquerque	Company:		Company:	
FAT: STANDAID RUSH!	LAB NUMBER:	PORTLAND		RECEIVED BY: (LAB) 1.	Time:	RECEIVED BY: (LAB) 1.	Time:	RECEIVED BY: (LAB) 2.	Time:
		PHOENIX		Signature:	Date:	Signature:	Date:	Signature:	Date:
		FIBERGLASS		Printed Name:	Date:	Printed Name:	Date:	Printed Name:	Date:
				Company: A. Little		Company:		Company:	
DUE DATE: 11/10/95									
RUSH SURCHARGE: \$									
CLIENT DISCOUNT: %									

LAB # LK1043



Analytical Technologies, Inc.

2709-D Pan American Freeway, NE Albuquerque NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. 410310

RECEIVED

October 27, 1994

OCT 28 1994

Camp, Dresser & Mckee, Inc.
2400 Louisiana Blvd. NE
AFC-5, Suite #740
Albuquerque, NM 87110

CAMP DRESSER & MCKEE INC.
ALBUQUERQUE

Project Name/Number: CITY OF SANTA FE LANDFILL 1257-121-CP-SUBS

Attention: Anne Urenda

On 10/04/94, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze non-aqueous sample(s). The sample(s) were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

EPA Method 418.1 analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

Total Uranium analyses were performed by Analytical Technologies, Inc., 225 Commerce Drive, Fort Collins, CO.

All other analyses were performed by Analytical Technologies, Inc., 9830 S. 51st Street, Suite B-113, Phoenix, AZ.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski, Ph.D.
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure



Analytical Technologies, Inc.

CLIENT : CAMP, DRESSER & MCKEE INC. DATE RECEIVED : 10/04/94
 PROJECT # : 1257-121-CP-SUBS
 PROJECT NAME : CITY OF SANTA FE LANDFILL REPORT DATE : 10/27/94

ATI ID: 410310

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	LF-4/SS-5	NON-AQ	10/04/94

---TOTALS---

<u>MATRIX</u>	<u>#SAMPLES</u>
NON-AQ	1

ATI STANDARD DISPOSAL PRACTICE

the samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.



SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lt. Governor

**NEW MEXICO
ENVIRONMENT DEPARTMENT**

1190 Saint Francis Drive, Room N2150

P.O. Box 5469

Santa Fe, New Mexico 87502-5469

Phone (505) 827-0197 Fax (505) 827-2902

www.env.nm.gov



RYAN FLYNN
Secretary

BUTCH TONGATE
Deputy Secretary

Certified Mail – Return Receipt Requested No. 7014 1200 0002 0265 7825

April 20, 2016

Lawrence M. Garcia, Special Projects Administrator
Solid Waste Management Division
City of Santa Fe
P.O. Box 909
1142 Siler Road
Santa Fe, New Mexico 87507-0909

Re: Methane Exceedances at the Closed Paseo de Vista Landfill

Dear Mr. Garcia:

On April 19, 2016, Marc L. Bonem, Enforcement Officer, EA-II, Solid Waste Bureau (“SWB”), New Mexico Environment Department (“NMED”), inspected the closed Paseo de Vista Landfill to determine compliance with the New Mexico Solid Waste Rules (“SWR”), 20.9.2 – 20.9.10 NMAC.

As part of the landfill inspection, Mr. Bonem performed verification methane monitoring along the perimeters of the landfill. At four monitoring points located along the east, south and west boundaries of the landfill, the combustible gas indicator’s methane readings achieved or exceeded 100 % of the Lower Explosive Limit (“LEL”).

REGULATORY DISCUSSION

The SWR, 20.9.6.9(A)(3)(h)(ii) NMAC, requires municipal and special waste landfill owners and operators to have a written post-closure care plan, approved by the secretary, which includes “a methane monitoring plan in compliance with Subsections B and C of 20.9.5.9 NMAC.” The SWR, 20.9.5.9(B)(2) NMAC, requires municipal and special waste landfill owner and operators to prevent the generation and lateral migration of methane such that the “concentration of methane does not exceed the LEL at the facility property boundary.” The SWR, 20.9.5.9(C)(3) NMAC, states that if methane gas levels exceed the limits specified in 20.9.5.9(B)(1) and (2) NMAC, the landfill owner or operator shall “(a) immediately take all necessary steps to ensure protection of public health, welfare and the environment and notify the secretary; (b) within seven days of detection, record the methane levels detected and a description of the steps taken to protect public health, welfare and the environment; and (c) within 60 days of detection,

Lawrence M. Garcia

April 20, 2016

Page 2 of 2

implement a remediation plan approved by the secretary for the methane releases, and notify the secretary that the plan has been implemented; the plan shall describe the nature and extent of the problem and the proposed remedy...”.

REQUESTED CORRECTIVE ACTION

Considering the foregoing, the SWB requests your immediate action in this matter to more fully assess the methane-related conditions at the landfill, presumably in part, by contracting with an environmental consultant or otherwise accomplishing a thorough methane monitoring assessment with rigorous sampling. Compliance with the actions specified at 20.9.5.9(C)(3) NMAC (as appropriate) and any additional actions required under the approved post-closure care plan, is necessary. Specific and technical questions regarding corrective action in this matter should be coordinated with George Schuman, Manager, Permit Section, (505) 827-2328, george.schuman@state.nm.us, or his designate.

The failure to assure timely and appropriate corrective action will result in additional enforcement action, which may include the assessment of a civil penalty.

If you have any questions regarding this correspondence, please call me at (505) 222-9585 or you may reach me via electronic mail at chuck.akeley@state.nm.us.

Sincerely,



George W. Akeley Jr. (Chuck)
Solid Waste Bureau, Enforcement Section Manager

Enclosure – Copy of Solid Waste Facility Inspection Report and Monitoring Map (4/19/2016)

GWA:mlb

cc: George Schuman, Manager, Permit Section, Solid Waste Bureau *[via electronic mail]*
Teri D. Monaghan, Enforcement Coordinator, Solid Waste Bureau *[via electronic mail]*
Marc L. Bonem, Enforcement Officer, EA-II, Solid Waste Bureau *[via electronic mail]*



STATE OF NEW MEXICO - ENVIRONMENT DEPARTMENT

Page 2

SOLID WASTE FACILITY INSPECTION REPORT

Facility: Paseo de Vista Landfill (clsd) Inspector(s): Marc L. Bonem

14. EVIDENCE OF UNAUTHORIZED WASTE

- a. Bulk Liquids b. Batteries
c. Hazardous Waste d. Infectious Waste
e. Petroleum Waste f. Sludge
g. Asbestos h. Radioactive Waste
i. Contaminated Soil j. Ash
k.

16. PERMIT REQUIREMENTS (In Effect)

- a. No Facility Permit
b. Unauthorized Modification
c. Refusal of Inspection
d.

16. CORRECTIVE MEASURES

- a. Action Taken b. Continue Monitoring
c. Initiate Assessment d. Incomplete Documentation
e. Select Proper Remedy f. Remedial Activity Schedule
g.

Show all violations below indicating the Number and Item on the Inspection Report, the Regulation Section number and a detailed narrative.

Table with 4 columns: No., Item, Sec.#, Violation Detail - Narrative. Contains handwritten entry for item 5a regarding methane readings and fence maintenance.

Violations MUST BE CORRECTED BY: 5/19/16 Operator/Rep. Signature: [Signature] Date: 4/19/16
Follow-up Inspection Due On (Date): 5/20/16 NMED/Rep. Signature: [Signature] Date: 4-19-2016

Handwritten number 2/2



**NEW MEXICO
ENVIRONMENT DEPARTMENT**

1190 Saint Francis Drive, Room N2150

P.O. Box 5469

Santa Fe, New Mexico 87502-5469

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SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lt. Governor

RYAN FLYNN
Secretary

BUTCH TONGATE
Deputy Secretary

**NEW MEXICO ENVIRONMENT DEPARTMENT
SOLID WASTE BUREAU
ENTRY NOTIFICATION**

Facility Name: Paseo de Vista LFC

Facility Address: East of Bv RRT, Santa Fe

This is to notify you that pursuant to New Mexico Solid Waste Act ("SWA"), NMSA 1978, Section 74-9-33, as an authorized representative of the New Mexico Environment Department ("NMED"), I am allowed to enter this facility and/or vehicle at any reasonable time in order to make an inspection or investigation of solid waste management practices.

This is also to notify you that in accordance with the New Mexico Solid Waste Rules ("SWR"), 20.9.2.12 NMAC, as an authorized representative of the NMED, I am authorized to investigate, inspect, enforce, monitor or sample at this facility and/or vehicle.

I have presented you with credentials indicating that I am duly authorized to enforce and administer all laws, rules and regulations within the jurisdiction of the NMED.

James Barr
NMED Authorized Representative

4-19-2016
Date

Andon Juan
Facility Representative

4-19-2016
Date



STATE OF NEW MEXICO - ENVIRONMENT DEPARTMENT
SOLID WASTE FACILITY INSPECTION REPORT

DATE: 4-19-2015 FACILITY NAME: Paseo de Vista Landfill CONTROL #: _____
 REASON FOR INSPECTION: FACILITY OPERATOR: City of Santa Fe FACILITY LOC.: East of BuRRt
 Routine Follow Up
 Complaint Other
 Suspected Violation
 Closure / Post Closure
 DISTRICT: EA - II (NW of Paseo de Las Vistas)
 STATUS: INTERIM PERMITTED CLOSED PHONE: N.A.
 TYPE OF FACILITY: Landfill (closed) OPERATING HOURS: N.A. DAYS OF WEEK: N.A.
 TYPE OF WASTE HANDLED MSW INDUSTRIAL C & D SPECIAL Tons / Cu. Yds. N.A. Daily/Monthly (circle one)

1. FACILITY / OPERATIONAL CONTROLS

- a. Litter
- b. Roads Maintained
- c. Noise
- d. Vectors
- e. Dust / Odor
- f. Access Controlled
- g. Tipping / Insp. Area
- h. Scavenging Control
- i. Fire Control
- j. Health/Environment Hazard
- k. Compaction
- l.

2. SIGNS REQUIRED / PROPERLY POSTED

- a. Operating Days/Hours
- b. Loading/Unloading Area
- c. Emergency Numbers
- d. Directions to Fill Areas
- e. Fires Prohibited
- f. Scavenging Prohibited
- g. Operation Procedures
- h. Bldg / Warning / Visible
- i.

3. OPERATOR / REPRESENTATIVE / EMPLOYEES

- a. Certified
- b. On Site While Open
- c. Employees Trained
- d.

4. COVER

- a. Daily Applied
- b. Intermediate Applied
- c. Final Cover
- d. Excavating a Closed Cell
- e. Compaction
- f. Stabilized Vegetation
- g.

5. MONITORING / SAMPLING / ANALYZING / HANDLING

- a. Methane
- b. Leachate
- c. Ground Water
- d. Unauthorized Waste Analyzed
- e. Frequency Maintained
- f. Proper Equip / Test Used
- g. Gas Control
- h. Waste Properly Processed
- i.

6. DRAINAGE / EROSION

- a. Water Run-on
- b. Water Run-off
- c.

7. PROPER STORAGE / ISOLATION / DISPOSAL

- a. Special Waste
- b. Hazardous Waste
- c. Infectious Waste
- d. Asbestos
- e. Tires
- f. White Goods
- g. Recyclables
- h. Lead Acid Batteries
- i. Hot Waste
- j. Timely Removal
- k. Ash
- l. Petroleum Contam. Sol
- m. Transfer Stations
- n.

8. PROPER EQUIPMENT / MAINTAINED

- a. Facility Equipment
- b. Storage Equipment
- c. Audible Signals
- d. Transport Equipment
- e. Collection Equipment
- f. Fire Fighting Equipment
- g. Compaction Equipment
- h. Clean & Sanitized
- i.

9. PLANS & PROGRAMS On File

- a. Contingency
- b. Operating / Maintenance
- c. Inspection
- d. Disposal Management
- e. Facility Site Plan
- f. Closure / Post Closure
- g. Training Programs
- h. Removal - Stored Waste
- i. Ground Water Monitor
- j. Fire Protection & Prevention
- k. Methane Monitoring
- l. Disease Vectors/Rodent Ctrl
- m. Clean-up/Remediation
- n. Leachate Control
- o. Deviation From Plans
- p.

RECORDS / REPORTS / RESULTS Maintained

10. INSPECTION RECORDS

- a. Daily Records Kept
- b. Source/Type/Volume of Waste
- c. Signatures
- d. Times & Dates
- e. Names of Co. & Driver
- f. Vehicle License Number
- g. Vehicle Description
- h. Observations
- i.

11. NOTIFICATION - RECORDS When required was:

- a. NM ED/Facility/Other
- b. Area Restricted
- c. Clean Up Assured
- d. Transportation Assured
- e. Disposal Assured
- f.

12. MONITORING / SAMPLING / ANALYSIS - RECORDS

- a. Methane Levels Taken Quarterly
- b. Unauthorized Waste Analyzed
- c. Contaminated Waste/Soil Analyzed
- d. Ground Water Sampling Results
- e. Leachate Sampling & Treatment
- f.

13. SPECIAL WASTE RECORDS (Type)

- a. Lab Analysis Results
- b. Paint Filter Test Results
- c. Manifests
- d. Remediation Documentation
- e. Treatment Certification
- f.

VERIFICATION METHANE MONITORING
LOCATIONS ABOVE 100% LEL

MLB 4-19-2016
No Scale
Pasco De Vista LAs



CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 8/06/2014

3rd Quarter 2014 report

Landfill Name: Paseo de Vista Landfill Sampler name: Lawrence Garcia

Date 10/15/2014 Barometric Pressure: 30.19 in and falling Temperature: 76° F

Weather conditions: Fair

Wind Direction: W

Wind Speed: 6 MPH

Date & amount of last precipitation (within last 48 hours): 00"

Instrument: M-40 Industrial Scientific Date instrument last calibrated: September 1, 2014

Methane sampling type: (Dedicated Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	3:35 PM	12 Min	15'	0		
MW-13	3:57 PM	19 Min	29.5'	0		
MW-10	4:20 PM	30 Min	47'	6		
MW-11	4:40 PM	20 Min	80'	9		
Scale house Scale Crawl space	1:48 PM	10 Min	N/A	0		
Scale house Inside	1:37 PM	10 Min	N/A	0		
Truck Tunnel	2:10 PM	10 Min	N/A	0		
Tipping Floor	2:25 PM	10 Min	N/A	0		
Transfer station Offices	3:15 PM	10 Min	N/A	0		
Bailing Room	2:40 PM	10 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on September 17, 2014. Monitoring wells ten and eleven was monitored for approximately twenty minutes and stabilized. Monitoring wells ten and eleven are deeper wells, and the casings are left open for passive ventilation. Both monitoring wells ten and eleven showed minimal amounts of methane percentages but were still within regulations, I think this is attributed to the barometric pressures falling.

CITY OF SANTA FE, METHANE MONITORING REPORT

last update provided on 12/16/2015

1st Quarter 2016 report

Landfill Name: Paseo de Vista Landfill

Sampler name: Lawrence Garcia

Date May 4, 2016 Barometric Pressure: 29.62 in and rising Temperature: 66° F

Weather conditions: (Partly Cloudy with 20% Chance of thunder showers

Wind Direction: SW Wind Speed: 30 MPH

Date & amount of last precipitation (within last 48 hours): 0.00"

Instrument: GRAY Date instrument last calibrated: 10/16/2015

Methane sampling type: (Dedicated Prob)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	10:11	19 Min	15'	0		
MW-13	10:33	12 Min	29.5'	0		
MW-10	11:03	25 Min	47'	67%		
MW-11	12:01	21 Min	80'	52%		
Scale house Scale Crawl space	8:27	12 Min	N/A	0		
Scale house Inside	8:15	10 Min	N/A	0		
Truck Tunnel	9:21	12 Min	N/A	0		
Tipping Floor	9:07	10 Min	N/A	0		
Transfer station Offices	8:45	16 Min	N/A	0		
Bailing Room	9:41	12 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on March 29, 2016. Only monitoring ports ten and eleven has H-4 methane present. Both monitoring wells ten and eleven were sampled for approximately twenty minutes.

CITY OF SANTA FE, METHANE MONITORING REPORT

last update provided on May 4, 2016

2nd Quarter 2016 report

Landfill Name: Paseo de Vista Landfill

Sampler name: Lawrence Garcia

Date July 7, 2016 Barometric Pressure: 30.37 in and rising Temperature: 56° F

Weather conditions: (Partly Cloudy with 20% Chance of thunder showers)

Wind Direction: N Wind Speed: 6 MPH

Date & amount of last precipitation (within last 48 hours): 0.00"

Instrument: Industrial Scientific Ventis MX4 Date instrument calibrated: 5/16/2016

Methane sampling type: (Dedicated Prob)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	10:44	15 Min	15'	0		
MW-13	11:03	15 Min	29.5'	0		
MW-10	11:21	19 Min	47'	0		
MW-11	11:43	19 Min	80'	0		
Scale house Scale Crawl space	9:08	19Min	N/A	0		
Scale house Inside	8:45	20 Min	N/A	0		
Administrative Building	9:23	30 Min	N/A	0		
Truck Tunnel	10:15	10 Min	N/A	0		
Tipping Floor	10:00	13 Min	N/A	0		
Bailing Room	10:29	10 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on June 29, 2016. Methane monitoring well 10 (MW10) showed minimal amounts of H-4 present. All the other monitoring wells had no sign of methane present, including the Transfer Station. The monitoring device used is new and was calibrated by the vendor.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 3/31/2015

2nd Quarter 2015 report

Landfill Name: Paseo de Vista Landfill Sampler name: Lawrence Garcia

Date 7/30/2015 Barometric Pressure: 30.34 in and rising Temperature: 60° F

Weather conditions: Partly Cloudy

Wind Direction: NE

Wind Speed: 4 MPH

Date & amount of last precipitation (within last 48 hours): Two tenths of an inch

Instrument: M-40 Industrial Scientific Date instrument last calibrated: July 29, 2015

Methane sampling type: (Multi-Gas Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	11:10 AM	15 Min	15'	0%		
MW-13	11:30 AM	20 Min	29.5'	0%		
MW-10	12:30 PM	25 Min	47'	18%		
MW-11	12:00 PM	25 Min	80'	0%		
Scale house Scale Crawl space	9:43 AM	12 Min	N/A	0		
Scale house Inside	930 AM	11 Min	N/A	0		
Truck Tunnel	10:45 PM	13 Min	N/A	0		
Tipping Floor	12:04 PM	11 Min	N/A	0		
Transfer station Offices	10:00 AM	11 Min	N/A	0		
Bailing Room	10:45 PM	13 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on June 30, 2015. The only monitoring location that had any sign of H-4 Methane present was Monitoring wells ten. Monitoring well 10 was sampled for twenty-five minutes and stabilized at 18% H-4 Methane. Monitoring wells ten is one of our deepest wells, and the casing is left open for passive ventilation.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 10/15/2014

1st Quarter 2015 report

Landfill Name: Paseo de Vista Landfill Sampler name: Lawrence Garcia

Date 4/7/2015 Barometric Pressure: 30.19 in and rising Temperature: 23° F

Weather conditions: Overcast

Wind Direction: N

Wind Speed: 2 MPH

Date & amount of last precipitation (within last 48 hours): 00"

Instrument: M-40 Industrial Scientific Date instrument last calibrated: March 31, 2015

Methane sampling type: (Multi-Gas Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	1:20 PM	20 Min	15'	2%		
MW-13	1:26 PM	20 Min	29.5'	3%		
MW-10	1:55 PM	9 Min	47'	126%		
MW-11	2:11 PM	13 Min	80'	111%		
Scale house Scale Crawl space	11:14 AM	10 Min	N/A	0		
Scale house Inside	11:25 AM	14 Min	N/A	0		
Truck Tunnel	12:43 PM	10 Min	N/A	0		
Tipping Floor	12:04 PM	11 Min	N/A	0		
Transfer station Offices	11:51 AM	11 Min	N/A	0		
Bailing Room	12:19 PM	10 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on March 31, 2015. Monitoring wells ten and eleven was monitored for approximately twelve minutes and exceeded 100% of H-4 Methane. Monitoring wells ten and eleven are deeper wells, and the casings are left open for passive ventilation. Both monitoring wells ten and eleven have consistently showed methane percentages. The Division believes that based on barometric pressures the presence of methane gas is stronger on occasion. The Division will conduct a seven day monitoring event and provide the data, and the Division plan based on the seven day monitoring results.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 7/30/2015 3rd Quarter Methane Monitoring report

Landfill Name: Paseo de Vista Landfill Sampler name: Lawrence Garcia

Date 10/29/2015 Barometric Pressure: 30.22 in and rising Temperature: 65° F

Weather conditions: Mostly Sunny

Wind Direction: N Wind Speed: 12 MPH

Date & amount of last precipitation (within last 48 hours): None

Instrument: M-40 Industrial Scientific Date instrument last calibrated: July 29, 2015

Methane sampling type: (Multi-Gas Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	11:37 AM	20 Min	15'	0%		
MW-13	12:01 PM	20 Min	29.5'	0%		
MW-10	12:26 PM	20 Min	47'	2%		
MW-11	12:50 PM	20 Min	80'	2%		
Scale house Scale Crawl space	10:31 AM	10 Min	N/A	0		
Scale house Inside	10:20 AM	10 Min	N/A	0		
Truck Tunnel	11:19 AM	10 Min	N/A	0		
Tipping Floor	10:54 AM	10 Min	N/A	0		
Transfer station Offices	10:43 AM	10 Min	N/A	0		
Bailing Room	11:05 AM	13 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on September 29, 2015. The only monitoring location that had any sign of H-4 Methane present was monitoring wells ten and eleven. Both monitoring wells 10 and eleven were sampled for twenty minutes and stabilized at 2% H-4 Methane. Both well casing is left open for passive ventilation.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 10/29/2015 4th Quarter Methane Monitoring report

Landfill Name: Paseo de Vista Landfill Sampler name: Lawrence Garcia

Date 12/16/2015 Barometric Pressure: 29.87 in and rising Temperature: 14° F

Weather conditions: Mostly Sunny

Wind Direction: N Wind Speed: 6 MPH

Date & amount of last precipitation (within last 48 hours): None

Instrument: M-40 Industrial Scientific Date instrument last calibrated: Dec 14, 2015

Methane sampling type: (Multi-Gas Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL
MW-12	2:12 PM	21 Min	15'	0%
MW-13	1:48 PM	20 Min	29.5'	0%
MW-10	2:39 PM	21 Min	47'	35%
MW-11	3:04 PM	24 Min	80'	43%
Scale house Scale Crawl space	10:55 AM	10 Min	N/A	0
Scale house Inside	10:38 AM	10 Min	N/A	0
Truck Tunnel	12:15 PM	10 Min	N/A	0
Tipping Floor	12:00 PM	10 Min	N/A	0
Transfer station Offices	11:09 AM	17 Min	N/A	0
Bailing Room	12:30 AM	13 Min	N/A	0

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on December 16, 2015. The only monitoring location that had any sign of H-4 Methane present was monitoring wells ten and eleven. Both monitoring wells ten and eleven were sampled for approximately twenty minutes, although these wells showed signs of H-4 Methane both wells were below regulated limits. Both well casing is left open for passive ventilation.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 11/21/2014

1st Quarter 2014 report

Landfill Name: Paseo de Vista Landfill

Sampler name: Lawrence Garcia

Date 5/24/2013 Barometric Pressure: 30.00 in and rising Temperature: 54° F

Weather conditions: Fair with wind speed at four MPH

Wind Direction: N/W

Wind Speed: 4 MPH

Date & amount of last precipitation (within last 48 hours): 00"

Instrument: M-40 Industrial Scientific Date instrument last calibrated: March 20, 2014

Methane sampling type: (Dedicated Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	10:30 AM	20 Min	15'	0		
MW-13	11:15 AM	20 Min	29.5'	0		
MW-10	11:27 AM	30 Min	47'	44		
MW-11	10:06 AM	31 Min	80'	47		
Scale house Scale Crawl space	1:10 AM	11 Min	N/A	0		
Scale house Inside	12:38 PM	12 Min	N/A	0		
Truck Tunnel	2:36 PM	14 Min	N/A	0		
Tipping Floor	12:07 PM	10 Min	N/A	0		
Transfer station Offices	1:28 AM	15 Min	N/A	0		
Bailing Room	2:14 PM	11 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on March 31, 2014. Monitoring well ten and eleven was monitored for approximately thirty minutes and stabilized. Both well casings are left open for passive venting. Both well depths are deep and I did not purge the casing as we normally do.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 3/24/2014 2nd Quarter 2014 report

Landfill Name: Paseo de Vista Landfill Sampler name: Lawrence Garcia/Eric Lucero

Date 8/6/2014 Barometric Pressure: 30.00 in and steady Temperature: 63° F

Weather conditions: Fair with wind speed at seven MPH

Wind Direction: N/W Wind Speed: 7 MPH

Date & amount of last precipitation (within last 48 hours): 00"

Instrument: M-40 Industrial Scientific Date instrument last calibrated: June 24, 2014

Methane sampling type: (Dedicated Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	3:35 PM	10 Min	15'	1		
MW-13	3:57 PM	10 Min	29.5'	1		
MW-10	4:20 PM	10 Min	47'	51		
MW-11	4:40 PM	31 Min	80'	53		
Scale house Scale Crawl space	1:48 PM	10 Min	N/A	0		
Scale house Inside	1:37 PM	10 Min	N/A	1		
Truck Tunnel	2:10 PM	10 Min	N/A	0		
Tipping Floor	2:25 PM	10 Min	N/A	0		
Transfer station Offices	3:15 PM	10 Min	N/A	0		
Bailing Room	2:40 PM	10 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on June 24, 2014. Monitoring wells ten and eleven was monitored for approximately ten minutes and stabilized. Monitoring wells ten and eleven are deeper wells, and the casings are left open for passive ventilation. Both monitoring wells ten and eleven showed elevated methane percentages but were still within regulations, I think this is attributed to the barometric pressures holding steady.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 8/06/2014 _____

3rd Quarter 2014 report

Landfill Name: Paseo de Vista Landfill Sampler name: Lawrence Garcia

Date 10/15/2014 Barometric Pressure: 30.19 in and falling Temperature: 76° F

Weather conditions: Fair

Wind Direction: W

Wind Speed: 6 MPH

Date & amount of last precipitation (within last 48 hours): 00"

Instrument: M-40 Industrial Scientific Date instrument last calibrated: September 1, 2014

Methane sampling type: (Dedicated Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	3:35 PM	12 Min	15'	0		
MW-13	3:57 PM	19 Min	29.5'	0		
MW-10	4:20 PM	30 Min	47'	6		
MW-11	4:40 PM	20 Min	80'	9		
Scale house Scale Crawl space	1:48 PM	10 Min	N/A	0		
Scale house Inside	1:37 PM	10 Min	N/A	0		
Truck Tunnel	2:10 PM	10 Min	N/A	0		
Tipping Floor	2:25 PM	10 Min	N/A	0		
Transfer station Offices	3:15 PM	10 Min	N/A	0		
Bailing Room	2:40 PM	10 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on September 17, 2014. Monitoring wells ten and eleven was monitored for approximately twenty minutes and stabilized. Monitoring wells ten and eleven are deeper wells, and the casings are left open for passive ventilation. Both monitoring wells ten and eleven showed minimal amounts of methane percentages but were still within regulations, I think this is attributed to the barometric pressures falling.

CITY OF SANTA FE, METHANE MONITORING REPORT

Last update provided on 3/29/2013

3rd Quarter 2013 report

Landfill Name: Paseo de Vista Landfill

Sampler name: Lawrence Garcia

Date 10/22/2013 Barometric Pressure: 33.32 in and falling Temperature: 69° F

Weather conditions: Fair with blowing gusts from ten to fifteen MPH

Wind Direction: S

Wind Speed: 16 MPH

Date & amount of last precipitation (within last 48 hours): 00"

Instrument: M-40 Industrial Scientific Date instrument last calibrated: Sept 15, 2013

Methane sampling type: (Dedicated Probe)

Location See attached Map	Time sample began	Total sampling time	Well Depth	CH4 % LEL		
MW-12	12:15 PM	20 Min	15'	0		
MW-13	12:48 PM	25 Min	29.5'	0		
MW-10	1:22 PM	23 Min	47'	0		
MW-11	2:10 AM	15 Min	80'	0		
Scale Crawl space	10:34 AM	10 Min	N/A	0		
Scale house Inside	11:20 AM	10 Min	N/A	0		
Truck Tunnel	10:51 AM	12 Min	N/A	0		
Tipping Floor	11:30 AM	20 Min	N/A	0		
Transfer station Offices	11:10 AM	12 Min	N/A	0		
Bailing Room	11:55 AM	12 Min	N/A	0		

COMMENTS: The City of Santa Fe Environmental Services Division conducted sampling on September 15, 2013. Monitoring well ten and eleven was monitored for approximately fifteen to twenty minutes. Both well casings are left open for passive venting. The methane LEL % was at zero for all monitoring points. The barometric pressure was falling which could have created a vacuum affect drawing fresh air from the surface.