SWMU ASSESSMENT REPORT FOR THE LC-38 DIESEL SPILL ON WHITE SANDS MISSILE RANGE

Submitted to:

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EXECUTIVE SUMMARY

A strategic reserve of diesel fuel was stored for the Defense Fuels Agency in a 150,000-gallon above-ground storage tank (AST) at Launch Complex 38 (LC-38) on White Sands Missile Range (WSMR). During an annual evaporative loss measurement conducted in the summer of 2000, WSMR personnel could not account for missing fuel estimated in the amount of 31,000 gallons. The tank was dedicated exclusively to diesel fuel storage throughout its service life at WSMR. Upon discovery of the fuel leak, WSMR notified the New Mexico Environment Department's (NMED) Ground Water Quality Bureau in accordance with section 1203 of the New Mexico Water Quality Control Commission (WQCC) Regulations (20 New Mexico Administrative Code 6.2). Following a preliminary investigation at the site conducted in February 2001, the NMED Hazardous Waste Bureau (HWB) took the regulatory lead for this investigation and required a Solid Waste Management Unit (SWMU) Assessment be performed.

The purpose of this SWMU Assessment is to further characterize the geology and hydrology of the diesel spill site, the extent of contamination in soils and ground water, and determine future actions for the site based on a Risk Based Decision Making Analysis. Activities for this investigation were completed according to the NMED approved work plan titled "*Work Plan for the RCRA Facility Investigation at the Launch Complex 38 Site on White Sands Missile Range.*"

Results of this SWMU Assessment indicate that a significant amount of diesel fuel leaked into the subsurface at LC-38 from a 150,000 gallon diesel AST. Contamination resulting from this release has reached a maximum depth of approximately 75 ft bgs. The contaminant plume is supported by the thick laterally continuous clay layer approximately 20 ft thick. The thick, continuous clay layer has prevented further downward migration of the diesel fuel. Ground-water monitoring wells installed and sampled during this investigation show that depth to regional ground water is greater than 230 ft bgs. Analytical results from ground-water samples indicate contamination has not reached the regional water table.

Based on analysis using the Risk Based Decision Making Process (RBDMP) developed by the NMED Underground Storage Tank Bureau (UST) Bureau, it was determined that the current land use exposure scenario for off-site residents and commercial workers is incomplete. All construction worker scenarios were well below Risk Based Screening Levels (RBSL) indicating contaminant concentrations are below levels of concern for potential current and future, on-site construction workers.

In evaluating future land use, the indoor inhalation pathway for vapor migration from subsurface soils could be complete if a facility or residence is constructed over the contaminated site. Representative concentrations for the majority of observed contaminants of concern (COC) exceeded RBSLs for future land use scenarios for both on-site commercial and on-site residents. The groundwater ingestion pathway is incomplete because no drinking or irrigation water wells are located within a 10-mile radius of the site and due to total dissolved solids in the area exceeding 8,000 mg/L.

The AST at LC-38 will remain part of the Defense Fuels Agency Military Ready Reserve Pool. There are no plans for removal of the AST at this time. The AST is currently empty and will remain so until it is made ready for use. WSMR will maintain this site as an industrial site for the foreseeable future.

Based on current land use, no exposure pathways are considered complete at this time. No residential areas will be built for the foreseeable future and no construction activities are planned for this site. Based on these findings, the site is currently protective of human health and ecological exposure.

WSMR proposes No Further Remedial Action at this site. The WSMR Real Property Planning Board will zone this site as off limits for future commercial/residential use. Additionally, WSMR will annotate the Real Property Inventory to reflect that should the AST be removed, any remaining contaminated materials within 15 feet of the final land surface would be subject to remediation.

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LIST OF ACRONYMS

AST	Above-Ground Storage Tank
COC	Contaminant of Concern
DTC	Developmental Test Command
EPA	Environmental Protection Agency
ft	Feet
GPS	Global Positioning System
HWB	Hazardous Waste Bureau
LC-38	Launch Complex 38
NMED	New Mexico Environment Department
O.D.	Outside Diameter
PID	Photoionization Detector
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
RBDMP	Risk Based Decision Making Process
RBSL	Risk Based Screening Level
RFI	RCRA Facility Investigation
SSL	Soil Screening Level
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WQCC	Water Quality Control Commission
WSMR	White Sands Missile Range

SWMU ASSESSMENT REPORT FOR THE LC-38 DIESEL SPILL ON WHITE SANDS MISSILE RANGE

1.0 INTRODUCTION

A strategic reserve of diesel fuel for the Defense Fuels Agency was stored in a 150,000-gallon above-ground storage tank (AST) at Launch Complex 38 (LC-38), just north of Nike Avenue, 13 miles east of the White Sands Missile Range (WSMR) Post Headquarters. During an annual evaporative loss measurement at the AST, White Sands Missile Range (WSMR) personnel could not account for missing fuel estimated in the amount of 31,000 gallons.

Immediately upon discovery that fuel was unaccounted for, product lines from the adjacent loading terminal to the AST were uncovered. The piping emerged from the north side of the AST and elbowed towards the west berm. Most of the pipeline was concealed underground; at the west berm, the piping angled up and reemerged at the loading terminal. A leak in the product line was apparent and is considered as the source of the fuel release. The New Mexico Environment Department's (NMED) Ground Water Quality Bureau was notified in accordance with section 1203 of the New Mexico Water Quality Control Commission (WQCC) Regulations (20 New Mexico Administrative Code 6.2). Corrective action for the diesel spill required under WQCC Regulations and the terms of the White Sands Missile Range Hazardous Waste Management permit (#NM 2750211235) includes an investigation to delineate the horizontal and vertical extent of soil and groundwater contamination.

In February 2001 a preliminary investigation was performed to assess the vertical extent of contaminant migration and characterize the geologic materials below the site. Soil samples collected from the leak site and at locations immediately north and south of the source were analyzed for Total Petroleum Hydrocarbons (TPH), Volatile Organic Compounds (VOC), and Semi-Volatile Organic Compounds (SVOC). This preliminary fact-finding effort also served to define whether a perched or regional aquifer was impacted with diesel product. The investigation determined that the vertical extent of diesel contamination extended to approximately 75 ft below ground surface (bgs). Lateral extent of contamination was not determined. The regional aquifer was not encountered during the preliminary investigation nor were any perched water bearing zones.

1.1 Objectives and Scope

The purpose of this Solid Waste Management Unit (SWMU) Assessment is to supplement the preliminary investigation by obtaining information to further characterize the geology and hydrology of the diesel spill site, the extent of contamination in soils and ground water, and determine future actions for the site based on a Risk Based Decision Making Process (RBDMP). The scope of work for this investigation was completed as outlined in the NMED approved Work Plan titled "*Work Plan for the RCRA Facility Investigation at the Launch Complex 38 Site on White Sands Missile Range.*" The Work Plan followed the guidance set forth for conducting a

Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). Although this site has not formally been designated as a SWMU, the RFI guidance was chosen as the appropriate guidance to follow. Based on the NMED letter dated 10 November 2003 (Subject: Work Plan for the RCRA Facility Investigation at the Launch Complex 38 Site on White Sands Missile Range), results of this SWMU Assessment will be used by the NMED Hazardous Waste Bureau (HWB) to make a determination of whether additional investigation and remediation is necessary and whether to modify WSMR's RCRA Permit to add the LC-38 diesel spill.

1.2 Approach and Implementation

This investigation was conducted to further determine the extent of soil and/or ground-water contamination, determine possible contaminant transport pathways, and evaluate the potential for human exposure using RBDMP. Field activities to support these objectives consisted of the completion of 7 soil borings and the installation and sampling of three down-gradient and one up-gradient groundwater monitoring wells.

Soil samples were collected and analyzed for organic compounds (VOCs by Method 8260 and SVOCs by Method 8270), and TPH, by Method 8015 modified for diesel range organics (DRO). Groundwater samples were collected and analyzed for total and dissolved metals, VOCs, SVOCs, TPH, and standard groundwater physical parameters and dissolved anions. In addition, geotechnical samples were collected from one down-gradient monitoring well location to support determination of potential remedial actions.

1.3 White Sands Missile Range Background

The majority of the installation is situated within the Tularosa Basin; with areas along the western and northwestern boundary extending into the Jornada del Muerto Basin. WSMR is located in Doña Ana, Socorro, Lincoln, Otero, and Sierra Counties, New Mexico. The Main Post area of WSMR is located at the southwestern corner of the installation, approximately 27 miles east-northeast of Las Cruces, NM and 45 miles north of El Paso, TX. The WSMR headquarters and most installation support activities are located at the Main Post area. The location of LC-38 in relation to WSMR and surrounding areas is shown in Figure 1-1 (on following page).

The WSMR was established July 9, 1945 as White Sands Proving Ground (the name was changed in 1958), to be America's testing range for the new concept of missile weapons. The WSMR now functions as an outdoor laboratory consisting of a large complex of test ranges, launch sites, impact areas and instrumentation sites required to develop and test tactical and strategic weapons and weapons systems. WSMR is designated as a national range whose mission is the support of missile development and test programs for the Army, Navy, Air Force, NASA and other government agencies.

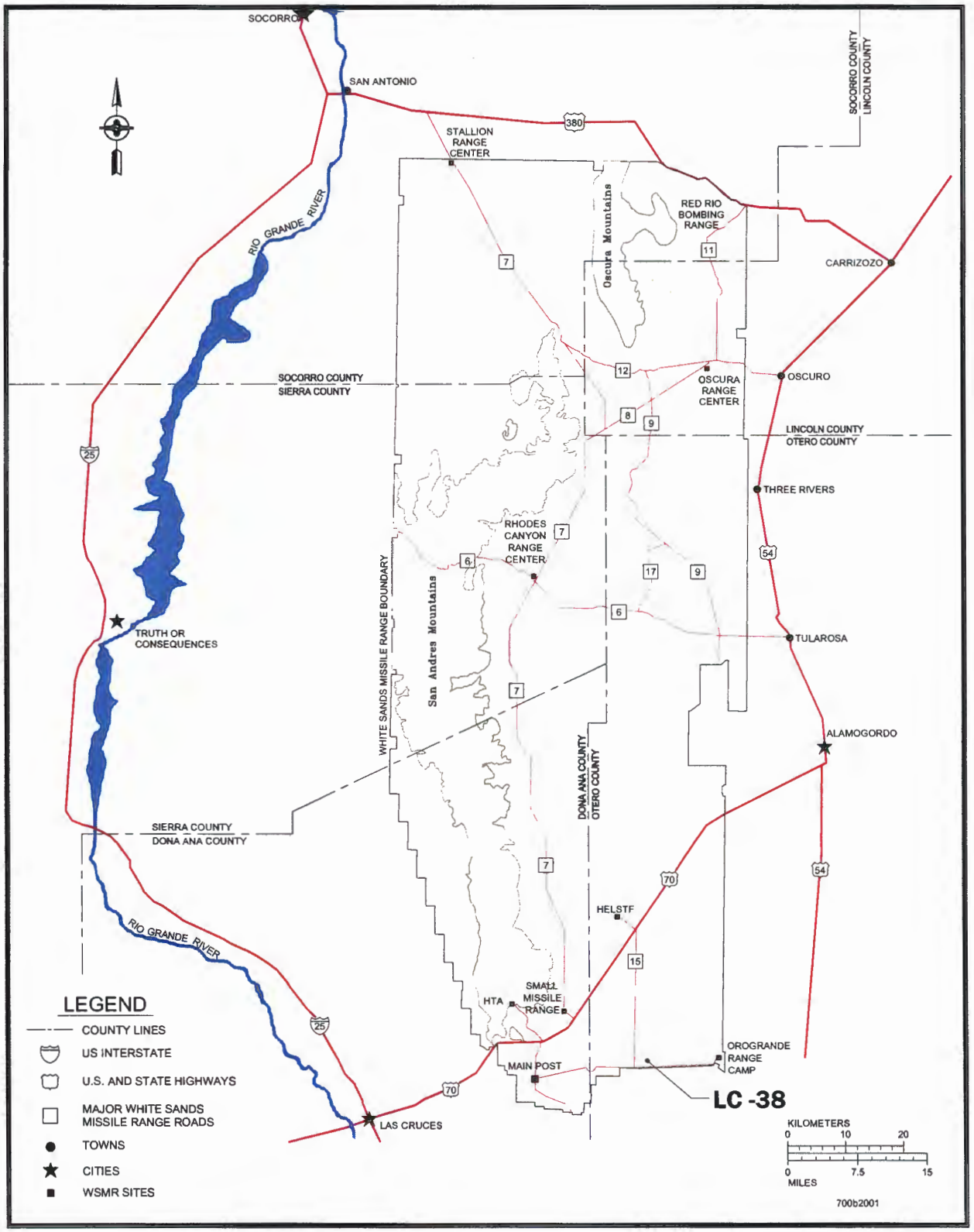


Figure 1-1.
Location of Launch Complex-38 on White Sands Missile Range.

2.0 WSMR PHYSICAL DESCRIPTION

2.1 Regional Geology

WSMR lies within the Mexican Highland Section of the Basin and Range Province. This province is characterized by a series of tilted fault blocks forming longitudinal, asymmetric ridges, or mountains, and broad intervening basins. The geology of WSMR consists predominantly of the Tularosa Basin and surrounding mountain ranges. Figure 2-1 is a cross-section through the Tularosa Basin and surrounding mountain ranges. The San Andres Mountains, San Augustin, and Oscura Mountains border the Tularosa Basin on the west while the Sacramento Mountains form the eastern border. A narrow region of north-south-trending, large-displacement normal faulting separates the mountains from the basin resulting in the change in relief across the missile range. The average elevation of the Tularosa Basin is 4,000 ft above mean sea level. The majority of WSMR property including LC-38 is located within the Tularosa Basin (WSMR, 1998).

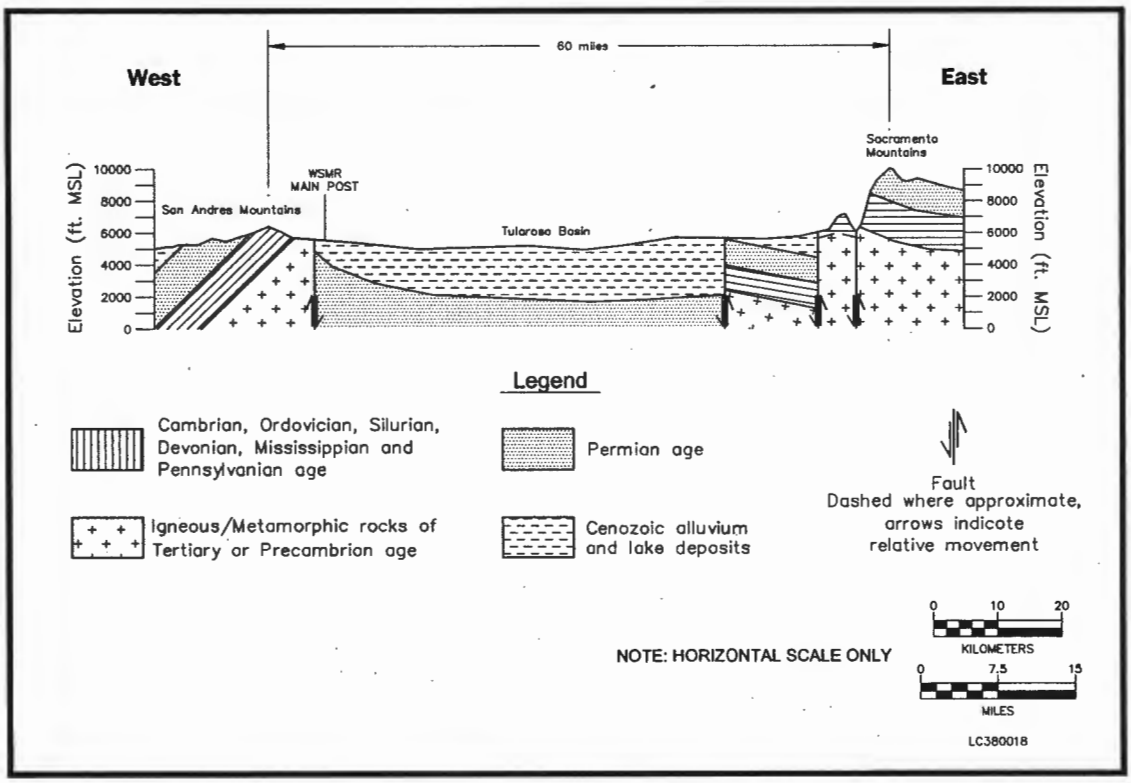


Figure 2-1.
Mexican Highland Section, Basin and Range Province, Tularosa Basin Cross Section.

The San Andres Range trends north-south for approximately 85 miles along the western border of WSMR and varies in elevation from approximately 5,700 ft at San Augustin Pass, where Highway 70 crosses the mountains, to over 9,000 ft at Salinas Peak, the highest point on WSMR. The San Andres Mountains form the westward dipping limb of a broad anticlinal structure whose axial plane follows the Tularosa Valley. The mountains are composed of a thick sequence of sedimentary rocks [Mississippian to Pennsylvanian limestones, sandstones, and shales] which dip

westward on the western limb of the anticline (Kottlowski et al., 1956). The Organ Mountain fault and Artillery Range fault zones extend from El Paso, Texas to the Mockingbird Gap along the eastern base of the San Andres Mountains. These fault zones are composed of large-displacement normal faults which promoted the uplift of the fault block mountain ranges (San Andres and Oscura) above the Tularosa Basin and are the result of continued extension in the Rio Grande Rift (Seager, 1981).

The Sacramento Mountains form an asymmetrical ridge with a steep escarpment on the west and a broad alluvial apron on the east. The escarpment marks a major fault zone along the eastern edge of the Sacramento Mountains overlooking the downthrown Tularosa Valley. The fault zone is composed of normal faults where the Sacramento Mountains were uplifted relative to the downdropped Tualrosa Basin. The Sacramento Mountains contain a series of strike valleys that cut into well exposed rocks ranging from Precambrian granites to Paleozoic through tertiary sedimentary rocks [limestones, sandstones, and shales] (Kottlowski, 1956). These sedimentary rocks, along with those in the San Andres Mountains, provide the source for gypsum and other evaporite minerals (mineral salts) prevalent within the Tularosa Basin.

The Tularosa Basin contains thick sequences of Tertiary and Quaternary age alluvial and bolson fill deposits. These sediments, more than 5,000 ft thick in some areas, consist mainly of silt, sand, gypsum and clay weathered from the surrounding mountain ranges. The average elevation of the basin floor is 4,000 ft above mean sea level and surface features consist of flat sandy areas, sand dunes, basalt flows, and playas (dry lake beds).

The nature of the bolson-fill deposits varies both laterally and vertically throughout the Tularosa Basin. Coarse-grained, poorly sorted sediments deposited near mountain fronts grade into fine-grained, well sorted sediments towards the center of the basin (Kelly, 1973). Sediments further from the mountain fronts also contain a greater percentage of clay and gypsum. Vertically, the sediments are reported to become finer-grained and more consolidated until reaching a laterally continuous clay unit at about 1,000 ft below ground surface (Kelly and Hearne, 1976).

In general, the stratigraphy is represented by unconsolidated to partially consolidated, fine to medium-grained sand with subordinate amounts of clay. Caliche is present as discrete layers and nodules throughout the stratigraphic section. Although no faults within the basin fill are mapped within the immediate area, Quaternary faulting is known to exist within the region. These faults are reported to occur within the unconsolidated bolson sediments, trend north to south, and are most common near the mountain fronts. Orr and Myers (1986) divide the Tularosa Basin fill deposits into 5 distinct mappable units which include:

- Coarse to fine-grained deposits occur in gently sloping alluvial fans along the basin margin. The alluvial fans spread outward from the surrounding mountain slopes and coalesce into flat alluvial plains toward the basin interior. These fan deposits interfinger with lacustrine (lake) and alluvial deposits of the central part of the Tularosa Basin.
- Fine-grained sediments formed from lacustrine deposition extend throughout most of the Tularosa Basin. These deposits consist mainly of clay and evaporites with minor sand beds and occur near surface in the northern part of the basin and at depth in the southern part of the basin.

- Fluvial-eolian sand, gravel, and clay deposits occur in the southern part of the basin, near Fort Bliss, extending from the Organ and Franklin Mountains and south to the Hueco Mountains.
- Gypsiferous evaporite deposits of the Lake Lucero-White Sands area occupy the White Sands National Monument (WSNM) and areas administered by WSMR including the Lake Lucero area and the alkali flats north of Lake Lucero. These deposits occur as dense recrystallized gypsum, gypsum sand dunes, and alluvial deposits. Hard caliche (cemented with recrystallized gypsum) is present at or near surface in the dry lake gypsum deposits of the central portion of the basin.
- The last depositional unit is described as composed of coarse-grained deposits saturated with saline water in the central portion of the Tularosa Basin.

2.2 Regional Hydrology

2.2.1 Climatology

Average annual precipitation at a gauging station in the Tularosa Basin, east of the WSMR Main Post, is 10.8 inches per year. About 50 percent of the annual precipitation in southern New Mexico occurs during the months of July through September. The average high temperature in the summer is approximately 92 degrees Fahrenheit with the lows reaching 65 degrees Fahrenheit. During the winter months the average high is approximately 57 degrees Fahrenheit and the average low is approximately 36 degrees Fahrenheit. Average annual relative humidity readings are 37 percent. Wind is a climatic factor at WSMR from February to about May. Westerly winds can reach approximately 40 miles per hour with gusts over 65 miles per hour (U.S. Army, 1998).

2.2.2 Surface Water

Natural surface waters on WSMR are primarily ephemeral due to the semi-arid climate. Most watercourses flow during and shortly after intense, localized storm events. These arroyos are typically incised on the alluvial fans shed from the San Andres Mountains and the Oscura Mountain Range and terminate in the Tularosa and Jornada del Muerto Basins. Water that reaches the basin seeps into the subsurface and/or evaporates. No surface water flows out of the Tularosa Basin.

2.2.3 Ground Water

The fault-bounded basins of the Tularosa Basin and Range Physiographic Province are filled with sediments eroded from the surrounding mountains as the basins subside. Groundwater flows from the mountainous recharge areas toward the central portions of the basins. The groundwater flows in unconsolidated basin sediments, also known as bolson deposits. Travel and residence time in the bolsons allows the groundwater to dissolve the bolson deposit minerals. Groundwater that has traveled from the mountain recharge areas to the center of the Tularosa Basin is generally non-potable due to high total dissolved solids (TDS) concentrations.

Groundwater within the basement-cored uplifts in the Basin and WSMR region of New Mexico generally occurs under unpredictable fracture-flow conditions in the Precambrian basement rock. Faults defining the boundaries between ranges and basins are major sites of recharge to the regional groundwater aquifer.

Unconsolidated clay, silt, sand, and gravel strata overlie this regional aquifer, with the finer-grained lithologies predominating, and caliche layers and nodules are prevalent throughout the stratigraphic section. The finer-grained strata and caliche deposits act to impede the vertical migration of free liquids and to help to isolate the unconfined aquifer from the effects of activities at the land surface.

Recharge to the regional aquifer is from precipitation falling on the mountain ranges and alluvial fans, which border the bolson on the west. This precipitation infiltrates the unconsolidated, relatively coarse deposits of the alluvial fans, and the resultant groundwater flows toward the center of the Tularosa Bolson, generally to the east-southeast. However, groundwater flow direction may be altered locally, because of the pumping of water supply wells. The groundwater within the western Tularosa Bolson region is presumed to discharge to the south as underflow into the contiguous, northern Hueco Bolson of western Texas. No surface expressions of groundwater discharge have been reported within the western Tularosa Bolson. Dissolved constituents in groundwater increase with distance eastward from the mountain front, reflecting the increased residence time of groundwater moving from the western bolson margin toward the center of the Tularosa Bolson (U.S. Army, 1998).

Wells completed within the alluvial fans of the western Tularosa Bolson supply fresh water to satisfy the entire water needs of WSMR.

2.3 LC-38 Diesel Spill Site Description

LC-38 was developed to sustain missile-testing operations. The infrastructure at LC-38 included a stored reserve supply of diesel fuel contained in a 150,000 gallon AST (Figure 2-2). In the summer of 2000 it was determined that approximately 31,000 gallons of fuel could not be accounted for. Immediately upon the discovery of the missing inventory, the product lines from the adjacent loading terminal to the AST were uncovered. A leak in the product line was apparent and considered as the source of the fuel release. The AST and leaking fuel line are shown in photographs attached to Figure 2-2.

3.0 SUMMARY OF PREVIOUS INVESTIGATIONS

Prior to this SWMU Assessment, a preliminary investigation was performed at the site to help determine the extent of contamination at the site. A summary of the preliminary investigation is provided in a Letter Report prepared under Contract DAAD07-95-C-0125, WAO No. 700-B2. Drilling for the preliminary investigation at the LC-38 AST diesel release site began on February 13, 2001 and concluded on February 16. Three exploratory holes were drilled for the preliminary investigation as listed below:

Site Name	Location	Total Depth
Soil Boring 1 (BH-01)	4ft north of leak	TD at 105ft
Soil Boring 2 (BH-02)	30ft south of leak	TD at 80ft
Soil Boring 3 (BH-03)	37ft north of leak	TD at 82.5ft

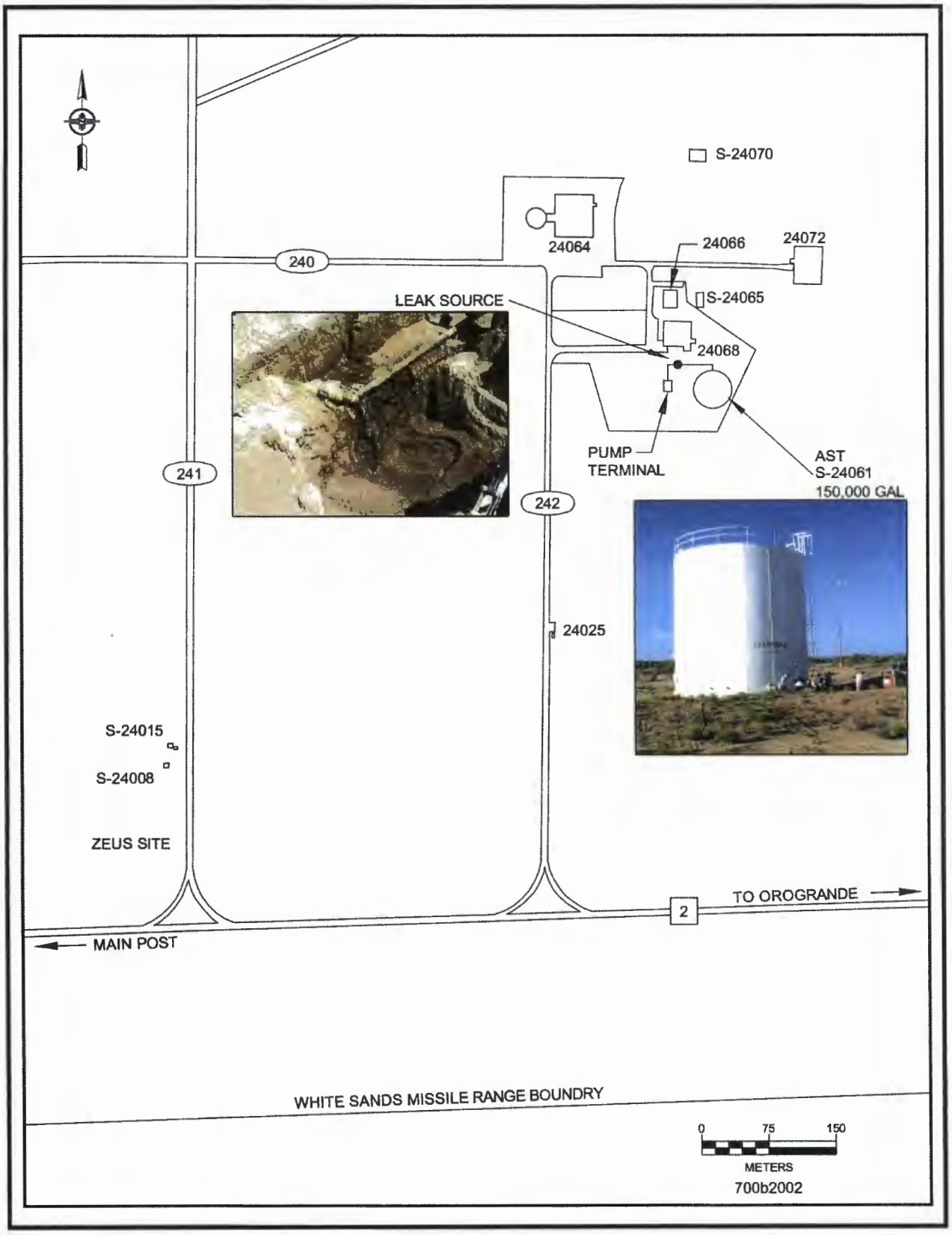


Figure 2-2. Location of the Diesel Fuel AST at LC-38.

The locations of these borings are shown below in Figure 3-1. Subsurface soil samples were collected and analyzed for TPH. Additionally, a few samples were analyzed for VOCs and SVOCs at the discretion of the sampling team.

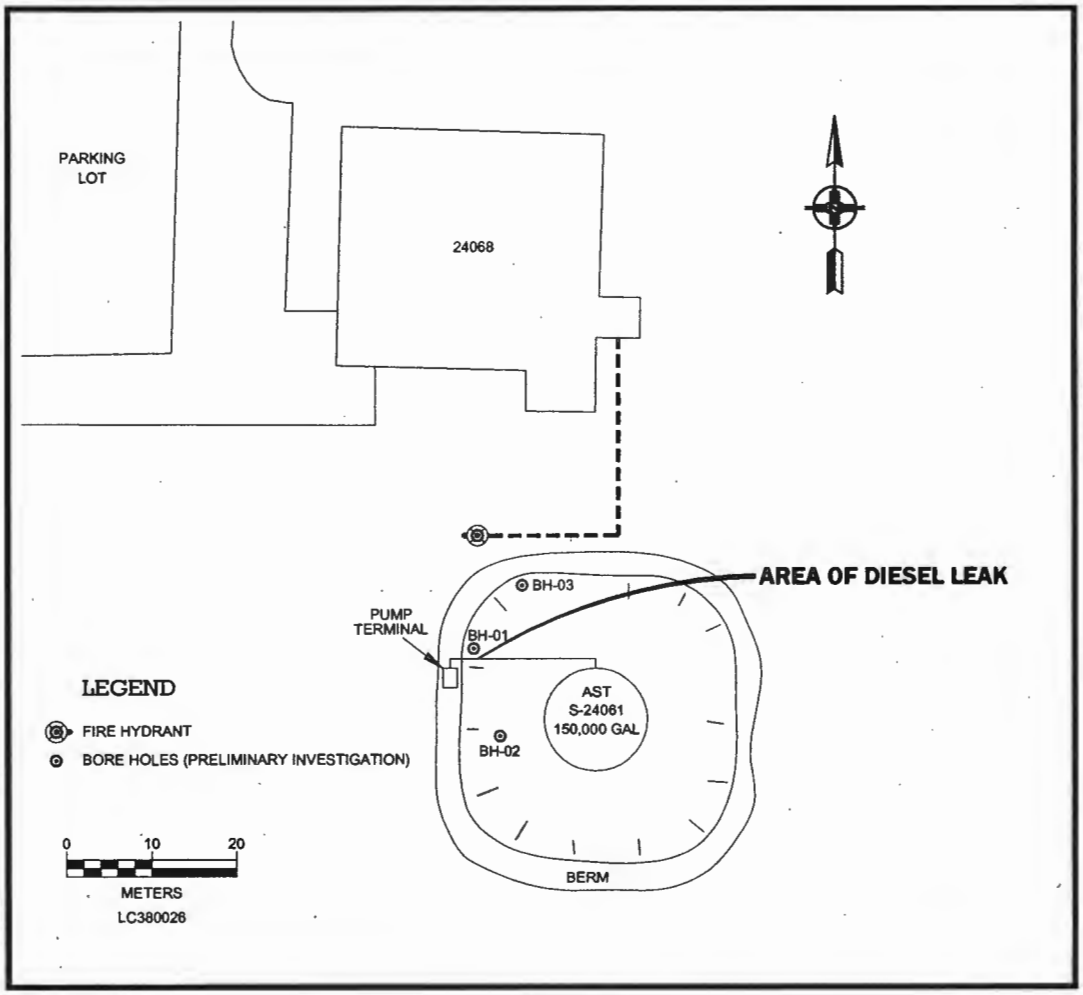


Figure 3-1. Soil borings locations at LC-38, February 2001.

The TPH results are summarized in Table 3-1(on following page). Note that the data is presented showing the boreholes as they are laid out from north to south. Where data is not presented for a depth, it is due to the fact that sampling was not always at the same depth in each hole.

All analytical results from this investigation are tabluated in Appendix A. The data from the preliminary investigation shows that the diesel fuel flowed vertically to a depth of approximately 75 feet before it ran out of sufficient head force to drive it further. The investigating team encountered no ground water over this interval or to a depth of 105 feet bgs. TPH analysis documented the mass distribution of contamination at approximately 5-foot intervals. The more compound-specific analyses, SW-846 8260 and 8270, were run on samples strategically spaced to maximize cost-benefit, but also verify the TPH results and provide for future risk screening. Results from this preliminary investigation were included in the preparation of the Baseline Risk Assessment provided in Section 5.0 of this SWMU Assessment Report.

Table 3-1. Preliminary Investigation TPH DRO.

DIESEL RANGE ORGANICS, mg/Kg			
DEPTH, ft	BH-03	BH-01	BH-02
4.5 - 5.0	1.4		16
9.5 - 10.0	1.8	14,000	6.1
14.5 - 15.0	1.4		8.4
17.5 - 18.0		11,000	
19.5 -20.0	1.4	11,000	24
24.5 - 25.0	15	17,000	14
29.5 - 30.0	3.6	21,000	
34.5 - 35.0	4.5	16,000	13
39.5 - 40.0	3.7	14,000	1.1
44.5 - 45.0	5,200	21,000	0.8
49.5 - 50.0		10,000	
53.7 - 54.2	30,000		
54.5 - 55.0	21,000	24,000	27
57.0 - 57.5			20,000
59.5 - 60.0	5,000	11,000	26,000
64.5 - 65.0	12,000	49,000	180
67.0 - 67.5	70,000		6,800
69.5 - 70.0	23	420	160
70.0 - 70.5		3,000	
74.5 - 75.0	56		1.4
79.5 - 80.0	1.2	2.2	
104.5 - 105.0		1.1	

Note: The soil borings for the February 2001 sampling event were originally labeled as SB-01, SB-02, and SB-03 at the time of sample collection. However, due to mislabeling in the workplan (February 2002) for the November 2003 event, the soil borings were renamed BH-01, BH-02, and BH-03, respectively. This nomenclature for the 2001 soil borings was used through the SWMU Assessment (November 2003) sampling event for planning purposes. Soil borings for the November 2003 event were numbered SB-001 through SB-007. To keep the nomenclature for both sampling events from further confusion, soil borings for the preliminary investigation (February 2001) event will continue to be referred to with the "BH" prefix.

4.0 SWMU ASSESSMENT

4.1 Field Investigation

4.1.1 Borehole Completion/Soil Sample Collection

On 3-13 November 2003, 7 soil borings were augered using hollow-stem drilling techniques at the LC-38 diesel spill site for the collection of subsurface soil samples and installation of one soil gas monitoring well. Figure 4-1 (on following page) shows soil boring and monitoring well locations at the LC-38 site. SB-001 was completed in the down-gradient direction (near location for MW-003) for collection of geotechnical samples. Geotechnical analysis included sieve, hydrometer, and total organic carbon (TOC) analysis. The remaining soil borings were

completed for collection of chemical samples related to the diesel spill including TPH, VOCs, and SVOCs. As outlined in the work plan, samples for TPH were collected approximately every 10 feet down hole. When field readings (VOCs by photoionization detector (PID) and/or staining and odor) indicated the presence of hydrocarbons, samples were collected approximately every 5 ft for VOCs and SVOCs. Table 4-1 lists all soil borings completed for this SWMU Assessment including soil boring identification, sample identification, sample depths (in parentheses in sample I.D.), and sample analyte collection.

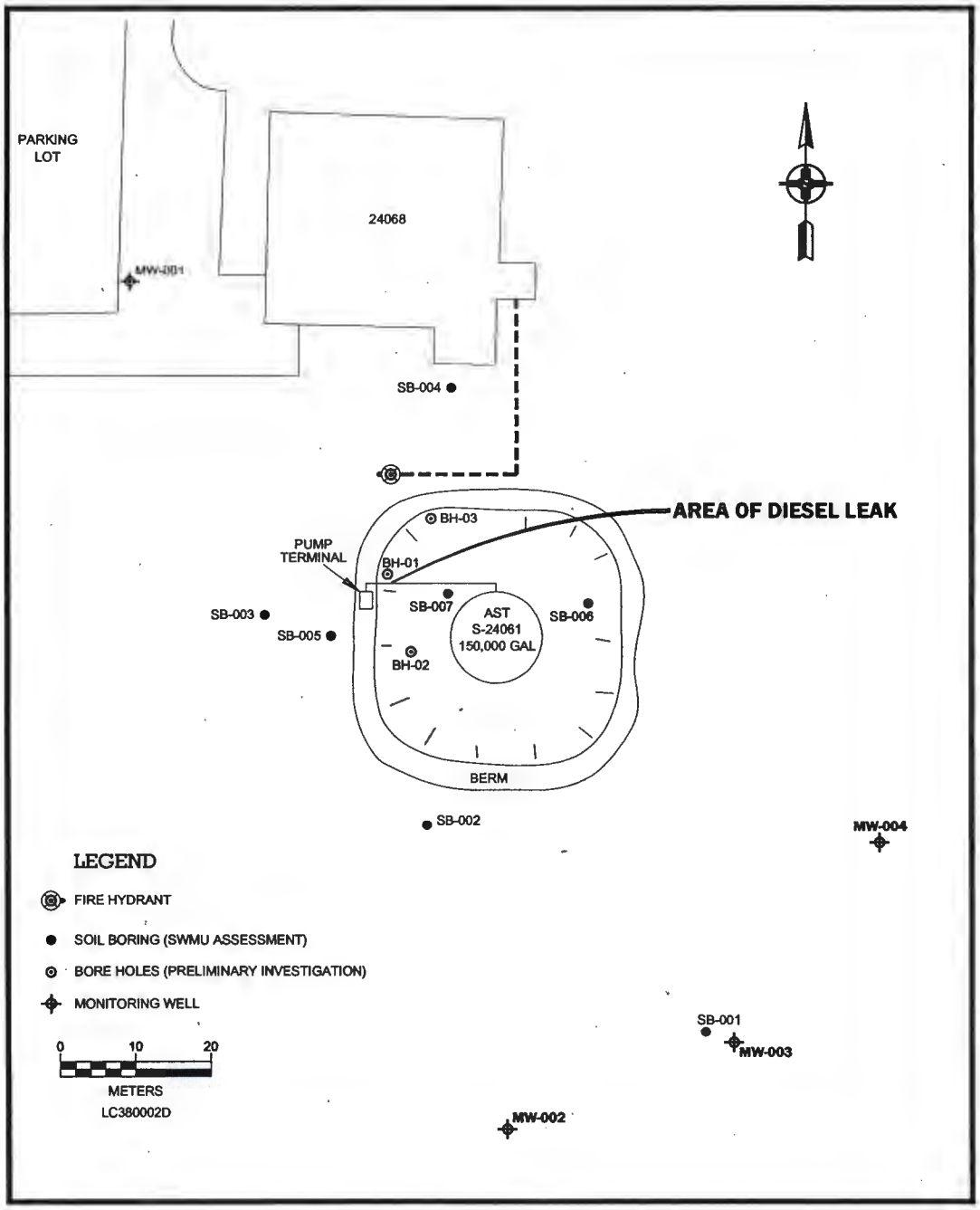


Figure 4-1.
Location of all Soil Borings and Monitoring Wells Completed at LC-38.

Table 4-1. LC-38 Diesel Spill Soil Borings.

Soil Boring #/TD	Sample Identification	Sample Collected For:	Soil Boring #/TD	Sample Identification	Sample Collected For:
SB-001/100 ft	LC-38-DSPL-SB-001-(2.0-3.0)	geotechnical	**SB-005**/110 ft	LC38-DSPL-SB-005-(8.5-9.0)	TPH
	LC-38-DSPL-SB-001-(9.0-10.0)	geotechnical		LC38-DSPL-SB-005-(20-20.5)	TPH
	LC-38-DSPL-SB-001-(19.0-19.5)	geotechnical		LC38-DSPL-SB-005-(30-30.5)	TPH
	LC-38-DSPL-SB-001-(22.0-23.0)	geotechnical		LC38-DSPL-SB-005-(40-40.5)	TPH
	LC-38-DSPL-SB-001-(29.0-30.0)	geotechnical		LC38-DSPL-SB-005-(49.5-50.5)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(34.0-35.0)	geotechnical		LC38-DSPLSB-005-(53.5-54.0)	VOC, SVOC
	LC-38-DSPL-SB-001-(39.0-40.0)	geotechnical		LC38-DSPLSB-005-(59.0-59.2)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(49.0-50.0)	geotechnical		LC38-DSPLSB-005-(63.-63.5)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(52.0-53.0)	geotechnical		LC38-DSPLSB-005-(64.5-64.7)	VOC, SVOC
	LC-38-DSPL-SB-001-(59.0-60.0)	geotechnical		LC38-DSPL-SB-005-(73.5-74)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(69.0-70.0)	geotechnical		LC38-DSPL-SB-005-(77.5-77.8)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(75.0-77.0)	geotechnical		LC38-DSPL-SB-005-(84.9-85.0)	TPH
	LC-38-DSPL-SB-001-(79.0-80.0)	geotechnical		LC38-DSPL-SB-005-(89.8-90.0)	TPH
	LC-38-DSPL-SB-001-(84.0-84.5)	TPH		LC38-DSPL-SB-005-(92.9-93.2)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(89.0-90.0)	geotechnical		LC38-DSPL-SB-005-(97.5-97.7)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(96.5-97.5)	geotechnical		LC38-DSPL-SB-005-(103-103.2)	TPH, VOC, SVOC
	LC-38-DSPL-SB-001-(99.0-99.5)	TPH		LC38-DSPL-SB-005-(108-108.5)	TPH, VOC, SVOC
SB-002/99.5 ft	LC38-DSPL-SB-002 (6.0)	TPH	**SB-006**/100 ft	LC38-DSPL-SB-006-(7.0-7.3)	TPH
	LC38-DSPL-SB-002-(17.0)	TPH		LC38-DSPL-SB-006-(20.0-20.5)	TPH
	LC38-DSPL-SB-002-(27.0-27.5)	TPH		LC38-DSPL-SB-006-(30.0-30.5)	TPH
	LC38-DSPL-SB-002-(39.5-40.0)	TPH		LC38-DSPL-SB-006-(39.0-39.5)	TPH
	LC38-DSPL-SB-002-(49.5-50.0)	TPH		LC38-DSPL-SB-006-(50.0-50.5)	TPH
	LC38-DSPL-SB-002-(59.5-60.0)	TPH		LC38-DSPL-SB-006-(59.5-60.0)	TPH
	LC38DSPLSB-002-(65.7-66.8)	TPH, VOC, SVOC		LC38-DSPL-SB-006-(69.5-70.0)	TPH
	LC38-DSPL-SB-002-(70.0-70.5)	TPH, VOC, SVOC		LC38-DSPL-SB-006-(79.5-80.0)	TPH
	LC38-DSPL-SB-002-(74.5-75.0)	TPH, VOC, SVOC		LC38-DSPL-SB-006-(89.5-90.0)	TPH
	LC38-DSPL-SB-002-(78.0-78.5)	TPH, VOC, SVOC		LC38-DSPL-SB-006-(99.0-99.5)	TPH, VOC, SVOC
	LC38-DSPL-SB-002-(86.5-87.0)	TPH	**SB-007**/109 ft	LC38-DSPL-SB-007-(10.0-10.5)	TPH
	LC38-DSPL-SB-002-(91.0-91.5)	TPH		LC38-DSPL-SB-007-(20-20.5)	TPH, VOC, SVOC
	LC38-DSPL-SB-002-(95.0-95.5)	TPH		LC38-DSPL-SB-007-(25.0-25.5)	VOC, SVOC
	LC38-DSPL-SB-002-(99.0-99.5)	TPH		LC38-DSPL-SB-007-(30.0-30.5)	TPH, VOC, SVOC

Soil Boring #/TD	Sample Identification	Sample Collected For:	Soil Boring #/TD	Sample Identification	Sample Collected For:
SB-003/100 ft	LC38-DSPL-SB-003-(1.5-1.8)	TPH		LC38-DSPL-SB-007-(35.0-35.5)	VOC, SVOC
	LC38-DSPL-SB-003-(10.0-10.5)	TPH		LC38-DSPL-SB-007-(40.0-40.5)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(20.0-20.5)	TPH		LC38-DSPL-SB-007-(45.0-45.5)	VOC, SVOC
	LC38-DSPL-SB-003-(30.0-30.5)	TPH		LC38-DSPL-SB-007-(50-50.5)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(40.0-40.5)	TPH		LC38-DSPL-SB-007-(55-55.5)	VOC, SVOC
	LC38-DSPL-SB-003-(50.0-50.5)	TPH		LC38-DSPL-SB-007-(59-59.5)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(60.0-60.5)	TPH		LC38-DSPL-SB-007-(61.3-62)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(66.-66.5)	TPH, VOC, SVOC		LC38-DSPL-SB-007-(62-62.5)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(67.0-67.5)	TPH, VOC, SVOC		LC38-DSPL-SB-007-(69.5-70.0)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(71.3-71.5)	VOC, SVOC		LC38-DSPL-SB-007-(70-70.5)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(78.0-78.5)	TPH, VOC, SVOC		LC38-DSPL-SB-007-(74.0-74.5)	VOC, SVOC
	LC38-DSPL-SB-003-(84.0-84.5)	TPH		LC38-DSPL-SB-007-(79-79.5)	TPH
	LC38-DSPL-SB-003-(88.0-88.5)	TPH		LC38-DSPL-SB-007-(83-83.3)	TPH, VOC, SVOC
	LC38-DSPL-SB-003-(94.0-94.5)	TPH		LC38-DSPL-SB-007-(84.5-85)	TPH
	LC38-DSPL-SB-003-(98.5-99.0)	TPH		LC38-DSPL-SB-007-(89-89.3)	TPH, VOC, SVOC
SB-004/100 ft	LC38-DSPL-SB-004-(6.0-6.5)	TPH		LC38-DSPL-SB-007-(94.0-94.3)	VOC, SVOC
	LC38-DSPL-SB-004-(14.0-14.2)	TPH		LC38-DSPL-SB-007-(97.0-97.3)	TPH, VOC, SVOC
	LC38-DSPL-SB-004-(20.0-20.5)	TPH		LC38-DSPL-SB-007-(103.3-103)	TPH
	LC38-DSPL-SB-004-(30.0-30.5)	TPH		LC38-DSPL-SB-007-(108.5-108.8)	TPH, VOC, SVOC
	LC38-DSPL-SB-004-(40.0-40.5)	TPH			
	LC38-DSPL-SB-004-(50.0-50.5)	TPH			
	LC38DSPLSB-004-(63.3-63.8)	TPH, VOC,SVOC			
	LC38-DSPL-SB-004-(64.0)	TPH, SVOC			
	LC38-DSPL-SB-004-(68.0-68.5)	TPH, VOC,SVOC			
	LC38-DSPL-SB-004-(69.2)	TPH, SVOC			
	LC38-DSPL-SB-004-(75.0)	TPH			
	LC38-DSPL-SB-004-(80.0-80.5)	TPH			
	LC38-DSPL-SB-004-(84.0-85.0)	TPH			
	LC38-DSPL-SB-004-(90.0)	TPH			
	LC38-DSPL-SB-004-(95.0)	TPH			
	LC38-DSPL-SB-004-(96.5-97.0)	TPH			

Soil borings were completed using a continuous-flight, hollow-stem auger mounted on a CME-75 truck mounted drill rig (Photograph 4-1). The soil borings were augered using 4.25 inch inside diameter, 5 ft length auger flights (Photograph 4-2). Carbon steel 5 ft long 4 inch O.D. split-barrels were used to collect samples for chemical analysis. The split-barrel samplers were driven through continuous coring.

Photograph 4-1. CME-75 Drill Rig.

Photograph 4-2. Auger Flight with Split Barrel Sampler Protruding.

When the split-barrel was removed from the boring and opened, any material appearing to be slough was removed. All samples were collected directly from the split-barrel sampler without compositing and placed directly into the sample jar. After the split-barrel sampler was opened, volatile samples were collected as quickly as possible following field screening and selection of sample zone. Excess soil around the top of the sample jars was wiped away with a clean paper towel to ensure the cap would fit tightly.

When the split-barrel was removed from the boring and opened, it was carefully transferred to a clean polyvinyl chloride (PVC) tray for photographing (Photograph 4-3 on following page) lithologic logging by the field geologist (Photograph 4-4 on following page) and for collection of chemical samples (Photograph). All soil cores were photographed for documentation and inclusion in the SWMU Assessment project files. Chemical samples were placed in clean, new glass jars with Teflon-lined caps provided by the laboratory and packed with zero headspace where possible. Lithologic logs for all soil borings are included in Appendix B.

Photograph 4-3.
Example of Photographic Documentation of Soil Boring Core.

Photograph 4-4. Lithologic Logging of Soil Boring Core.

Photograph 4-5. Soil Sample Collection.

Following completion of each soil boring, the boring was backfilled using a bentonite/cement grout. Drill cuttings were placed in 20 cubic yard roll-off containers, labeled as non-hazardous, and secured. The location of each soil boring was surveyed using a Global Positioning System (GPS) unit to an accuracy of plus or minus 1 meter. GPS coordinates collected at the LC-38 diesel spill site are included in Table 4-2.

Table 4-2.
GPS Coordinates of Soil Borings and Monitoring Wells at LC-38.

GPS Point	Northing UTM NAD 83	Easting UTM NAD 83
SB-001	3586142.725	381763.844
SB-002	3586170.175	381726.967
SB-003	3586198.208	381705.425
SB-004	3586228.726	381730.23
SB-005	3586195.399	381714.275
SB-006	3586199.726	381748.408
SB-007	3586201.015	381729.763
MW-001	3586246.449	381681.625
MW-002	3586129.780	381737.586
MW-003	3586141.289	381767.536
MW-004	3586167.830	381786.756

the southwestern corner of the installation, approximately 27 miles (43.4 km) east-northeast of Las Cruces, NM and 45 miles (72.4 km) north of El Paso, TX (Figure 1-1). The WSMR headquarters and most installation support activities are located at the Main Post area. The location of LC-38 in relation to Main Post is shown in Figure 1-2. The WSMR is the largest land-area military installation in the United States, comprised of nearly 3,200 square miles (5,631 sq. km) of land. The installation is approximately 99 miles (159 km) long and 25 to 40 miles (40.22 to 64.4 km) wide.

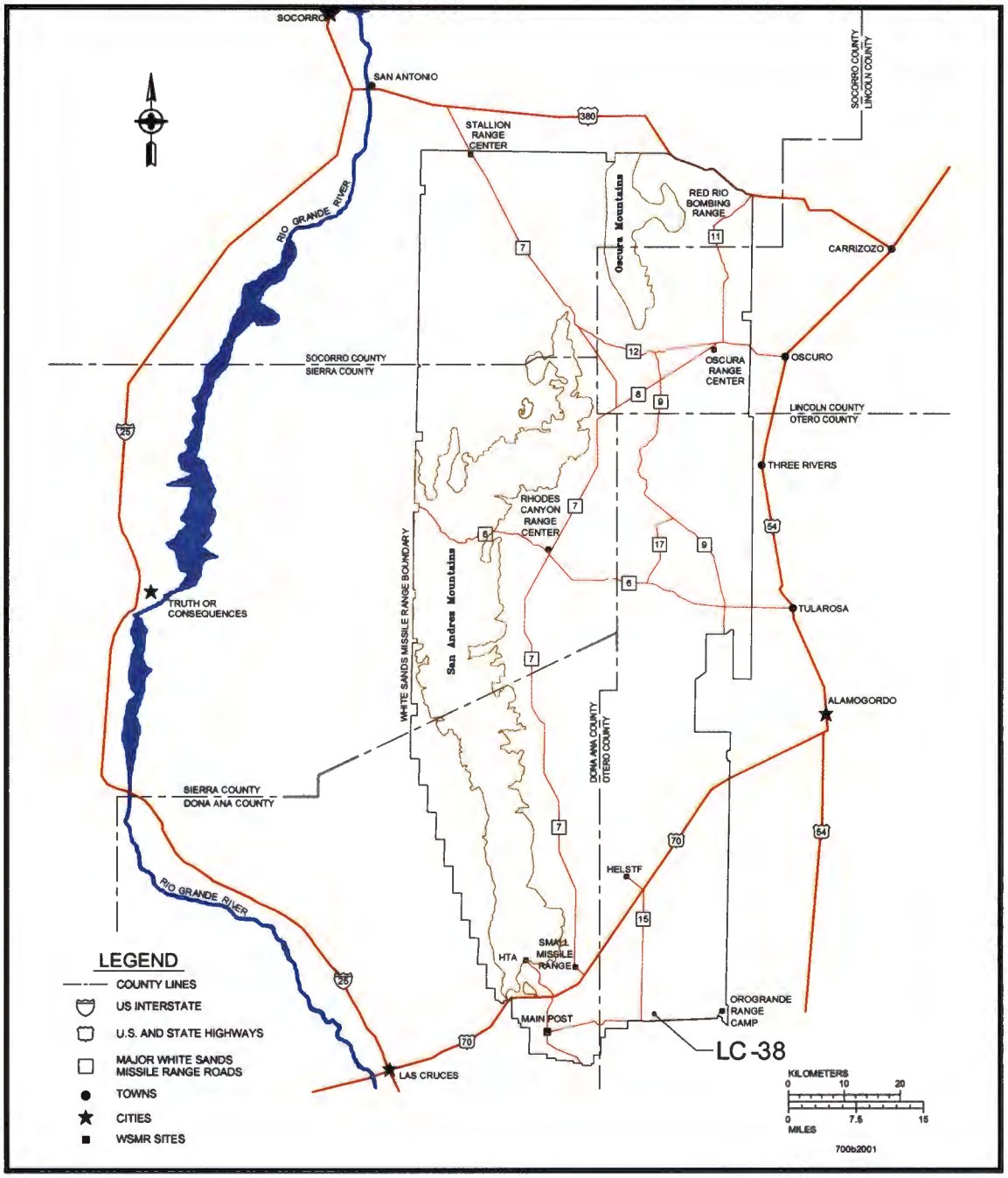


Figure 1-1.
Location of Launch Complex-38 on White Sands Missile Range.

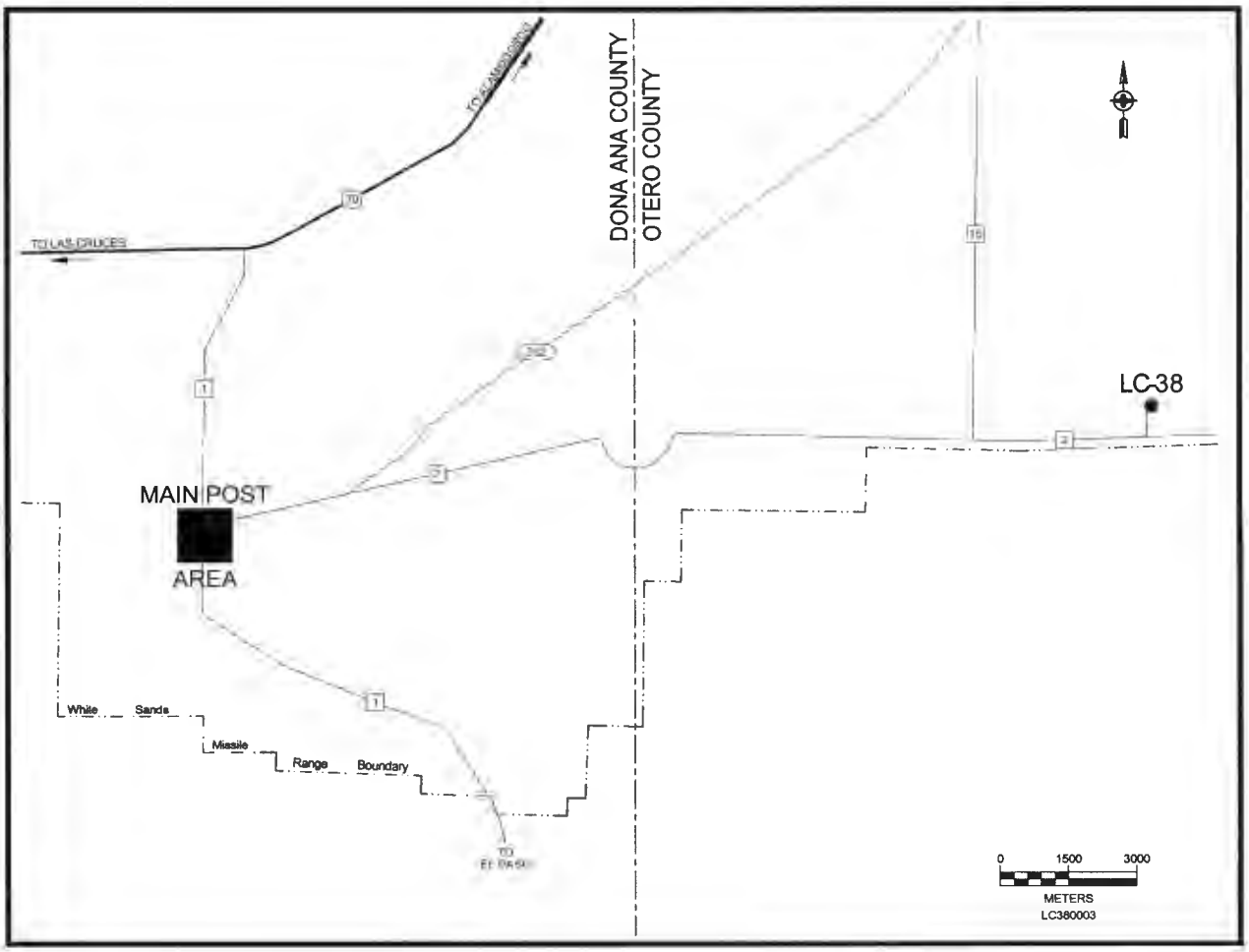


Figure 1-2.
Location of LC-38 and route from Main Post area.

The WSMR was established July 9, 1945 as White Sands Proving Ground (the name was changed in 1958), to be America's testing range for the new concept of missile weapons. The New Mexico desert was selected to be the nation's testing range for several reasons: the desert is sparsely populated, has almost year-round clear weather and unlimited visibility, and as such, affords relatively easy recovery of spent missiles.

The WSMR now functions as an outdoor laboratory consisting of a large complex of test ranges, launch sites, impact areas and instrumentation sites required to develop and test tactical and strategic weapons and weapons systems. WSMR is designated as a national range whose mission is the support of missile development and test programs for the Army, Navy, Air Force, NASA and other government agencies.

White Sand Missile Range is located in the Tularosa Basin, about 25 miles east of Las Cruces, New Mexico. The Tularosa Basin is bounded on west side by the Organ, San Andres Mountains and on the eastern limit, which is outside the Range, is formed from the north by the Jarilla, Sierra Blanca, and Sacramento Mountains.

All soil samples collected for this investigation were assigned sample numbers as follows:

For subsurface soil samples: ####-****- xx-yyy (zzz.z)

where:
- #### = Area Identifier (LC38)
- **** = Site Type (DSPL - Diesel Spill)
- xx = sample location type
  - where: SB = Soil Boring
  - MW = Monitoring Well
- yyy = sample location number
- zzz.z = sample depth interval

4.1.2 Monitoring Well Installation

4.1.2.1 Ground-Water Monitoring Wells

The design for the monitoring well installation (MW-001 through MW-004) (Figure 4-1) was based on the need to confirm the direction of ground-water flow at the site and to provide monitoring wells for ground-water sampling and analysis. MW-001 was designed to be the up-gradient monitoring well while MW-002, MW-003, and MW-004 were designed to be spread out down-gradient. Monitoring well locations were chosen (as outlined in the work plan) based on ground-water contouring and 3-point problems calculated from existing wells in the region. The ground-water flow direction was believed to be from the north-west to the south-east. Depth to ground water was estimated to be 240 ft bgs. As shown in Figure 4-1, the wells were installed to reflect the assumed flow direction. Monitoring well construction data is included in Table 4-3.

Table 4-3. Monitoring Well Construction Data.

Well I.D.	Rel Elevation* ft (brass marker)	Casing Diameter in	casing/screen type	TD As Constructed bgs ft	Screened Interval bgs ft	LOC ft	Lithology of Screened Interval	Recharge
MW-001	1,000.00	4	sch 40 pvc/0.010 wire wrap SS	261	235-255	2.57	fine sand w/silt and clay lenses	1 gal/2-3 min; 3.5 hrs to reach static after bailing dry
MW-002	1,003.92	4	sch 40 pvc/0.010 wire wrap SS	254	225-245	2.42	clay w/silty sand lenses	very slow; approx 1 day to reach static after bailing dry
MW-003	1,003.56	4	sch 40 pvc/0.010 wire wrap SS	255	227-247	2.39	sandy silt, sand and clay lenses	5 gal/hour; approx 2 hrs to get back to static after bailing dry
MW-004	1,003.37	4	sch 40 pvc/0.010 wire wrap SS	257	229-249	2.36	229-240 silty clay; 241-249 fine sand	2.5 gal/min
TW-001**	N/A	2	sch 40 pvc/0.010 sch 40 pvc	68	58-68	≈ 3	clay with few sand lenses	N/A

* Relative Elevation to MW-001. Arbitrary Elevation for MW-001 chosen as 1,000 ft. Actual Elevation unknown. Ground surface elevation in area is around 4,040 ft.

** TW-001 is a test well not screened in the water table. Screened in the vadose zone impacted by the diesel spill.

Drilling of the monitoring wells was accomplished using a 1500 Gardner Denver mud rotary equipped drill rig (Photograph 4-6) with an 8-inch tri-cone drill bit. All drilling activities were performed with potable water from a water point located near the site. No drilling fluids (such as E-Z Mud) other than the potable water were used in case of TPH interference. There was sufficient formation clay to create a thick drilling mud when mixed with the potable water.

The well riser for the monitoring wells installed for this investigation consisted of new threaded, flush joint, PVC Schedule 40 pipe of 4-inch nominal diameter (Photograph 4-7 on following page). A 5 ft section of riser pipe (sand trap), with a bottom cap, was constructed at the base of the screen (Photograph 4-8). Screen and riser sections were joined by threaded flush-joint couplings, to form water-tight unions that retain 100% of the strength of the screen. Solvent glues, cements, or adhesive tapes were not used to join sections of pipe and screen.

The well screen for the groundwater monitoring wells consisted of new, threaded, flush joint, nominal 4-inch diameter Schedule 40 stainless steel (20 ft length) (Photograph 4-7). The screens were non-contaminating, factory constructed, of "continuous wrap" design. Field slotted or cut screen was not used. The slot size for the well screen used is 0.010 inch so that it would be compatible with the gravel pack material.

Photograph 4-6.
Mud Rotary Drilling of Monitoring Wells at LC-38.

Photograph 4-7. PVC Riser and Stainless Steel Screen Materials.

Photograph 4-8. Screen and Sand Trap Section of Monitoring Well.

A 2 ft to 6 ft seal consisting of bentonite pellets and chips was placed into the annular space between the riser and boring wall. The bentonite seal was installed above the filter pack and hydrated with formation water.

Filter pack material consisted of clean, washed, well graded, rounded to subrounded silica sand. Grain size (20-40 mesh size with uniformity coefficient in the range of 1.1-1.6) was selected so as to exclude the majority of the material in the aquifer. The filter pack was placed 1 foot below the base of the sand trap to at least 2 ft above the top of the screened interval. The filter pack was put in place using a 1.25-inch tremie pipe.

Upon completion of the well, a PVC cap was installed to help prevent material from entering the well. A protective above-grade aluminum shroud with a locking cap was centered around the well. The protective well casing rises approximately 2 ft above ground level. The well surface completions consist of a 4 ft x 4 ft cement pad with bollards cemented in place. The well construction completion diagrams lithologic logs for the monitoring wells are included in Appendix C.

All wells were developed following installation. Due to the amount of clay material in the screened zone, potable water was used in the development process for surging. The amount of potable water put into each well was noted so that the same amount would be removed. Following removal of potable water from each well, development continued until the pH, temperature, and conductance of the groundwater had stabilized. Stability was defined as three consecutive sets of temperature and conductance values within $\pm$ 5 percent of each other, and pH within 0.1 units. The volume of water removed between measurement sets was 5-10 gallons. All development water was containerized in lined 20 cubic yard roll-off containers.

With the exception of MW-002, all wells were developed until parameters were relatively stable and the ground water had cleared. TDS concentrations analyzed from MW-002 are half the concentrations of the other monitoring wells indicating that all potable water used in development may not have been fully removed. The formation materials surrounding the screened interval in MW-002 contain considerably more clay than the other monitoring wells. The clay in the screened interval of this monitoring well impedes sufficient ground-water flow such that the well recharges slowly (approximately 1 day for 1 well volume).

4.1.2.2 Soil Gas Monitoring Well

The soil gas monitoring well was installed in the SB-007 borehole for future testing if needed to determine remediation alternatives. The borehole was backfilled with bentonite chips to approximately 69 ft bgs. The borehole was screened from 58 ft to 68 ft bgs using 0.010 inch slot size, schedule 40 PVC (2-inch outside diameter) screen. This zone was chosen because it appeared to be the most contaminated using the field screening methods discussed earlier. Riser used in the construction is 2-inch diameter schedule 40 PVC. A 10-20 mesh size quartz sand was emplaced around the screened interval as a filter pack. A 3.5 ft bentonite seal was placed above the filter pack and charged with potable water. The borehole was grouted to the surface from 52.5 ft bgs using a neat bentonite cement grout. The surface completion included a locking aluminum shroud. A well completion diagram for the soil gas monitoring well is included in Appendix B.

4.1.3 Ground-Water Sample Collection

Prior to ground-water sample collection on 26 January 2004, a hydrocarbon/water interface probe was used in each well (MW-001 through MW-004) for determination if diesel product was present at the water table. The probe was lowered through each well and water column with no indication of product. Additionally, as the probe was removed from the well, it was cleaned using a dry paper towel. No indication of hydrocarbon odors were present on the paper towel following this procedure.

Ground-water samples were collected on 26-27 January 2004. Ground-water sample collection was accomplished using an electric submersible pump for monitoring wells MW-001 and MW-004. Due to the slow recharge of MW-002 and MW-003, a disposable bailer (1 liter capacity) was used for purge and sample collection.

Prior to monitoring well sampling, ground water was purged from each well to obtain a representative groundwater sample. The desired volume of water to be removed was three well volumes as calculated from well construction diagrams and the water level information collected during the sampling event. However, due to the slow recharge nature of MW-002, it was not possible to obtain the target water volume from all of the wells within a reasonable amount of time. MW-002 was sampled the following morning following sufficient time to recharge. MW-003 produced formation water better than originally expected. Three well volumes were removed for MW-003 prior to sample collection.

Water level information and water quality measurements taken during the collection of each sample are provided in Table 4-4. Table 4-5 outlines the purging history conducted at the wells during this sampling event.

Table 4-4.
January 2004 Field Measurements from LC-38 Monitoring Wells.

Well #	Depth to GW TOC ft	Water Sample Temperature °F	Water Sample Conductivity (µS/cm)	Water Sample pH
MW-001	235.14	72.3	11,110	7.38
MW-002	239.50	--	8,250	7.24
MW-003	239.18	58.0	11,660	7.24
MW-004	238.90	68.8	11,750	6.89

µS/cm Microsiemens per centimeter.
-- Temperature listed by sampling team was 32 °F, which is suspected as instrument or human error.

Table 4-5.
January 2004 Purge History for the LC-38 Monitoring Wells.

Well #	Target Purge Volume gal	Date/Time Purged	Actual Purge Volume gal	Date/Time Sampled
MW-001	57	1-26-04/1100-1244	57	1-26-04/1244
MW-002	34	1-26-04	9	1-27-04/0920
MW-003	37	1-27-04/1045-1359	37	1-27-04/1359
MW-004	41	1-27-04/0929-1030	41.5	1-27-04/1032

4.1.4 Monitoring Well/Soil Boring Survey

A professional survey of the monitoring wells and soil borings had not been completed at the time of this report. However, a relative survey was completed on 3 February 2004 (monitoring wells) and 10 February 2004 (soil borings) to provide data on ground-water flow direction and vertical offset of the soil borings. The survey was completed using a Topcon ATG3 Autolevel and stadia rod. Surface elevations for all soil borings were surveyed relative to MW-001. MW-001 was assigned an arbitrary relative elevation of 1,000 ft above sea level (approximate elevation based on contour map is 4,040 ft). With this determination, all other monitoring wells and soil borings were surveyed as either higher or lower (to nearest 0.01 ft) than the arbitrary 1,000 ft elevation of MW-001. The survey data (Table 4-6) for each soil boring provides a relatively accurate surface profile to vertically orient all soil borings and monitoring wells for this investigation.

Table 4-6.
Relative Survey of Monitoring Wells and Soil Borings at LC-38.

Boring	Backsight to MW-001 ft	Foresight to Boring/Well ft	Calculation ft	Relative Elevation ft
3 February 2004				
MW-001 (brass marker)	8.95	NA	NA	1,000
TOC	8.95	6.38	8.95-6.38=+2.57	1,002.57
MW-002 (brass marker)	8.95	5.03	8.95-5.03=+3.92	1,003.92
TOC	8.95	2.61	8.95-2.61=+6.34	1,006.34
MW-003 (brass marker)	8.95	5.39	8.95-5.39=+3.56	1,003.56
TOC	8.95	3.00	8.95-3.00=+6.95	1,006.95
MW-004 (brass marker)	8.95	5.58	8.95-5.58=+3.37	1,003.37
TOC	8.95	3.22	8.95-3.22=+5.73	1,005.73
10 February 2004				
BH-01 (location estimated)	8.14	7.42	8.14-7.42=+0.72	1,000.72
BH-02 (location estimated)	8.14	8.44	8.14-8.44=-0.30	999.70
BH-03 (location estimated)	8.14	8.02	8.14-8.02=+0.12	1,000.12
SB-001	8.14	5.51	8.14-5.51=+2.36	1,002.36
SB-002	8.14	3.95	8.14-3.95=+4.19	1,004.19
SB-003	8.14	5.64	8.14-5.64=+2.5	1,002.50
SB-004	8.14	7.72	8.14-7.72=+0.42	1,000.42
SB-005	8.14	4.35	8.14-4.35=+3.79	1,003.79
SB-006	8.14	7.85	8.14-7.85=+0.29	1,000.29
SB-007	8.14	8.78	8.14-8.78=-0.64	999.36

4.1.5 Deviations from Work Plan

There were no significant deviations from the NMED approved work plan titled "*Work Plan for the RCRA Facility Investigation at the Launch Complex 38 Site on White Sands Missile Range.*" However, minor deviations were noted and are listed below.

- Laboratory reporting limits for TPH, VOCs, and SVOCs varied from those proposed in the work plan by limited amounts. In some instances, the actual reporting limits were slightly higher or slightly lower than those proposed.

- Additional TPH samples were collected in some zones of contamination along with the planned VOC and SVOC samples.
- MW-002, due to slow recharge and time considerations, was not developed to the extent specified in the work plan.
- Soil samples were not composited as outlined in the work plan. The majority of samples were collected directly from the split spoon and placed in sample jars to minimize volatile loss.
- Two monitoring wells (MW-001 and MW-004) were purged and sampled using a decontaminated submersible pump instead of bailing based on good recharge rates and amount of water required for purging.

4.2 Data Analysis

Soil samples for analysis of TPH, VOCs, and SVOCs were delivered by Federal Express to Laucks Testing Laboratories (940 South Harney Street; Seattle, Washington 98108). Groundwater samples for analysis of TPH, VOCs, SVOCs, physical characteristics, metals, dissolved chloride, dissolved sulfate, and alkalinity were signed over to a laboratory courier with Trace Analysis (6701 Aberdeen Avenue, Suite 9; Lubbock, Texas 79424) for shipment. All samples collected for the SWMU Assessment arrived at their respective laboratories in good condition and within temperature requirements (2° C to 6° C).

All chemical samples were extracted and analyzed within Environmental Protection Agency (EPA) maximum holding times for each analyte. Requirements for the soil/water sampling and analysis are included in Table 4-7.

Table 4-7.
Sample Containers, Test Methodologies, Hold Times, and Preservatives for Soils and Water.

Analytical Parameter	Analytical Method	Soil*		Groundwater		
		Container	Max. Hold Time	Container	Max. Hold Time	Preservative
Physical Characteristics Specific Conductivity Laboratory pH Total Dissolved Solids	EPA 120.1 EPA 150.1 EPA 160.1	NA	NA	1 liter Polyethyl.	7 days	4 °C
Dissolved Chloride	EPA 300.0	NA	NA	1 liter Polyehtyl.	28 days	4 °C
Dissolved Sulfate	EPA 300.0	NA	NA	1 liter Polyethyl.	28 days	4 °C
Alkalinity	SM 2320B	NA	NA	1 liter Polyethyl.	28 days	4 °C
Metals	SW 846 6010	NA	NA	1 liter Polyethyl.	180 days	HNO3 pH<2
VOCs	SW 846 8260	4 oz. Glass	14 days	3-40 ml Glass	14 days	HCl pH<2
SVOCs	SW 846 8270	4 oz. Glass	14 days	2-1 Liter Amber Glass	7 days extraction / 40 days analysis	4 °C
Total Petroleum Hydrocarbons - DRO	SW 846 8015B Modification	4 oz. Glass	14 days	3-40 ml Glass	14 days	HCL pH<2
Perchlorate	EPA 314.0	NA	NA	500 ml Polyethyl.	28 days	None

NA - Not applicable to this analysis
* preservation for all soil samples is chilling to and maintaining the sample at 4°C (39.2°)

4.2.1 Site Specific Geology

The geology of the LC-38 site is characterized by 5 major lithologic facies determined from the lithologic logging of cores from 7 soil borings across the LC-38 site. Figure 4-2 is a north-south cross-section showing interpreted lithology across the site. The lithologic facies are listed as follows: A) Clay Facies; B) Intermixed Facies; C) Clay Facies; D) Intermixed Facies; and E) Sand Facies.

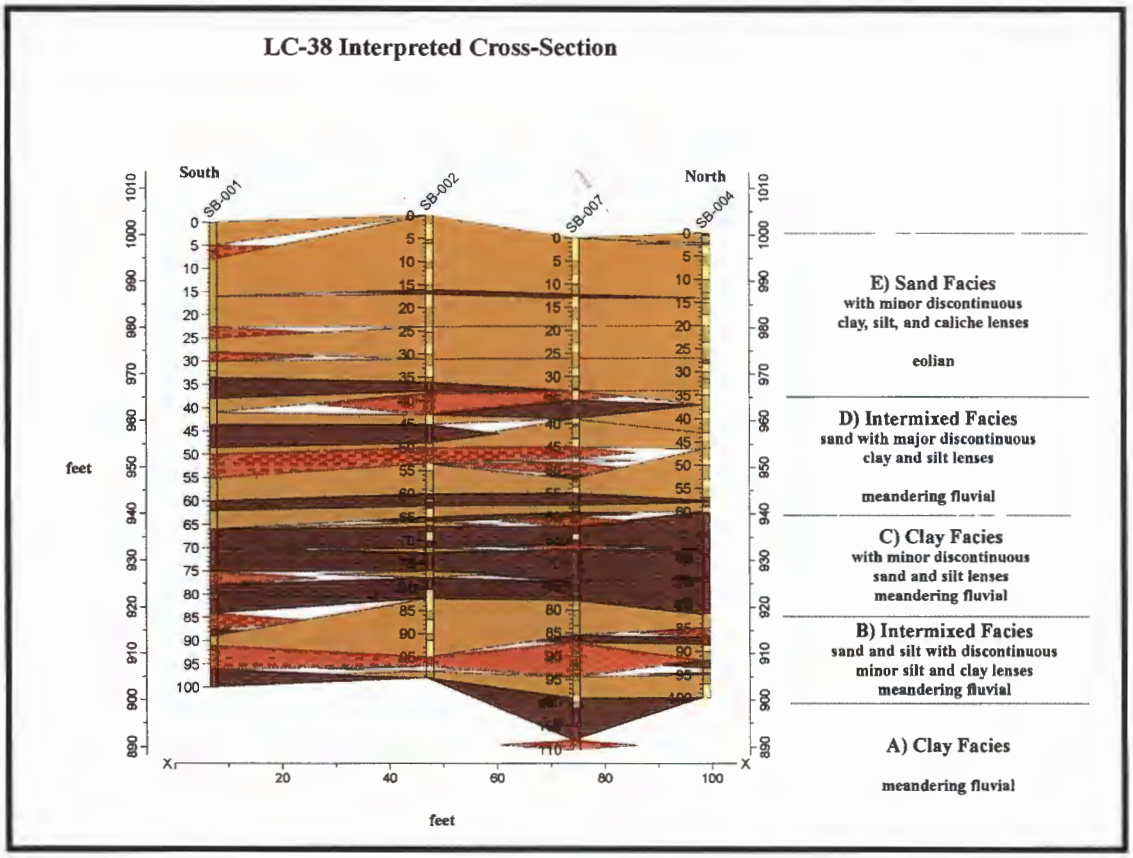


Figure 4-2. LC-38 Interpreted Cross-Section.

A) Clay Facies
The clay facies is located from approximately 100 ft to 110 ft bgs (maximum depth augered) and consists of a lean, hard, dry clay. Minor discontinuous silt lenses are evident in this facies. The depositional environment is likely a meandering fluvial system. The clay was potentially deposited as oxbow lake deposits or back flood plain deposits from crevasse splay during flood stage.

B) Intermixed Facies
The intermixed facies, from approximately 82 ft to 100 ft bgs, consists of well-sorted fine-grained sand and silt layers with minor discontinuous silt and clay lenses. The depositional environment is likely that of a meandering fluvial system. The fine-grained sands were likely deposited as either point bar deposits within the stream or more likely as

overbank deposits close to the stream. The silts and clay deposits likely represent finer overbank sediments deposited increasingly farther away from the fluvial source. The vertically intermixed nature of the sands, silts, and clays shows the meandering nature of the fluvial system over time.

C) Clay Facies
The clay facies, from approximately 60 ft to 82 ft bgs, consists of a lean, hard, dry clay with very minor well-sorted, fine-grained sand and silt lenses. The clay was potentially deposited as oxbow lake deposits or back flood plain deposits from crevasse splay during flood stage.

D) Intermixed Facies
This intermixed facies, from approximately 33 ft to 60 ft bgs, consists of well-sorted fine-grained sand deposits with major discontinuous silt and clay lenses. As described in the intermixed facies above, this facies is likely the result of a meandering fluvial system.

E) Sand Facies
The sand facies, from the surface to approximately 33 ft bgs, is dominated by well-sorted, fine-grained quartzose sand. Minor medium-grained sands and trace silt are present in this unit. Very minor discontinuous silt, clay, and caliche lenses are present. This facies likely shows the transition from fluvial deposition to eolian deposition.

4.2.2 Site Specific Hydrogeology

Prior to sampling monitoring wells, the water level was measured to the nearest 0.01 ft with an electronic water level indicator. Water levels in the monitoring wells were measured from a mark at the top of the casing (north side of the casing). The water level indicator probe was decontaminated prior to and after use by rinsing with water meeting requirements of ASTM Type II reagent water. Table 4-8 lists all depth to water measurements including surveyed (relative) elevation of brass cap and top of casing. A three-point problem, indicating ground-water flow direction, has been completed and overlays the LC-38 monitoring wells on Figure 4-3 (on following page). Based on the January 2004 depth to water (DTW) measurements and ground-water elevation, the ground-water flow direction is to S45°E. The ground-water gradient across the site is calculated to be 0.001.

Table 4-8. Depth to Water Measurements.

Well I.D.	TOC Elevation (Relative) ft	Brass Cap Elevation (Relative) ft	LOC ft	DTW from TOC (January 2004) ft	DTW BGS (January 2004) ft	Groundwater Elevation (Relative) (January 2004) ft
MW-001	1,002.57	1,000	2.57	235.14	232.57	767.43
MW-002	1,006.34	1,003.92	2.42	239.50	237.08	766.84
MW-003	1,006.95	1,003.56	2.39	239.18	236.79	766.77
MW-004	1,005.73	1,003.37	2.36	238.90	236.54	766.83

TOC Top of Casing.
DTW Depth to Water.
LOC Length of Casing.

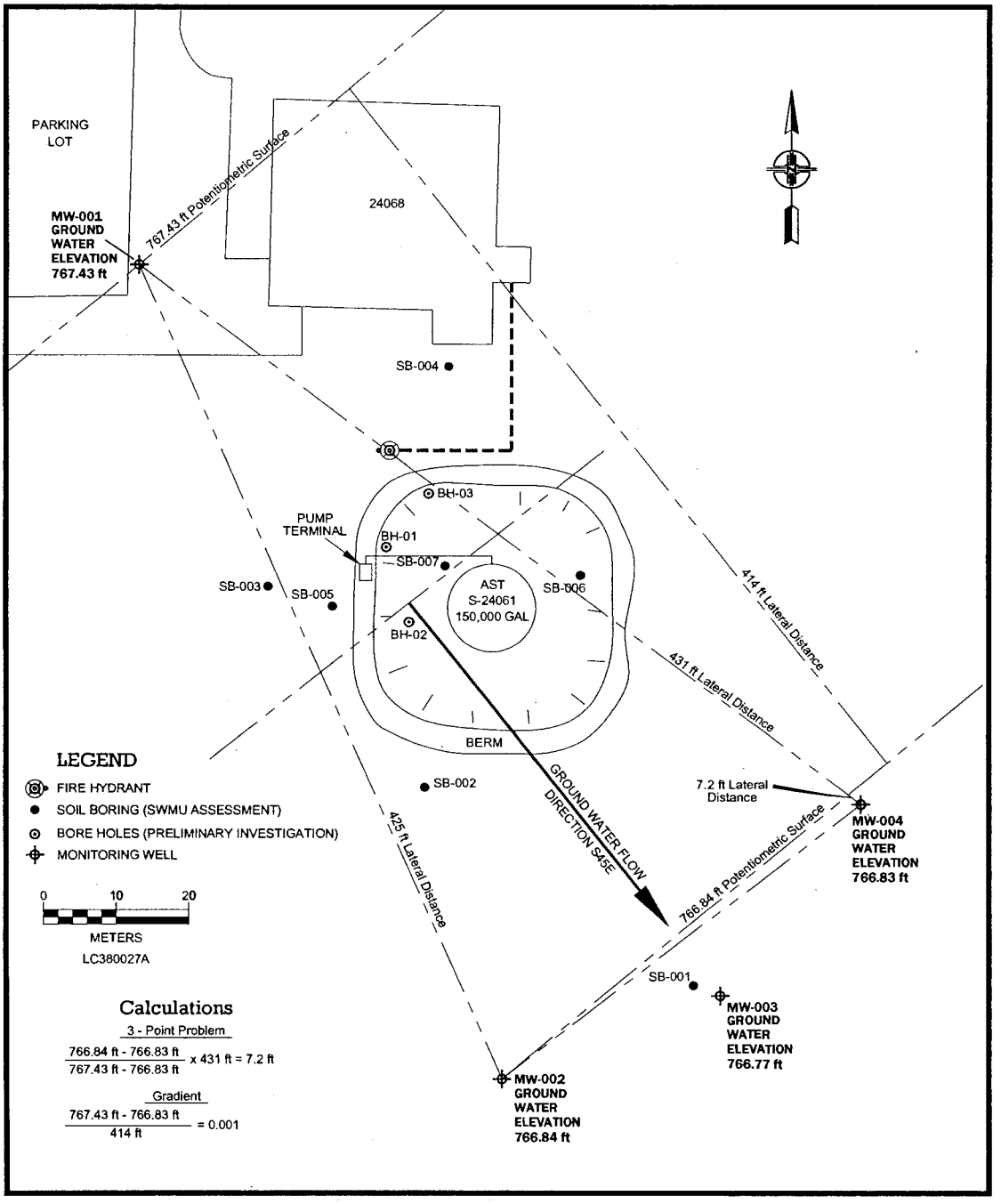


Figure 4-3. Ground Water Flow Direction (three-point problem).

4.2.3 Soil Data Chemical Analysis

Laboratory analytical results for the soil sample collection and analysis for VOCs and SVOCs are included in Appendix D. Results are tabulated (detects and non-detects) and compared to each analytes NMED Soil Screening Level (SSL) or NMED TPH Screening Guideline. TPH DRO results are shown in Table 4-9 (on following page). For analytes having no NMED SSL, an EPA Human Health Screening Level is used. A discussion of contaminant detections follows in this section. Nature and extent of contamination is discussed in Section 4.3.

Table 4-9. SWMU Assessment TPH DRO.

Sample Identification November 2003	Oil Range Organics mg/kg		Diesel Range Organics mg/kg	
NMED Screening Level			880	
LC38-DSPL-SB-001-84.0-84.5	110	U	27	
LC38-DSPL-SB-001-99.0-99.5	120	U	29	U
LC38-DSPL-SB-002-6.0	110	U	28	U
LC38-DSPL-SB-002-17.0	120	U	31	U
LC38-DSPL-SB-002-27.0-27.5	100	U	26	U
LC38-DSPL-SB-002-39.5-40.0	110	U	28	U
LC38-DSPL-SB-102-39.5-40.0	110	U	28	U
LC38-DSPL-SB-002-49.5-50.0	120	U	31	U
LC38-DSPL-SB-002-59.5-60.0	110	U	27	U
LC38DSPLSB-002-65.7-66.8	740		110000	D
LC38-DSPL-SB-002-70.0-70.5	120	U	31	U
LC38-DSPL-SB-102-70.0-70.5	120	U	31	U
LC38-DSPL-SB-002-74.5-75.0	120	U	30	U
LC38-DSPL-SB-002-78.0-78.5	110	U	27	U
LC38-DSPL-SB-002-86.5-87.0	110	U	140	
LC38-DSPL-SB-002-91.0-91.5	100	U	26	U
LC38-DSPL-SB-002-95.0-95.5	100	U	26	U
LC38-DSPL-SB-002-99.0-99.5	110	U	26	U
LC38-DSPL-SB-003-1.5-1.8	100	U	26	U
LC38-DSPL-SB-003-10.0-10.5	120	U	30	U
LC38-DSPL-SB-003-20.0-20.5	120	U	29	U
LC38-DSPL-SB-003-30.0-30.5	110	U	27	U
LC38-DSPL-SB-003-40.0-40.5	110	U	29	U
LC38-DSPL-SB-003-50.0-50.5	100	U	26	U
LC38-DSPL-SB-003-60.0-60.5	120	U	30	U
LC38DSPL-SB-003-66.-66.5	2800	U	110000	D
LC38-DSPL-SB-003-67.0-67.5	120	U	170	
LC38-DSPL-SB-003-78.0-78.5	120	U	76	
LC38-DSPL-SB-003-84.0-84.5	110	U	28	U
LC38-DSPL-SB-003-88.0-88.5	110	U	28	U
LC38-DSPL-SB-003-94.0-94.5	110	U	28	U
LC38-DSPL-SB-003-98.5-99.0	110	U	27	U
LC38-DSPL-SB-004-6.0-6.5	110	U	59	
LC38-DSPL-SB-004-14.0-14.2	110	U	28	U
LC38-DSPL-SB-004-20.0-20.5	110	U	27	U
LC38-DSPL-SB-004-30.0-30.5	110	U	26	U
LC38-DSPL-SB-004-40.0-40.5	110	U	27	U
LC38-DSPL-SB-104-40.0-40.5	110	U	27	U
LC38-DSPL-SB-004-50.0-50.5	110	U	27	U
LC38DSPLSB-004-63.3-63.8	1100	U	38000	D
LC38-DSPL-SB-004-64.0	120	U	1900	
LC38-DSPL-SB-004-68.0-68.5	120	U	31	U
LC38-DSPL-SB-004-69.2	110	U	39	
LC38-DSPL-SB-004-75.0	120	U	29	U
LC38-DSPL-SB-004-80.0-80.5	120	U	30	U
LC38-DSPL-SB-104-80.0-80.5	120	U	30	U
LC38-DSPL-SB-004-84.0-85.0	110	U	27	U
LC38-DSPL-SB-004-90.0	120	U	31	U
LC38-DSPL-SB-004-95.0	110	U	28	U
LC38-DSPL-SB-004-96.5-97.0	110	U	28	U
LC38-DSPL-SB-005-8.5-9.0	110	U	27	U

Sample Identification November 2003	Oil Range Organics mg/kg		Diesel Range Organics mg/kg	
LC38-DSPL-SB-005-20-20.5	100	U	26	U
LC38-DSPL-SB-005-30-30.5	100	U	26	U
LC38-DSPL-SB-005-40-40.5	110	U	28	U
LC38-DSPL-SB-005-49.5-50.5	110	U	26	U
LC38-DSPLSB-005-59.0-59.2	570	U	10000	D
LC38-DSPLSB-005-63.-63.5	530	U	26000	D
LC38-DSPL-SB-005-73.5-74	530	U	8400	D
LC38-DSPL-SB-005-77.5-77.8	110	U	100	
LC38-DSPL-SB-005-84.9-85.0	110	U	28	U
LC38-DSPL-SB-005-89.8-90.0	110	U	27	U
LC38-DSPL-SB-005-92.9-93.2	120	U	33	
LC38-DSPL-SB-005-97.5-97.7	100	U	26	U
LC38-DSPL-SB-005-103-103.2	110	U	26	U
LC38-DSPL-SB-005-108-108.5	120	U	29	U
LC38-DSPL-SB-105-108-108.5	120	U	29	U
LC38-DSPL-SB-006-7.0-7.3	100	U	26	U
LC38-DSPL-SB-006-20.0-20.5	110	U	26	U
LC38-DSPL-SB-006-30.0-30.5	100	U	26	U
LC38-DSPL-SB-006-39.0-39.5	120	U	30	U
LC38-DSPL-SB-006-50.0-50.5	110	U	27	U
LC38-DSPL-SB-006-59.5-60.0	100	U	26	U
LC38-DSPL-SB-006-69.5-70.0	130	U	32	U
LC38-DSPL-SB-006-79.5-80.0	120	U	30	U
LC38-DSPL-SB-006-89.5-90.0	110	U	27	U
LC38-DSPL-SB-106-89.5-90.0	110	U	27	U
LC38-DSPL-SB-006-99.0-99.5	110	U	26	U
LC38-DSPL-SB-007-10.0-10.5	110	U	27	
LC38-DSPL-SB-007-20-20.5	110	U	26	U
LC38-DSPL-SB-007-30.0-30.5	100	U	26	U
LC38-DSPL-SB-007-40.0-40.5	110	U	53	
LC38-DSPL-SB-007-50-50.5	110	U	37	
LC38-DSPL-SB-007-59-59.5	600	U	20000	D
LC38-DSPL-SB-007-61.3-62	3000	U	120000	D
LC38-DSPL-SB-007-62-62.5	120	U	1400	D
LC38-DSPL-SB-007-69.5-70.0	120	U	1000	
LC38-DSPL-SB-007-70-70.5	120	U	630	
LC38-DSPL-SB-007-79-79.5	110	U	29	U
LC38-DSPL-SB-007-83-83.3	110	U	27	U
LC38-DSPL-SB-007-84.5-85	110	U	27	U
LC38-DSPL-SB-007-89-89.3	110	U	27	U
LC38-DSPL-SB-007-97.0-97.3	100	U	25	U
LC38-DSPL-SB-007-103.3-103	120	U	29	U
LC38-DSPL-SB-107-103.3-103	120	U	29	U
LC38-DSPL-SB-007-108.5-108.8	120	U	30	U

U Not detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
D The sample was diluted by the laboratory.

4.2.3.1 SB-001

SB-001 is located approximately 240 ft southeast of the leak source. SB-001 was completed outside of the zone of soil contamination for the collection of geotechnical samples. Sample identification numbers for SB-001 and sample depth intervals are included in Table 4-1. Geotechnical samples were analyzed for TOC, % solids, soil pH, sieve, and hydrometer analysis.

Results for TOC and soil moisture are included in Table 4-10. Results for the sieve and hydrometer analysis are included in Appendix E. TOC, as a percentage of dry base, ranged from not detected to 0.3 %. Soil pH ranged from 7.4 to 9.1. Total solids ranged from 81.7 % to 97.9 % with total moisture ranging from a high of 19.3 % to a low of 2.1 %. Results from the geotechnical analysis may be used in the future for determination of potential remedial alternatives at the LC-38 diesel spill.

Table 4-10.
TOC, Soil pH and % Solids Results from SB-001 Soil Samples.

Sample Identification November 2003	Total Organic Carbon (%, dry base)		Total Solids %	Soil pH
LC38-DSPL-SB-001-4.5-5.0	0.2		93.5	7.4
LC38-DSPL-SB-001-9.0-10.0	0.1	U	97.9	8.1
LC38-DSPL-SB-001-19.0-19.5	0.1	U	91.9	8.7
LC38-DSPL-SB-001-22.0-23.0	0.1	U	95.1	8.8
LC38-DSPL-SB-001-29.0-30.0	0.2		89.9	8
LC38-DSPL-SB-001-34.0-35.0	0.3		91.2	8.3
LC38-DSPL-SB-001-39.0-40.0	0.2		93.2	7.7
LC38-DSPL-SB-001-49.0-50.0	0.1	U	92.2	8.2
LC38-DSPL-SB-001-59.0-60.0	0.1	U	97.3	9.2
LC38-DSPL-SB-001-69.0-70.0	0.2		81.7	8.7
LC38-DSPL-SB-001-75.0-77.0	0.2		92.1	9.1
LC38-DSPL-SB-001-79.0-80.0	0.2		90.2	9.1
LC38-DSPL-SB-001-89.0-90.0	0.1	U	96.2	8.7
LC38-DSPL-SB-001-96.5-97.5	0.2		86.3	8

U Analyte was not detected above the laboratory reporting limit.

Due to a PID detection of 1 to 2 ppm VOC measured during field screening, two TPH samples were collected from SB-001 that were not planned for in the approved work plan. One sample collected at 84.0 to 84.5 ft bgs had a minor detection of TPH at 27 mg/kg. The second sample collected at 99.0 to 99.5 ft bgs was not detected at a reporting limit of 29 mg/kg. The 27 mg/kg detection is so close to the laboratory reporting limit for TPH that the result is suspect. The NMED TPH Screening Guideline (for residential direct exposure) for diesel fuel #2 is 880 mg/kg.

4.2.3.2 SB-002

SB-002 is located approximately 114 ft south of the leak source. Sample identification numbers for SB-002 and sample depth intervals are included in Table 4-1. TPH results (Table 4-9) for this boring indicate non-detects from near surface down to approximately 65 ft bgs. The sample from the 65.7-66.8 ft interval had a TPH DRO concentration of 110,000 mg/kg, well above the screening guideline of 880 mg/kg. This interval corresponds to a well-sorted sand lens as interpreted from the soil boring lithologic log. There were no other TPH detections down hole to approximately 100 ft bgs, with the exception of the 86.5-87.0 ft interval. TPH was detected at 140 mg/kg at this depth.

VOC (Table D-1A and -1B) and SVOC (D-2A, -2B, and -2C) sample collection began at the 65.7-66.8 ft interval due to no field evidence for hydrocarbons above this interval. VOC analytical results, for the 65.7-66.8 ft interval, indicate detections of benzene, toluene, ethylbenzene, and xylenes (BTEX) at concentrations of 19,000 µg/kg (NMED SSL 1,900 µg/kg), 80,0000 µg/kg (NMED SSL 180,000 µg/kg), 76,000 µg/kg (NMED SSL 68,000 µg/kg), and 165,000 µg/kg (NMED SSL 63,000 µg/kg), respectively. The benzene, ethylbenzene, and xylenes detections exceeded their respective NMED SSLs. Low concentrations of VOCs were detected in a sample collected from the 70.0-70.5 ft interval. Additional VOC samples were collected at 74.5 ft and 78.0 ft with no detections of note.

SVOC detections mirrored the VOC analytical results. From the 65.7-66.7 ft sample, 2-methylnaphthalene, dibenzofuran, fluorene, naphthalene, and phenanthrene were detected at 320,000 µg/kg (NMED SSL not established), 55,000 µg/kg (NMED SSL 290,000 mg/kg), 87,000 µg/kg (NMED SSL 2,100,000 µg/kg), 69,000 µg/kg (NMED SSL 53,000 µg/kg), and 120,000 µg/kg (NMED SSL 1,800,000 µg/kg), respectively. Of the SVOCs detected, only naphthalene exceeded its NMED SSL.

4.2.3.3 SB-003

SB-003 is located approximately 65 ft west-southwest of the leak source. Sample identification numbers for SB-003 and sample depth intervals are included in Table 4-1. As in SB-002, TPH (Table 4-9) results for SB-003 indicate non-detects from near surface down to approximately 66 ft bgs. The sample from the 66.0-66.5 ft interval had a TPH DRO concentration of 110,000 mg/kg, well above the screening guideline of 880 mg/kg. This interval corresponds to a silty-sand lens as interpreted from the soil boring lithologic log. Minor TPH levels of 170 mg/kg and 76 mg/kg were detected in the 67.0 ft and 78.0 ft intervals. TPH was not detected deeper than the 78.0 ft interval.

VOC (Table D-1A and -1B) and SVOC (D-2A, -2B, and -2C) sample collection began at the 66.0-66.5 ft interval due to no field evidence for hydrocarbons above this interval. VOC analytical results, for this interval, indicate detections of BTEX at concentrations of 9,800 µg/kg (NMED SSL 1,900 µg/kg), 52,000 µg/kg (NMED SSL 180,000 µg/kg), 40,000 µg/kg (NMED SSL 68,000 µg/kg), and 86,000 µg/kg (NMED SSL 63,000 µg/kg), respectively. The benzene and xylenes detection exceeded their respective NMED SSLs. No VOCs were detected in the 67.0 ft interval. Significant concentrations of BTEX, though well below NMED SSLs, were detected in the 71.3-71.5 ft interval. VOCs were analyzed by not detected below this interval.

SVOC detections mirrored the VOC analytical results. From the 66.0-66.5 ft sample, 2-methylnaphthalene, dibenzofuran, fluorene, naphthalene, and phenanthrene were detected at 310,000 µg/kg (NMED SSL not established), 52,000 µg/kg (NMED SSL 290,000 mg/kg), 76,000 µg/kg (NMED SSL 2,100,000 µg/kg), 52,000 µg/kg (NMED SSL 53,000 µg/kg), and 110,000 µg/kg (NMED SSL 1,800,000 µg/kg), respectively. No SVOCs from this sample were detected above the NMED SSLs. Very low levels of SVOCs were detected at the 67.0 ft interval, but were flagged by the laboratory as being less than the laboratory reporting limit. As in the case of the VOCs for this sample, significant concentrations of SVOCs, though below NMED SSLs, were detected in the 71.3-71.5 ft interval. No significant detections of SVOCs were found below this depth in SB-003.

4.2.3.4 SB-004

SB-004 is located approximately 95 ft north-northeast of the leak source. Sample identification numbers for SB-004 and sample depth intervals are included in Table 4-1. TPH results (Table 4-9) for this boring indicate mostly non-detects from near surface down to approximately 65 ft bgs. An anomalous TPH detection of 59 mg/kg was detected at the 6.0 to 6.5 ft interval. The sample from the 63.3-63.8 ft interval had a TPH DRO concentration of 38,000 mg/kg, well above the screening guideline of 880 mg/kg. This interval corresponds to a well-sorted sand lens as interpreted from the soil boring lithologic log. The 64.0 ft interval had a TPH concentration of 1,900 mg/kg. There were no other TPH detections down hole to approximately 100 ft bgs, with the exception of the 69.2 ft interval. TPH was detected at 39 mg/kg at this depth.

VOC (Table D-1A and -1B) and SVOC (D-2A, -2B, and -2C) sample collection began at the 63.3-63.8 ft interval due to no field evidence for hydrocarbons above this interval. VOC analytical results, for this interval, indicate detections of BTEX at concentrations of 14,000 µg/kg (NMED SSL 1,900 µg/kg), 160,0000 µg/kg (NMED SSL 180,000 µg/kg), 160,000 µg/kg (NMED SSL 68,000 µg/kg), and 380,000 µg/kg (NMED SSL 63,000 µg/kg), respectively. The benzene, ethylbenzene, and xylenes detections exceeded their respective NMED SSLs. Additional VOC samples were collected below the 63.3-63.8 ft interval with no detections of note.

SVOC detections mirrored the VOC analytical results. From the 63.3-63.8 ft sample, 2-methylnaphthalene, dibenzofuran, fluorene, naphthalene, and phenanthrene were detected at 120,000 µg/kg (NMED SSL not established), 20,000 µg/kg (NMED SSL 290,000 mg/kg), 30,000 µg/kg (NMED SSL 2,100,000 µg/kg), 23,000 µg/kg (NMED SSL 53,000 µg/kg), and 42,000 µg/kg (NMED SSL 1,800,000 µg/kg), respectively. No SVOC from this interval exceeded its NMED SSL. No SVOCs of note were detected below the 64.0 ft interval.

4.2.3.5 SB-005

SB-005 is located approximately 40 ft southwest of the leak source. Sample identification numbers for SB-005 and sample depth intervals are included in Table 4-1. TPH results (Table 4-9) for this boring indicate non-detects from near surface down to approximately 59 ft bgs. The sample from the 59.0-59.2 ft interval had a TPH DRO concentration of 10,000 mg/kg, well above the screening guideline of 880 mg/kg. A TPH concentration of 26,000 mg/kg was detected in the sample from the 63.0-63.5 ft interval. The concentration of TPH at the 73.5-74.0 interval is 8,400 mg/kg. At 77.5 to 77.8 ft bgs, the TPH concentration is 100 mg/kg. There were no other TPH detections down hole to approximately 100 ft bgs, with the exception of the 92.9-93.2 ft interval. TPH was detected at 33 mg/kg at this depth. This detection is suspect based on its closeness to the laboratory reporting limit.

VOC (Table D-1A and -1B) and SVOC (D-2A, -2B, and -2C) sample collection began at the 49.5-50.5 ft interval due to no field indications for hydrocarbons above this interval. Due to a field indication of VOCs present at 49.5 ft and 53.5 ft bgs, VOC and SVOC samples were collected. No VOCs were reported by the laboratory for these two sample intervals. VOC analytical results, for the 59.0-59.2 ft interval, indicate detections of TEX at concentrations of

2,300 µg/kg (NMED SSL 180,000 µg/kg), 3,200 µg/kg (NMED SSL 68,000 µg/kg), and 7,200 µg/kg (NMED SSL 63,000 µg/kg), respectively. Significant VOC concentrations, though lower than applicable NMED SSLs, were detected in the samples collected from the 63.0 ft, 64.5 ft, 68.0 ft, and 73.5 ft intervals. Additional VOC samples were collected from the 77.5 ft, 92.9 ft, 97.5 ft, and 108.0 ft depth intervals with no VOC detections of note.

SVOC detections mirrored the VOC analytical results. From the 59.0-59.2 ft sample, 2-methylnaphthalene, dibenzofuran, fluorene, naphthalene, and phenanthrene were detected at 45,000 µg/kg (NMED SSL not established), 5,500 µg/kg (NMED SSL 290,000 mg/kg), 5,900 µg/kg (NMED SSL 2,100,000 µg/kg), 7,400 µg/kg (NMED SSL 53,000 µg/kg), and 16,000 µg/kg (NMED SSL 1,800,000 µg/kg), respectively. No SVOC exceeded its NMED SSL from this sample. Samples from the 63.0 ft, 64.5 ft, 68.0 ft, and 73.5 ft intervals had SVOC concentrations similar to the 59.0 ft interval. No SVOCs of note were detected below the 73.5 ft interval. Some SVOCs were reported below this depth by the laboratory but flagged as also detected in the sample blank indicating laboratory cross-contamination.

4.2.3.6 SB-006

SB-006 is located approximately 89 ft from the leak source. Sample identification numbers for SB-006 and sample depth intervals are included in Table 4-1. TPH (Table 4-9) was not detected in samples from this soil boring. One VOC (Table D-1A and -1B) and SVOC (D-2A, -2B, and -2C) sample was collected at the 99.0-99.5 ft interval to ensure no hydrocarbons could be detected in this boring. No hydrocarbons were identified using the field screening methods in SB-006. VOCs and SVOCs were not detected in the 99.0-99.5 ft interval.

4.2.3.7 SB-007

SB-007 is located approximately 27 ft from the leak source. Sample identification numbers for SB-007 and sample depth intervals are included in Table 4-1. Low concentrations of TPH (Table 4-9) were detected in samples from the 10.0 ft, 40.0 ft, and 50.0 ft intervals in SB-007. Detections in these intervals were 27 mg/kg, 53 mg/kg, and 37 mg/kg, respectively. A TPH concentration of 20,000 mg/kg was detected in the interval from 59.0-59.5 ft bgs. TPH increases to 120,000 mg/kg in the 61.3-62.0 ft interval. TPH concentrations decrease to 1,400 mg/kg, 1,000 mg/kg, and 630 mg/kg in the samples from the 62.0 ft, 69.5 ft, and 70.0 ft intervals, respectively. TPH was not detected below 70.5 ft in SB-007.

Based on PID readings for VOCs read in the field, samples for VOCs (Table D-1A and -1B) and SVOCs (D-2A, -2B, and -2C) were collected and analyzed from SB-007 every 5 ft down hole beginning at the 20 ft interval. No VOCs were detected until the 55.0 ft interval. Increasing levels of volatiles (BTEX) are present from the 55.0-55.5 interval to the 61.3-62.0 ft interval. BTEX concentrations in this interval are 16,000 µg/kg (NMED SSL 1,900 µg/kg), 76,000 µg/kg (NMED SSL 180,000 µg/kg), 53,000 µg/kg (NMED SSL 68,000 µg/kg), and 115,000 µg/kg (NMED SSL 63,000 µg/kg), respectively. The benzene and xylenes detections exceeded their respective NMED SSLs. Decreased concentrations of VOCs were detected from 62.0 ft bgs to 70.5 ft bgs. VOCs were not detected below this interval.

SVOC detections mirrored the VOC analytical results. Increasing levels of SVOCs are present from the 55.0-55.5 ft interval to the 61.3-62.0 ft interval. SVOC concentrations in this interval (61.3-62.0 ft) for 2-methylnaphthalene, dibenzofuran, fluorene, naphthalene, and phenanthrene were detected at 420,000 µg/kg (NMED SSL not established), 50,000 µg/kg (NMED SSL 290,000 mg/kg), 63,000 µg/kg (NMED SSL 2,100,000 µg/kg), 89,000 µg/kg (NMED SSL 53,000 µg/kg), and 140,000 µg/kg (NMED SSL 1,800,000 µg/kg), respectively. The concentration of naphthalene exceeded its NMED SSL. Decreased concentrations of SVOCs were detected from 62.0 ft bgs to 70.5 ft bgs. SVOCs were not detected below this interval.

4.2.4 Ground-Water Data Chemical Analysis

All ground-water samples were analyzed for the constituents listed in Table 4-7. Results for the January 2004 sampling event are tabulated in Tables 4-10, 4-11, and 4-12 as compared to their respective NMED Water Quality Control Commission (WQCC) Standards.

Various analytes (Table 4-11 on following page) including dissolved cadmium, TDS, chloride, and sulfate were detected above their respective WQCC Standards (detections shown in bold). These detections are likely representative of natural ground-water conditions at the site. With the exception of dissolved cadmium, all analytes exceeding the WQCC Standards were detected at similar concentrations in the up-gradient (MW-001) and down-gradient (MW-002 through MW-004) monitoring wells. Dissolved cadmium was detected only in MW-002.

Based on results from the TPH DRO (Table 4-11), VOC (Table 4-12), and SVOC (Table 4-13) sample analysis, there is no indication that diesel contamination has reached ground water. All samples collected from the monitoring wells were non-detect for TPH DRO and SVOCs. Two VOCs (bromodichloromethane and dibromochloromethane) were detected just above their respective laboratory reporting limits in MW-002. Bromodichloromethane was detected at 1.16 µg/l, above its laboratory reporting limit of 1 µg/l. Dibromochloromethane was detected at 1.57 µg/l, above its laboratory reporting limit of 1 µg/l. An NMED WQCC Standard has not been established for these analytes. Both of these VOCs are trihalomethanes and are likely formed as a by-product of chlorination of drinking water. Since these analytes were only detected in MW-002, it is reasonable to assume they are associated with the potable water used during development of the well. An EPA Maximum Contaminant Level (MCL) for drinking water has been established for total trihalomethanes at 80 µg/l. As described in section 4.1.2.1, well development of MW-002 may not have removed all potable water used. No VOCs were detected in the remaining monitoring wells.

4.3 Nature and Extent of Contamination

As discussed in Section 3.0, the preliminary sampling event was conducted in February 2001 and consisted of the completion and sampling of three soil borings, shown as BH-01, BH-02, and BH-03 on Figure 4-1. The three soil borings were completed on a north-south axis near to the source leak (BH-01 was closest to source leak shown in Photograph 2-2). Due to only three borings completed in February 2001, a complete lateral extent of contamination was not determined. An additional 7 borings were planned and completed for the November 2003 event (SWMU Assessment) to further characterize the extent of contamination.

Table 4-11.
LC-38 Ground-Water Sample Results for Metals, Alkalinity, Physical Characteristics, Anions, Perchlorate, and TPH DRO.

Analyte mg/l January 2004	Method	WQCC Standard	LC38- DSPL-MW-001-0104	LC38- DSPL-MW-002-0104	LC38-DSPL-MW-003-0104	LC38-DSPL-MW-103-0104	LC38-DSPL-MW-004-0104
Metals							
Dissolved Silver	S 6010B	0.05	<0.013	<0.013	<0.013	<0.013	<0.013
Total Silver	S 6010B	NE	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125
Dissolved Arsenic	S 6010B	0.1	<0.01	<0.01	<0.01	<0.01	<0.01
Total Arsenic	S 6010B	NE	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Barium	S 6010B	1.0	<0.1	<0.1	<0.1	<0.1	<0.1
Total Barium	S 6010B	NE	<0.1	0.134	<0.1	<0.1	<0.1
Dissolved Cadmium	S 6010B	0.01	<0.025	**0.338**	<0.025	<0.025	<0.025
Total Cadmium	S 6010B	NE	<0.005	0.59	<0.005	<0.005	<0.005
Dissolved Chromium	S 6010B	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Total Chromium	S 6010B	NE	0.011	1.76	0.19	0.206	0.037
Dissolved Lead	S 6010B	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Total Lead	S 6010B	NE	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Selenium	S 6010B	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Selenium	S 6010B	NE	<0.05	<0.05	<0.05	<0.05	<0.05
Dissolved Mercury	S 7470A	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Mercury	S 7470A	NE	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Alkalinity							
Bicarbonate Alkalinity	SM 2320B	NE	102	96	100	96	104
Carbonate Alkalinity	SM 2320B	NE	<1	<1	<1	<1	<1
Hydroxide Alkalinity	SM 2320B	NE	<1	<1	<1	<1	<1
Total Alkalinity	SM 2320B	NE	102	96	100	96	104
Physical Characteristics							
Specific Conductance (µmhos/cm)	SM 2510B	NE	11900	6120	10300	10300	11400
Total Dissolved Solids	SM 2540C	1,000	**8700**	**4710**	**7840**	**7730**	**8370**
pH (s.u.)	SM 4500-H+	6-9	7.6	7.5	7.5	7.6	7.6
Anions							
Chloride	E 300.0	250	**2500**	**765**	**1950**	**2070**	**2590**
Sulfate	E 300.0	600	**2910**	**2300**	**3080**	**3120**	**3200**
Ammonium Perchlorate (µg/l)	E 314.0	NE	<3.54	6.4	4.17	3.18	<3.54
Total Petroleum Hydrocarbons - DRO	Mod. 8015B	NE	<5	<5	<5	<5	<5

< Less than the indicated laboratory reporting limit.
NE Not Established.
bold Contaminant concentrations is above the NMED WQCC Standard.

Table 4-12. LC-38 Ground-Water Sample Results for VOCs.

Analyte Method 8260 VOC µg/l January 2004	WQCC Standard	LC38- DSPL-MW-001-0104	LC38-DSPL-MW-002-0104	LC38-DSPL-MW-003-0104	LC38-DSPL-MW-103-0104	LC38-DSPL-MW-004-0104
1,1,1,2-Tetrachloroethane	NE	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	0.06	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	0.01	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	0.01	<1	<1	<1	<1	<1
1,1-Dichloroethane	0.025	<1	<1	<1	<1	<1
1,1-Dichloroethene	0.005	<1	<1	<1	<1	<1
1,1-Dichloropropene	NE	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	NE	<5	<5	<5	<5	<5
1,2,3-Trichloropropane	NE	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	NE	<5	<5	<5	<5	<5
1,2,4-Trimethylbenzene	NE	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	NE	<5	<5	<5	<5	<5
1,2-Dibromoethane (EDB)	0.0001	<1	<1	<1	<1	<1
1,2-Dichlorobenzene (ortho)	NE	<1	<1	<1	<1	<1
1,2-Dichloroethane (EDC)	0.01	<1	<1	<1	<1	<1
1,2-Dichloropropane	NE	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	NE	<1	<1	<1	<1	<1
1,3-Dichlorobenzene (meta)	NE	<1	<1	<1	<1	<1
1,3-Dichloropropane	NE	<1	<1	<1	<1	<1
1,4-Dichlorobenzene (para)	NE	<1	<1	<1	<1	<1
2,2-Dichloropropane	NE	<1	<1	<1	<1	<1
2-Butanone (MEK)	NE	<5	<5	<5	<5	<5
2-Chloroethyl vinyl ether	NE	<5	<5	<5	<5	<5
2-Chlorotoluene	NE	<1	<1	<1	<1	<1
2-Hexanone	NE	<5	<5	<5	<5	<5
4-Chlorotoluene	NE	<1	<1	<1	<1	<1
4-Methyl-2-pentanone (MIBK)	NE	<5	<5	<5	<5	<5
Acetone	NE	<10	<10	<10	<10	<10
Acrylonitrile	NE	<1	<1	<1	<1	<1
Benzene	0.01	<1	<1	<1	<1	<1
Bromobenzene	NE	<1	<1	<1	<1	<1
Bromochloromethane	NE	<1	<1	<1	<1	<1
Bromodichloromethane	NE	<1	1.16	<1	<1	<1
Bromoform	NE	<1	<1	<1	<1	<1
Bromomethane (methyl bromide)	NE	<5	<5	<5	<5	<5
Carbon Disulfide	NE	<1	<1	<1	<1	<1
Carbon Tetrachloride	0.01	<1	<1	<1	<1	<1

Analyte Method 8260 VOC µg/l January 2004	WQCC Standard	LC38- DSPL-MW-001-0104	LC38-DSPL-MW-002-0104	LC38-DSPL-MW-003-0104	LC38-DSPL-MW-103-0104	LC38-DSPL-MW-004-0104
Chlorobenzene	NE	<1	<1	<1	<1	<1
Chloroethane	NE	<1	<1	<1	<1	<1
Chloroform	0.1	<1	<1	<1	<1	<1
Chloromethane (methyl chloride)	NE	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	NE	<1	<1	<1	<1	<1
Dibromochloromethane	NE	<1	1.57	<1	<1	<1
Dibromomethane (methylene bromide)	NE	<1	<1	<1	<1	<1
Dichlorodifluoromethane		<1	<1	<1	<1	<1
Ethylbenzene	0.75	<1	<1	<1	<1	<1
Hexachlorobutadiene	NE	<5	<5	<5	<5	<5
Iodomethane (methyl iodide)	NE	<5	<5	<5	<5	<5
Isopropylbenzene	NE	<1	<1	<1	<1	<1
m,p-Xylene	0.62*	<1	<1	<1	<1	<1
Methylene chloride	0.1	<5	<5	<5	<5	<5
MTBE	0.1	<1	<1	<1	<1	<1
Naphthalene	NE	<5	<5	<5	<5	<5
n-Butylbenzene	NE	<1	<1	<1	<1	<1
n-Propylbenzene	NE	<1	<1	<1	<1	<1
o-Xylene	0.62*	<1	<1	<1	<1	<1
p-Isopropyltoluene	NE	<1	<1	<1	<1	<1
sec-Butylbenzene	NE	<1	<1	<1	<1	<1
Styrene	NE	<1	<1	<1	<1	<1
tert-Butylbenzene	NE	<1	<1	<1	<1	<1
Tetrachloroethene (PCE)	0.02	<1	<1	<1	<1	<1
Toluene	0.75	<1	<1	<1	<1	<1
trans 1,4-Dichloro-2-butene	NE	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	NE	<1	<1	<1	<1	<1
trans-1,3-Dichloropropene	NE	<1	<1	<1	<1	<1
Trichloroethene (TCE)	0.1	<1	<1	<1	<1	<1
Trichlorofluoromethane	NE	<1	<1	<1	<1	<1
Vinyl Chloride	0.001	<1	<1	<1	<1	<1

< Less than the indicated laboratory reporting limit.
NE Not Established.
* Standard is for total Xylenes.

Table 4-13. LC-38 Ground-Water Sample Results for SVOCs.

Analyte Method 8270 SVOC mg/l January 2004	LC38-DSPL-MW-001-0104	LC38-DSPL-MW-002-0104	LC38-DSPL-MW-003-0104	LC38-DSPL-MW-103-0104	LC38-DSPL-MW-004-0104
1,2,4,5-Tetrachlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005
1,2,4-Trichlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichlorobenzene (ortho)	<0.005	<0.005	<0.005	<0.005	<0.005
1,3-Dichlorobenzene (meta)	<0.005	<0.005	<0.005	<0.005	<0.005
1,4-Dichlorobenzene (para)	<0.005	<0.005	<0.005	<0.005	<0.005
1-Chloronaphthalene	<0.005	<0.005	<0.005	<0.005	<0.005
1-Methylnaphthalene	<0.005	<0.005	<0.005	<0.005	<0.005
1-Naphthylamine	<0.005	<0.005	<0.005	<0.005	<0.005
2,3,4,6-Tetrachlorophenol	<0.005	<0.005	<0.005	<0.005	<0.005
2,4,5-Trichlorophenol	<0.005	<0.005	<0.005	<0.005	<0.005
2,4,6-Trichlorophenol	<0.005	<0.005	<0.005	<0.005	<0.005
2,4-Dichlorophenol	<0.005	<0.005	<0.005	<0.005	<0.005
2,4-Dimethylphenol	<0.005	<0.005	<0.005	<0.005	<0.005
2,4-Dinitrophenol	<0.02	<0.02	<0.02	<0.02	<0.02
2,4-Dinitrotoluene	<0.005	<0.005	<0.005	<0.005	<0.005
2,6-Dichlorophenol	<0.005	<0.005	<0.005	<0.005	<0.005
2,6-Dinitrotoluene	<0.005	<0.005	<0.005	<0.005	<0.005
2-Chloronaphthalene	<0.005	<0.005	<0.005	<0.005	<0.005
2-Chlorophenol	<0.005	<0.005	<0.005	<0.005	<0.005
2-Methylnaphthalene	<0.005	<0.005	<0.005	<0.005	<0.005
2-Methylphenol	<0.005	<0.005	<0.005	<0.005	<0.005
2-Naphthylamine	<0.005	<0.005	<0.005	<0.005	<0.005
2-Nitroaniline	<0.005	<0.005	<0.005	<0.005	<0.005
2-Nitrophenol	<0.005	<0.005	<0.005	<0.005	<0.005
2-Picoline	<0.005	<0.005	<0.005	<0.005	<0.005
3,3-Dichlorobenzidine	<0.005	<0.005	<0.005	<0.005	<0.005
3-Methylcholanthrene	<0.005	<0.005	<0.005	<0.005	<0.005
3-Nitroaniline	<0.005	<0.005	<0.005	<0.005	<0.005
4,6-Dinitro-2-methylphenol	<0.005	<0.005	<0.005	<0.005	<0.005
4-Aminobiphenyl	<0.005	<0.005	<0.005	<0.005	<0.005
4-Bromophenyl-phenylether	<0.005	<0.005	<0.005	<0.005	<0.005
4-Chloro-3-methylphenol	<0.005	<0.005	<0.005	<0.005	<0.005
4-Chloroaniline	<0.005	<0.005	<0.005	<0.005	<0.005
4-Chlorophenyl-phenylether	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methylphenol / 3-Methylphenol	<0.005	<0.005	<0.005	<0.005	<0.005
4-Nitroaniline	<0.005	<0.005	<0.005	<0.005	<0.005
4-Nitrophenol	<0.005	<0.005	<0.005	<0.005	<0.005
7,12-Dimethylbenz(a)anthracene	<0.005	<0.005	<0.005	<0.005	<0.005
a,a-Dimethylphenethylamine	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthene	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	<0.005	<0.005	<0.005	<0.005	<0.005
Acetophenone	<0.005	<0.005	<0.005	<0.005	<0.005
Aniline	<0.005	<0.005	<0.005	<0.005	<0.005
Anthracene	<0.005	<0.005	<0.005	<0.005	<0.005
Benzidine	<0.015	<0.015	<0.015	<0.015	<0.015
Benzo(a)anthracene	<0.005	<0.005	<0.005	<0.005	<0.005

Analyte Method 8270 SVOC mg/l January 2004	LC38-DSPL-MW-001-0104	LC38-DSPL-MW-002-0104	LC38-DSPL-MW-003-0104	LC38-DSPL-MW-103-0104	LC38-DSPL-MW-004-0104
Benzo(a)pyrene	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(b)fluoranthene	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(g,h,i)perylene	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(k)fluoranthene	<0.005	<0.005	<0.005	<0.005	<0.005
Benzoic acid	<0.02	<0.02	<0.02	<0.02	<0.02
Benzyl alcohol	<0.005	<0.005	<0.005	<0.005	<0.005
bis(2-chloroethoxy)methane	<0.005	<0.005	<0.005	<0.005	<0.005
bis(2-chloroethyl)ether	<0.005	<0.005	<0.005	<0.005	<0.005
bis(2-chloroisopropyl)ether	<0.005	<0.005	<0.005	<0.005	<0.005
bis(2-ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01	<0.01
Butylbenzylphthalate	<0.005	<0.005	<0.005	<0.005	<0.005
Chrysene	<0.005	<0.005	<0.005	<0.005	<0.005
Dibenzo(a,h)anthracene	<0.005	<0.005	<0.005	<0.005	<0.005
Dibenzo(a,j)acridine	<0.005	<0.005	<0.005	<0.005	<0.005
Dibenzofuran	<0.005	<0.005	<0.005	<0.005	<0.005
Diethylphthalate	<0.005	<0.005	<0.005	<0.005	<0.005
Dimethylphthalate	<0.005	<0.005	<0.005	<0.005	<0.005
Di-n-butylphthalate	<0.005	<0.005	<0.005	<0.005	<0.005
Di-n-octylphthalate	<0.005	<0.005	<0.005	<0.005	<0.005
Diphenylamine	<0.005	<0.005	<0.005	<0.005	<0.005
Diphenylhydrazine	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl methanesulfonate	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	<0.005	<0.005	<0.005	<0.005	<0.005
Fluorene	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorocyclopentadiene	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachloroethane	<0.005	<0.005	<0.005	<0.005	<0.005
Indeno(1,2,3-cd)pyrene	<0.005	<0.005	<0.005	<0.005	<0.005
Isophorone	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl methanesulfonate	<0.005	<0.005	<0.005	<0.005	<0.005
Naphthalene	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrobenzene	<0.005	<0.005	<0.005	<0.005	<0.005
n-Nitrosodimethylamine	<0.005	<0.005	<0.005	<0.005	<0.005
n-Nitroso-di-n-butylamine	<0.005	<0.005	<0.005	<0.005	<0.005
n-Nitrosodi-n-propylamine	<0.005	<0.005	<0.005	<0.005	<0.005
n-Nitrosopiperidine	<0.005	<0.005	<0.005	<0.005	<0.005
p-Dimethylaminoazobenzene	<0.005	<0.005	<0.005	<0.005	<0.005
Pentachlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005
Pentachloronitrobenzene	<0.005	<0.005	<0.005	<0.005	<0.005
Pentachlorophenol	<0.005	<0.005	<0.005	<0.005	<0.005
Phenacetin	<0.005	<0.005	<0.005	<0.005	<0.005
Phenanthrene	<0.005	<0.005	<0.005	<0.005	<0.005
Phenol	<0.005	<0.005	<0.005	<0.005	<0.005
Pronamide	<0.005	<0.005	<0.005	<0.005	<0.005
Pyrene	<0.005	<0.005	<0.005	<0.005	<0.005
Pyridine	<0.005	<0.005	<0.005	<0.005	<0.005

< Less than the indicated laboratory reporting limit.

The SWMU Assessment sampling event, conducted in November 2003, consisted of the completion and sampling of seven soil borings, shown as SB-001 through SB-007 on Figure 4-1. SB-002 through SB-007 were completed on a north-south and east-west axis out from 27 ft to over 100 ft from the leak source.

Contaminant detects/non-detects from the February 2001 preliminary sampling event were tabulated and are presented in Appendix A. Samples from this event were collected for TPH (Table A-1) in soil borings BH-01, BH-02, and BH-03 approximately every 5 to 10 ft down the boreholes at the discretion of the sampling team. Additional samples were collected at various depths and analyzed for VOCs (Table A-2), SVOCs (Table A-3), PAHs (Table A-4), and RCRA metals (Table A-5). The bulk of this sampling effort concentrated on TPH concentrations only. Few VOC, SVOC, PAH, and RCRA metals samples were collected.

Contaminant detects/non-detects from the November 2003 SWMU Assessment sampling event were tabulated and are presented in Appendix D. Samples from this event were collected for TPH (Table 4-9), VOCs (Tables D-1A and D-1B), and SVOCs (Tables D-2A, D-2B, and D-2C). The bulk of this sampling effort concentrated on TPH sample collection. Samples for TPH were collected approximately every 10 ft down the boreholes as outlined in the workplan. If any field evidence of contamination was detected at the time of sample collection, the sampling interval changed to sample collection every 5 ft until outside of visible contamination. For intervals with visible contamination, VOC and SVOC samples were collected.

Additionally, for determination if contamination has reached ground water, four monitoring wells (1 up-gradient and 3 down-gradient) were completed in November 2003 and sampled in January 2004. The up-gradient well was placed to the northwest of the diesel spill while the three down-gradient wells were placed approximately 200 ft to the south-southeast, southeast, and east-south east of the spill. The wells were placed as proposed in the approved work plan based on calculations of regional ground-water flow to the southeast. This pattern was chosen to ensure that any potential ground-water contamination would be captured if minor variations in ground-water flow at the LC-38 site was present.

4.3.1 Extent of Contamination in Soils

Assessment of extent of contamination at the LC-38 diesel spill site is based on the two sampling events discussed previously.

4.3.1.1 February 2001 Preliminary Sampling Data Analysis

Table A-1 lists TPH results for the February 2001 sampling event. TPH was detected in all collected samples. BH-01 had the widest depth range of TPH detections. TPH was detected at 9.5 ft below ground surface at 14,000 ppm. The highest detection for TPH was 49,000 ppm at the 64.0-65.0 ft interval. The trend in BH-01 shows relatively high concentrations of TPH from the 9.5 ft interval down to 70.5 ft bgs. Below this interval, TPH concentrations taper off to less than 10 ppm detections.

Similar TPH detections in BH-02 (30 ft south of BH-01) are not detected until the 57.0 to 57.5 ft interval. However, concentrations less than 50 ppm were detected from 4.5 ft interval bgs to the 57 ft interval. The highest detection in BH-02 was 26,000 ppm at the 59.5 ft to 60.0 ft interval. Below this interval, concentrations taper off to less than 10 ppm after the 70.0 ft depth.

BH-03 (25 ft northeast of BH-01) showed a similar TPH trend to BH-02. Concentrations less than 20 ppm were reported from 4.5 ft to 40.0 ft bgs. Below this interval, TPH concentrations increased to 5,200 ppm at 45 ft bgs and to 70,000 ppm at the 67.5 ft interval. Below the 67.5 ft interval, TPH concentrations abruptly reduce to less than 60 ppm concentrations.

VOC results are included in Table A-2. 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, toluene, and total xylene were detected in BH-01 at the 5.0 ft to 5.5 ft and 49.5 ft to 50.0 ft bgs intervals, in BH-02 at the 62.3 ft to 62.7 ft interval, and in BH-03 at the 64.5 ft to 64.9 ft interval. These were the only VOC samples collected during this sampling event. The VOC detection intervals match intervals of high TPH concentrations.

SVOC (Table A-3) and PAH (Table A-4) detections, including 2-Methylnaphthalene, dibenzofuran, phenanthrene, naphthalene, and pyrene, similarly match depth intervals of highest TPH detections. These compounds are common components of diesel fuel. Samples for SVOCs and the reduced PAH list were only collected where field indication of diesel contamination was present. Like VOCs, these results are biased to known areas of contamination.

Four samples for RCRA metals (Table A-5) were collected during this sampling event. All metals except cadmium were detected. Arsenic, chromium, and lead were slightly elevated at the 65.0 ft interval in BH-02.

Analytical results (mainly TPH) and visual observation show that BH-01 was located close to the leak source. Diesel fuel migrated downward through the sands at the leak until it began to fan out laterally 30 ft from the source at approximately 45 ft bgs. Data from this sampling event indicate that the bulk of the diesel fuel contamination is resting in the interval from 57 ft bgs to 67.5 ft bgs. The deepest reliable detection for TPH from this event was at the 75.0 ft bgs depth in BH-03. TPH was detected in this interval at 56 ppm.

4.3.1.2 November 2003 SWMU Assessment Data Analysis

Table 6 lists TPH results for the November 2003 sampling event. The TPH detection pattern for all soil borings from this sampling event show TPH concentrations in the 10,000 ppm to 100,000 ppm range in the 60 ft to 65 ft bgs depth interval. TPH samples were collected from the surface every 10 ft down to this interval. Above this interval no appreciable concentrations of TPH were detected.

VOC analytical results from November 2003 are included in Tables D-1A and D-1B in Appendix D. Samples for VOCs were collected every 5 ft in zones where diesel contamination was evident using field screening methods. Results indicate that the volatiles, including BTEX, were detected in some of the collected samples. The highest concentrations of these analytes were concentrated in the 60 ft to 65 ft interval, which corresponds to the interval with the highest TPH concentrations.

Tables D-2A, D-2B, and D-2C in Appendix D include results from the November 2003 sampling event for SVOCs. SVOCs were sampled every 5 ft in zones where diesel contamination was evident from field screening methods. Results indicate that semi-volatiles including 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, dibenzofuran, fluorene, naphthalene, phenanthrene and pyrene were detected in some of the collected samples. These compounds are common components of diesel fuel. As in the case of the VOC and TPH results, the highest detections correspond to the 60 ft to 65 ft interval.

4.3.2 Contaminant Plume Modeling

As shown in Figure 4-1, BH-01, BH-02, and BH-03 were completed on a north-south axis near to the source leak. BH-01 was completed closest to the leak. SB-007 was located along the product line approximately 30 ft from BH-01. SB-005 was completed near the pump terminal. SB-004, SB-003, SB-002, and SB-006 were completed up to 100 ft from BH-01 to the north, west, south, and east, respectively. All boring location, to include the February 2001 locations, were designed to approximate a cross pattern through the diesel contamination to determine its full lateral and vertical extent.

Several methods were used to graphically model TPH contamination at LC-38, including:

1) tabulation of TPH concentrations; 2) modeling TPH concentrations in fence diagrams as compared to soil boring lithology; 3) contaminant plume modeling as compared to soil boring lithology; and 4) contaminant plume modeling as compared to lithologic fence diagrams of the LC-38 site. All models for the LC-38 diesel contamination are included in Appendix F.
1) Table F-1 lists all TPH detections for LC-38 soil borings on an west-east axis (SB-001, SB-005, BH-01, SB-007, and SB-006) and north-south axis (SB-004, BH-03, SB-007, BH-02, SB-002, and SB-001) compared to their appropriate sampling depth intervals. Table F-2 lists all TPH detections, as above, corrected to their appropriate relative elevations.

2) Geochemical fence diagrams, based on data gathered from both sampling events, were modeled in the RockWare® software program. The lithology (from soil boring logs) was input into the software program along with TPH concentrations and their associated depth intervals. All data was then corrected to relative elevations and output as the models shown in Figures F-1 through F-4. The geochemical data is contoured using a "cold" to "hot" color scheme. All quadrant locations (NW, NE, SW, and SE) are shown.

3) Geochemical contaminant plumes were modeled in RockWare® as above. Figure F-5 illustrates the approximate TPH plume showing concentrations > 10,000 ppm superimposed on soil boring logs. Figure F-6 illustrates the plume with TPH concentrations > 50,000 ppm. TPH concentrations > 75,000 ppm are modeled in Figure F-7.

4) The TPH plume was modeled (shown in green) in RockWare® as above and superimposed on a lithologic fence diagram of the LC-38 site. Figure F-8 illustrates the TPH contamination in a northwest view from above. Figure F-9 illustrates the same view from below.

Contaminant Plume

The vertical extent of diesel fuel contamination at LC-38 and site geology is well understood based on models of the site. The extent of contamination is directly related to site geology and amount of fuel spilled. The amount of fuel lost into the subsurface is estimated to be 31,000 gallons based on WSMR records.

All models illustrate an inverse mushroom-shaped contaminant plume situated beneath the leak source. The models indicate that the diesel fuel entered the subsurface near BH-01 (relative elevation of first encountered contamination at 991 ft) where it migrated near directly downward through the eolian fine-grained sands (eolian depositional facies). Few clay layers are present in this facies to impede contaminant migration. The plume spread out laterally around the relative elevation of 942 ft (40 ft -50 ft bgs) at a lateral distance of approximately 30 ft from the leak source. It is interpreted that the fuel encountered the laterally discontinuous clay (low permeability) lenses in this zone, which subsequently caused the fuel to spread laterally. The discontinuous nature of the clay also allowed for the fuel to continue migrating downward.

The maximum depth of contaminant migration is at the relative elevation of 925 ft (approximately 75 ft bgs). The contaminant plume is supported by the thick continuous clay layers of the clay facies located between the relative elevations of 940 ft to 918 ft (60 ft to 82 ft bgs). The bulk of the contamination rests above the relative elevation of 931 ft. The thick, continuous clay layers have prevented further downward migration of the diesel fuel.

The models indicate that significant contamination has migrated at least 100 ft laterally from the source along the confining clay layers at an approximate relative elevation of 937 ft to 935 ft (65 ft to 67 ft bgs). The maximum extent of lateral contamination from the source is less than 240 ft as evidenced by the absence of contamination in SB-001.

Diesel Fuel Volume

The reported release for the LC-38 diesel spill is 31,000 gallons. One issue to account for is the volume of diesel in the subsurface at the site. To resolve this issue, we have calculated the apparent volume of diesel in the subsurface at the site based on observed contamination from this investigation. The apparent volume of diesel fuel contamination at this site, as evidenced by the soil borings, area extent of contamination and TPH concentrations was calculated to be over 43,000 gallons. This estimation was derived by calculating the mass of TPH beneath the subsurface at the LC-38 site. The mass of TPH can be derived by multiplying the (V)olume of contaminated soil by the soil's bulk density (p_b) by the average (C)oncentration of TPH in the contaminated soil (Kuo, 1999). Therefore, Mass TPH = $(V)(p_b)(C)$.

The bulk density (p_b) of this soil is assumed to be 51 kg/ft^3. The volume of contaminated soil was obtained using the models discussed in Section 4.3.2. To more accurately determine volume (V) of contamination, the contaminated zone was divided into six sections from the near surface contamination down to the lowest depth of observed contamination. The average concentration (C) of TPH for each contaminated section was calculated based on observed TPH concentrations in each respective zone. Table 4-14 shows all estimates used in calculating the potential volume of diesel fuel in the subsurface beneath the LC-38 AST.

Table 4-14. Estimated Volume of Diesel Fuel.

Contaminated Zone	Approximate Depth bgs (ft)	Lateral Extent length (l) and width (w) (ft)	Subsurface Volume (V) = (l)(w)(h) (ft^3)	Bulk Density (ρ_b) (kg/ ft^3)	Average Concentration TPH (C) (mg/kg)	Mass TPH (V) (ρ_b)(C) (kg)	Volume* TPH (gallons)
1	10 to 30 =20	7 x 7	980	51	14,800	739	244
2	30 to 40 = 10	10 x 10	1,000	51	15,000	765	252
3	40 to 58 = 18	30 x 30	16,200	51	17,885	14,777	4,880
4	58 to 64 = 6	60 x 60	21,600	51	19,363	21,330	7,044
5	64 to 65 = 1	150 x 150	22,500	51	62,914	72,194	23,842
6	65 to 70 = 5	65 x 65	21,125	51	20,040	21,590	7,130
						Total	**43,392**

* To convert Mass TPH to Volume, we assume density of diesel fuel is 0.80 kg/l.
Liters of diesel is then converted to gallons by dividing by 3.785 liters per gallon.

Based on the calculation of apparent volume of diesel fuel, we are confident that the bulk of contaminant extent has been captured by this investigation. The 43,392 gallon estimate is approximately 30 % more than the reported release of 31,000 gallons which provides a wide margin for errors in estimation. Had the above calculations indicated only a fraction of the reported 31,000 gallons, then additional investigation would be warranted.

5.0 BASELINE RISK ASSESSMENT

5.1 Risk Based Decision Making Analysis

To determine the need for remediation and applicable cleanup targets at the LC-38 site, a risk analysis was performed following the Risk Based Decision Making Process (RBDMP) for petroleum releases, developed by the NMED Underground Storage Tank (UST) Bureau (NMED, 2000) (renamed to Petroleum Storage Tank Bureau in 2003). A NMED Tier 1 evaluation was performed for the contaminated portion of the LC-38 site. A Tier 1 analysis requires little site-specific chemical and hydraulic data and provides a conservative comparison of observed site contaminant concentrations to applicable Risk Based Screening Levels (RBSLs). Should observed contaminant concentrations exceed RBSLs in any medium for which a receptor pathway is potentially complete, either a higher tier risk analysis or remediation of the site to Tier 1 RBSLs are typically required.

5.1.1 Extent of Contamination

As discussed in Section 4.3, the LC-38 site is contaminated with diesel in one spatially distinct area. A total of 25 soil samples (from the two sampling events) were contaminated to above detection limits of at least one organic compound. For this RBDMP, the location of soil samples

found to be contaminated during both investigations is assumed to be located in the contamination source area. Sample results were not used if no VOC/SVOCs were detected, except as discussed below.

Table 5-1 provides a complete list of sample intervals used to determine the extent of contamination. Samples from two intervals that are not contaminated were included in the table. These non-detect samples are considered to be within the soil source area as the sample intervals both above and below are contaminated. Two boreholes, SB-01 and SB-06, did not encounter contamination and were not included in the table.

Table 5-1. Sample Intervals with COC Contamination.

BH-01	BH-02	BH-03	SB-02	SB-03	SB-04	SB-05	SB-07
5.0 – 5.5	58.5-59.0	49.5-50.0	65.7-66.8	66.0-66.5	63.3-63.8	59.0-59.2	55.0-55.5
29.5-30.0	62.4-62.8	64.5-64.9	70.0-70.5	67.0-67.5*	64.0	63.0-63.5	59.0-59.5
44.5-45.0*				71.3-71.5		64.5-64.7	61.3-62.0
49.5-50.0						68.0-68.5	62.0-62.5
70.0-70.5						73.5-74.0	69.5-70.0
							70.0-70.5

* - Indicates sample interval was not contaminated, 0.5 RBSL used to determine representative concentration

5.1.2 Site Conceptual Exposure Scenario

Because WSMR will maintain administrative control of the current missile range property *ad infinitum*, the LC-38 site is situated miles from the WSMR boundary, and access onto WSMR by the public is restricted, all resident child and adult pathways are currently incomplete for the site. However, the AST and associated equipment will eventually be demolished and removed from the site. Should land use change in the future to allow construction of residences, and should a residence be constructed directly above the localized contaminant source area, the indoor inhalation pathway for vapor migration from subsurface soils could conceivably be complete. In addition, no commercial facilities are located around the source area of the site and future construction is not anticipated. Therefore, all exposure scenarios for commercial workers are currently incomplete. However, future land use would not prohibit the construction of a military or contractor facility at the site. Again, if this construction were to occur directly above the localized contaminant source area, the indoor inhalation pathway for vapor migration from subsurface soils could conceivably be complete. The groundwater ingestion pathway is incomplete because no drinking or irrigation water wells are located within a 10-mile radius of the site due to total dissolved solids in the area exceeding 8,000 mg/L.

Construction workers working outdoors up to a depth of 15-foot could inhale volatilized compounds from contaminated soils. As a result, the outdoor inhalation pathway for construction workers seeking to cleanup the site is considered complete. In addition, those construction workers could be exposed to contaminated subsurface soil during site cleanup activities; therefore, the onsite "soil ingestion, inhalation, and dermal contact" pathway is considered complete. Because of the large distance between the site and the WSMR boundary, all off-site pathways are incomplete.

No RBDMP organic compounds were detected in groundwater at the LC-38 site. However, this risk analysis includes evaluation of representative soil concentrations protective of groundwater. The results are provided in the Tier 1 report included in Appendix G.

5.1.3 Representative Concentrations

The NMED RBDMP requires that representative concentrations be calculated and compared to RBSLs. The NMED requires that representative soil concentrations be calculated by averaging all laboratory analyses obtained from samples in the source area of contamination. While calculating the average concentration, one must note the following:

1. Non-detect soil samples within the soil source are considered contaminated to half the applicable detection limit.
2. Laboratory results from soil borings peripheral to the source should not be used.
3. Hotspots and discrete areas of contamination may require additional evaluation.

For this risk analysis, it was assumed that all soil samples in which at least one contaminant of concern (COC) was measured above detection limits were derived from the soil source. Non-detect samples sandwiched between contaminated samples were included in the calculation of representative concentrations and assigned half the applicable RBSL.

Approximately half the RBDMP COCs for diesel were not detected during laboratory analysis, including anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a-h)anthracene, and fluoranthene. Table G-1 in Appendix G outlines the method used to calculate representative concentrations for each detected RBDMP COC in the contaminated area at the LC-38 site.

In the case of groundwater, 4 monitoring wells were installed during the November 2003 investigation, one up gradient and 3 down gradient. No RBDMP organic COCs were found above detection limits during sampling in January 2004. As a result, this route of exposure was not evaluated.

5.1.4 Comparison of Representative Concentrations to Tier 1 RBSLs

Representative concentrations for the majority of observed COCs exceeded RBSLs for future land use scenarios for both on-site residents (child and adult) and on-site commercial workers (Table 5-2). All construction worker scenarios were well within RBSLs (Appendix G), and it is inferred that soil concentrations are protective of current and future, on-site construction workers at the site.

To evaluate whether soil concentrations are protective of groundwater, the RBDMP requires that an unsaturated soil configuration be identified for the site based on the thickness of the contaminated zone and transport zones. Once the configuration is determined the appropriate RBSLs can be used from *Table 4-12* of the New Mexico Underground Storage Tank Bureau's *Guidelines for Corrective Action* (March 13, 2000). For this risk analysis, RBSLs were selected using most conservative values for determining the contaminated zone (69 feet) and transport

zone (158 feet) thicknesses. These thicknesses fall between the values listed in *Table 4-12* so the next highest contaminated zone thickness (100 feet) and the next lowest transport zone thickness (140 feet) were used to arrive at a Tier 1 unsaturated zone soil configuration of 55. *Table 4-15* in the *Guidelines for Corrective Action* indicate that RBSLs are not computed for this configuration, as contaminants will not reach groundwater in 40 years.

Table 5-2. Representative Concentrations vs. RBSLs.

Sub-Surface Soil (Indoor Inhalation Of Vapors)				
Contaminants Of Concern	**Representative Concentration [mg/kg]**	**RBSLs [mg/kg]**	**On-Site Resident (Child and Adult)**	**On-Site Commercial Worker**
ORGANICS				
Benzene	66.32	207	X	X
Toluene	1530.57	1.88	X	X
Ethylbenzene	1226.63	36.9	X	X
Xylenes (Total)	1502.05	2.59	X	X
POLYCYCLIC AROMATIC HYDROCARBONS				
Acenaphthene	5585.20	2570	X	
Total Naphthalenes	430.06	34.5	X	X

5.2 Screening Level Ecological Risk Assessment

A wildlife biologist conducted a site visit to collect data and descriptive information necessary for the completion of the *Screening-Level Ecological Risk Assessment / Scoping Assessment / Site Assessment Checklist* provided by NMED. This information gathered for completion of the checklist included the identification of viable ecological habitat, biological receptors associated with the site, and potential exposure pathways. The completed checklist is included in Appendix H. Results of the checklist indicate that further ecological assessment is not warranted at this time.

6.0 CONCLUSIONS

The purpose of this SWMU Assessment is to further characterize the geology and hydrology of the diesel spill site, the extent of contamination in soils and ground water, and determine future actions for the site based on a Risk Based Decision Making Analysis. Activities for this investigation were completed according to the NMED approved work plan titled "*Work Plan for the RCRA Facility Investigation at the Launch Complex 38 Site on White Sands Missile Range.*"

Results of this SWMU Assessment indicate that a significant amount of diesel fuel leaked into the subsurface at LC-38 from a 150,000 gallon diesel AST. Contamination resulting from this release has reached a maximum depth of approximately 75 ft bgs. The bulk of contamination does not extend below 67 ft bgs. The contaminant plume is supported by the thick laterally continuous clay layer approximately 22 ft thick existing at 60 ft to 82 ft bgs . The thick, continuous clay layer has prevented further downward migration of the diesel fuel.

Significant contamination has migrated at least 100 ft laterally from the source along the confining clay layers at approximately 65 ft to 67 ft bgs. This investigation was unable to determine exact lateral extent of contamination but has determined the extent to be less than 240 ft from the source.

Ground-water monitoring wells installed and sampled during this investigation show that depth to regional ground water is greater than 230 ft bgs. No perched water bearing zones are present. Analytical results from ground-water samples indicate contamination has not reached the regional water table.

Based on the RBDMP developed by the NMED UST Bureau, it is determined that the current land use exposure scenario for off-site residents and commercial workers is incomplete. However, construction workers working outdoors up to a depth of 15-foot bgs could inhale volatilized compounds from contaminated soils. As a result, the outdoor inhalation pathway for potential construction workers at the site is considered complete. However, all construction worker scenarios were well within RBSLs and it is inferred that soil concentrations are protective of current and future, on-site construction workers at the site.

In evaluating future land use, the indoor inhalation pathway for vapor migration from subsurface soils could be complete if a facility or residence is constructed over the contaminated site. Pathways for future land use would be complete for on-site commercial or on-site residential land use. Representative concentrations for the majority of observed COCs exceeded RBSLs for future land use scenarios for both on-site commercial and on-site residents. The groundwater ingestion pathway is incomplete because no drinking or irrigation water wells are located within a 10-mile radius of the site and due to total dissolved solids in the area exceeding 8,000 mg/L.

7.0 RECOMMENDATIONS

The AST at LC-38 will remain part of the Defense Fuels Agency Military Ready Reserve Pool. There are no plans for removal of the AST at this time. The AST is currently empty and will remain so until it is made ready for use. WSMR may repair the fuel lines at the site and continue to use the AST for the reserve storage of diesel fuel. WSMR will maintain this site as an industrial site for the foreseeable future.

Based on current land use, no exposure pathways are considered complete at this time. No residential areas will be built for the foreseeable future and no construction activities are planned for this site. Based on these findings, the site is currently protective of human health and ecological exposure.

WSMR proposes No Further Remedial Action at this site. The WSMR Real Property Planning Board will zone this site as off limits for future commercial/residential use. As an additional safeguard, WSMR will monitor the wells at the site on an annual basis for 10 years using an interface probe for determination if fuel is present on the water table. Additionally, WSMR will annotate the Real Property Inventory to reflect that should the AST be removed, any remaining contaminated materials within 15 feet of the final land surface would be subject to remediation.

APPENDIX A

Initial Sampling Event Analytical Results - Tabulated

Table A-1.
TPH Results for the February 2001 Preliminary Investigation Sampling Event.

Sample Identification February 2001 Event	Diesel Range Organics µg/kg	
24068-SB01-(9.5-10.0)-0201	14000000	
24068-SB01-(17.5-18.0)-0201	11000000	
24068-SB01-(24.5-25.0)-0201	17000000	
24068-SB01-(29.5-30.0)-0201	21000000	
24068-SB01-(34.5-35.0)-0201	16000000	
24068-SB01-(39.5-40.0)-0201	14000000	
24068-SB01-(44.5-45.0)-0201	21000000	
24068-SB01-(49.5-50.0)-0201	10000000	
24068-SB01-(54.5-55.5)-0201	24000000	
24068-SB01-(59.5-60.0)-0201	11000000	
24068-SB01-(64.5-65.0)-0201	49000000	
24068-SB01-(69.5-70.0)-0201	420000	
24068-SB01-(70.0-70.5)-0201	3000000	
24068-SB01-(79.5-80.0)-0201	2200	J
24068-SB01-(104.5-105.0)-0201	1100	J
24068-SB02-(4.5-5.0)-0201	16000	
24068-SB02-(9.5-10.0)-0201	6100	J
24068-SB02-(14.5-15.0)-0201	8400	J
24068-SB02-(19.5-20.0)-0201	24000	
24068-SB02-(24.5-25.0)-0201	14000	
24068-SB02-(34.5-35.0)-0201	13000	
24068-SB02-(39.5-40.0)-0201	1100	J
24068-SB02-(44.5-45.0)-0201	820	J
24068-SB02-(54.5-55.0)-0201	27000	
24068-SB02-(57.0-57.5)-0201	20000000	
24068-SB02-(59.5-60.0)-0201	26000000	
24068-SB02-(64.5-65.0)-0201	180000	
24068-SB02-(67.0-67.5)-0201	6800000	
24068-SB02-(69.5-70.0)-0201	160000	
24068-SB02-(74.5-75.0)-0201	1400	J
24068-SB03-(4.5-5.0)-0201	1400	J
24068-SB03-(9.5-10.0)-0201	1800	J
24068-SB03-(14.5-15.0)-0201	1400	J
24068-SB03-(19.5-20.0)-0201	1400	J
24068-SB03-(24.5-25.0)-0201	15000	
24068-SB03-(29.5-30.0)-0201	3600	J
24068-SB01-(34.5-35.0)-0201	4500	J
24068-SB03-(39.5-40.0)-0201	3700	J
24068-SB03-(44.5-45.0)-0201	5200000	
24068-SB03-(54.5-55.0)-0201	21000000	
24068-SB03-(53.7-54.2)-0201	30000000	
24068-SB03-(59.5-60.0)-0201	5000000	
24068-SB03-(64.5-65.0)-0201	12000000	
24068-SB03-(67.0-67.5)-0201	70000000	
24068-SB03-(69.5-70.0)-0201	23000	
24068-SB03-(74.5-75.0)-0201	56000	
24068-SB03-(79.5-80.0)-0201	1200	J

J Detected below the laboratory reporting limit.

Table A-2.
VOC Results from the February 2001 Preliminary Investigation Sampling Event.

Analyte VOC Method 8260 µg/kg February 2001 Event	24068-SB01-(0.0)-0201		24068-SB01-(5.0-5.5)-0201		24068-SB01-(49.5-50.0)-0201		24068-SB02-(62.3-62.7)-0201		24068-SB03-(64.5-64.9)-0201	
1,1,1,2-Tetrachloroethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,1,1-Trichloroethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,1,2,2-Tetrachloroethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,1,2-Trichloroethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,1-Dichloroethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,1-Dichloroethene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,1-Dichloropropene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2,3-Trichlorobenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2,3-Trichloropropane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2,4-Trichlorobenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2,4-Trimethylbenzene	5.1	ND	49000		35000		17000		3700	
1,2-Dibromo-3-chloropropane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2-Dibromomethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2-Dichlorobenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2-Dichloroethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,2-Dichloropropane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,3,5-Trimethylbenzene	5.1	ND	160000		110000		56000		15000	
1,3-Dichlorobenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,3-Dichloropropane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1,4-Dichlorobenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
1-Chlorohexane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
2,2-Dichloropropane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
2-Butanone	10	ND	4600	ND	9600	ND	1200	ND	590	ND
2-Chlorotoluene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
2-Hexanone	10	ND	4600	ND	9600	ND	1200	ND	590	ND
4-Chlorotoluene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
4-Methyl-2-pentanone	10	ND	4600	ND	9600	ND	1200	ND	590	ND
Acetone	10	ND	4600	ND	9600	ND	1200	ND	16000	
Benzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Bromobenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Bromodichloromethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Bromodichloromethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Bromoform	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Bromomethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Carbon tetrachloride	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Chlorobenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Chloroethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Chloroform	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Chloromethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
cis-1,2-Dichloroethene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
cis-1,3-Dichloropropene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Dibromochloromethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Dibromomethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Dichlorodifluoromethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Ethylbenzene	5.1	ND	2300	ND	44000		13000		9000	
Hexachlorobutadiene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Isopropylbenzene	5.1	ND	2300	ND	21000	ND	8300		15000	

Analyte VOC Method 8260 µg/kg February 2001 Event	24068-SB01-(0.0)-0201		24068-SB01-(5.0-5.5)-0201		24068-SB01-(49.5-50.0)-0201		24068-SB02-(62.3-62.7)-0201		24068-SB03-(64.5-64.9)-0201	
Methylene chloride	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
n-Butylbenzene	5.1	ND	2300	ND	4800	ND	610	ND	9100	
n-Propylbenzene	5.1	ND	2300	ND	4800	ND	610	ND	5900	
Naphthalene	5.4		2300	ND	4800	ND	610	ND	27000	
p-Isopropyltoulene	5.1	ND	2300	ND	4800	ND	610	ND	4100	
sec-Butylbenzene	5.1	ND	2300	ND	4800	ND	610	ND	9400	
Styrene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
tert-Butylbenzene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Tetrachloroethene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Toluene	5.1	ND	47000		33000	ND	6700		9100	
trans-1,2-Dichloroethene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
trans-1,3-Dichloropropene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Trichloroethene	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Trichlorofluoromethane	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Vinyl chloride	5.1	ND	2300	ND	4800	ND	610	ND	290	ND
Xylene (total)	5.1	ND	24000		30000		8900		55000	

ND Not Detected at the indicated laboratory reporting limit.

Table A-3. SVOC Results for the February 2001 Preliminary Investigation Sampling Event.

Analyte SVOC Method 8270 µg/kg February 2001 Event	24068-SB01-(0.0)-0201		24068-SB01-(5.0-5.5)-0201		24068-SB01-(29.5-30.0)-0201		24068-SB01-(44.5-45.0)-0201		24068-SB01-(49.0-50.0)		24068-SB01-(74.5-75.0)-0201		24068-SB02-(9.5-10.0)-0201		24068-SB02-(49.5-50.0)-0201		24068-SB02-(58.5-59.0)-0201		24068-SB02-(62.4-62.8)-0201		24068-SB03-(49.5-50.0)-0201		24068-SB03-(64.4-64.8)-0201		24068-SB03-(73.0-73.5)-0201	
1,2,4-Trichlorobenzene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
1,2-Dichlorobenzene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
1,3-Dichlorobenzene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
1,4-Dichlorobenzene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2,2'-oxybis(1-Chloropropane)	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2,4,5-Trichlorophenol	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
2,4,6-Trichlorophenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2,4-Dichlorophenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2,4-Dimethylphenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2,4-Dinitrophenol	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
2,4-Dinitrotoluene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2,6-Dinitrotoluene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2-Chloronaphthalene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2-Chlorophenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2-Methylnaphthalene	350	ND	34000		61000		100000		38000		390	ND	350	ND	390	ND	5600	E	630000		90000	E	39000	E	510	
2-Methylphenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
2-Nitroaniline	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
2-Nitrophenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
3,3'-Dichlorobenzidine	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
3-Nitroaniline	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
4,6-Dinitro-2-methylphenol	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
4-Bromophenyl-phenylether	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
4-Chloro-3-methylphenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
4-Chloroaniline	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
4-Chlorophenyl-phenylether	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
4-Methylphenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
4-Nitroaniline	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
4-Nitrophenol	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
Acenaphthene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Acenaphthylene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Anthracene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Benzo[a]anthracene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Benzo[a]pyrene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Benzo[b]fluoranthene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Benzo[g,h,i]perylene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Benzo[k]fluoranthene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Benzoic acid	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
Benzyl alcohol	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
bis(2-Chloroethoxy)methane	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND

Analyte SVOC Method 8270 µg/kg February 2001 Event	24068-SB01-(0.0)-0201		24068-SB01-(5.0-5.5)-0201		24068-SB01-(29.5-30.0)-0201		24068-SB01-(44.5-45.0)-0201		24068-SB01-(49.0-50.0)		24068-SB01-(74.5-75.0)-0201		24068-SB02-(9.5-10.0)-0201		24068-SB02-(49.5-50.0)-0201		24068-SB02-(58.5-59.0)-0201		24068-SB02-(62.4-62.8)-0201		24068-SB03-(49.5-50.0)-0201		24068-SB03-(64.4-64.8)-0201		24068-SB03-(73.0-73.5)-0201	
bis(2-Chloroethyl)ether	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
bis(2-chloroisopropyl)ether	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
bis(2-Ethylhexyl)phthalate	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Butylbenzylphthalate	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Carbazole	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Chrysene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Di-n-butylphthalate	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Di-n-octylphthalate	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Dibenz[a,h]anthracene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Dibenzofuran	350	ND	19000	ND	11000	J	37000	ND	20000	ND	390	ND	350	ND	390	ND	660		200000	ND	2000	ND	4500		400	ND
Diethylphthalate	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Dimethylphthalate	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Fluoranthene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Fluorene	350	ND	19000	ND	12000	J	19000	J	20000	ND	390	ND	350	ND	390	ND	910		110000	J	2000	ND	5700		400	ND
Hexachlorobenzene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Hexachlorobutadiene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Hexachlorocyclopentadiene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Hexachloroethane	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Indeno[1,2,3-cd]pyrene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Isophorone	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
N-Nitroso-di-n-propylamine	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
N-Nitrosodimethylamine	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
N-Nitrosodiphenylamine	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Naphthalene	350	ND	19000	ND	13000	J	21000	J	20000	ND	390	ND	350	ND	390	ND	930		120000	J	9600		6100		400	ND
Nitrobenzene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Pentachlorophenol	880	ND	48000	ND	44000	ND	92000	ND	50000	ND	980	ND	870	ND	970	ND	960	ND	510000	ND	5100	ND	4900	ND	1000	ND
Phenanthrene	350	ND	19000	ND	19000		28000	J	12000	J	390	ND	350	ND	390	ND	1600		180000	J	25000	E	2000	ND	230	J
Phenol	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND
Pyrene	350	ND	19000	ND	18000	ND	37000	ND	20000	ND	390	ND	350	ND	390	ND	380	ND	200000	ND	2000	ND	2000	ND	400	ND

ND Not Detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
E Detection exceeded the upper limit of the calibration curve.

Table A-4.
PAH Results for the February 2001 Preliminary Investigation Sampling Event.

Analyte PAH Method 8270 µg/kg February 2001 Event	24068-SB01-(70.0-70.5)-0201		24068-SB01-(75.0-75.5)-0201		24068-SB01-(104.5-105.0)-0201		24068-SB02-(29.5-30.0)-0201		24068-SB02-(79.5-80.0)-0201		24068-SB03-(40.5-41.0)-0201		24068-SB03-(77.0-77.5)-0201		24068-SB03-(82.0-82.5)-0201	
Acenaphthene	440		18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Acenaphthylene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Anthracene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Benzo(a)anthracene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Benzo(a)pyrene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Benzo(b)fluoranthene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Benzo(g,h,I)perylene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Benzo(k)fluoranthene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Chrysene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Dibenzo(a,h)anthracene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Fluoranthene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Fluorene	720		18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Indeno(1,2,3-c,d)pyrene	19	ND	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Naphthalene	580		14	J	10	J	9.9	J	13	J	23	ND	19	ND	20	ND
Phenanthrene	1200	E	18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND
Pyrene	49		18	ND	19	ND	17	ND	19	ND	23	ND	19	ND	20	ND

ND Not Detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
E Detection exceeded the upper limit of the calibration curve.

Table A-5.
RCRA Metal Results for the February 2001 Preliminary Investigation Sampling Event.

Sample Identification February 2001 Event mg/kg	Arsenic		Barium		Cadmium		Chromium		Lead		Mercury		Selenium		Silver	
24068-SB01-(0.0)-0201	1.54		110		0.352	ND	3.3		7.30		0.1		0.384		0.7	ND
24068-SB01-(5.0-5.5)-0201	3.68		100		0.376	ND	7.4		6.11		0.04	ND	0.725		0.75	ND
24068-SB01-(49.5-50.0)-0201	2.13		110		0.399	ND	4.3		6.44		0.09		1.17		0.8	ND
24068-SB02-(65.0-65.1)-0201	6.61		26		0.413	ND	8.3		10.6		0.06		0.413	ND	0.83	ND

ND Not Detected at the indicated laboratory reporting limit.

APPENDIX B

Lithologic Logs for Soil Borings from the SWMU Assessment

DRILLING LOG	DIVISION	INSTALLATION	HOLE No.	SHEET No.
		WSMR	SB001	1 OF 6

1. PROJECT: LC 38	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
2. LOCATION (Coordinates or Station): DOWNGRADIENT ADJACENT MW 4 LOC.	12. MANUFACTURER'S DESIGNATION OF DRILL: CME 75
3. DRILLING AGENCY: RAZON KISTNER	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
4. HOLE No. (As shown on drawing title and file number): SB001	14. TOTAL NUMBER CORE BOXES: N/A
5. NAME OF DRILLER: MANNY	15. ELEVATION GROUND WATER: EST @ >200 FT BGS
6. DIRECTION OF HOLE: ☑ Vertical ☐ Inclined ____ Degrees from Vertical	16. DATE HOLE: STARTED 11-3-03 0800; COMPLETED 11-4-03 0953
7. THICKNESS OF OVERBURDEN: ≈ 100FT	17. ELEVATION TOP OF HOLE: T.B.D.
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING:
9. TOTAL DEPTH OF HOLE: 100 FT BGS; 10. SIZE AND TYPE OF BIT: 4.25 ID HSA 5.0 FT CONT. CORE	19. SIGNATURE OF INSPECTOR: J E GILLESPIE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
		SP	POORLY GRADED SAND, DRY, CALICHE, DRY HARD. NODULAR	60%	2-3FT S-1 Sample of Caliche TOC/PH/SVOC	STR 6/8 REDDISH YELLOW LOOSE. STR 8/2 PINKISH WHITE MOSTLY FINE SAND LITTLE TO FEW MED TRACE COARSE
0836	5	ML	N R. SILT, DRY, HARD, STR 6/6 REDDISH YELLOW, MOSTLY SILT, LITTLE CLAY, FINE SAND.	100%	S-2 9-10FT TOC/PH/SVOC 0900	
0859	10	SP	POORLY GRADED SAND, DRY, LOOSE, STR 8/8 PINK, MOSTLY FINE SAND, LITTLE SILT, MED SAND, TRACE CLAY			PID 0.0
0919	15	SP	N R. POORLY GRADED SAND MOIST MOSTLY 10 7.5YR 7/3 PINK, MOSTLY FINE SAND, LITTLE SILT, MED SAND	60%	S-3 12-15FT	LOOSE, MOIST SAME AS 9-10 FT PID 0.0
0930	20	SP	N R. POORLY GRADED SAND, SAME AS ABOVE MOSTLY MED SAND STIFF 19.5-20	50%	S-4 17.5-20	SAME AS ABOVE SUBROUNDED TRACE VOLCANICS GREEN/BLACK MINERALS PID 0.0
		ML	INCREASED SILT CONTENT "CATCHER" HAS MORE SILT THAN SAND	80%	S-5 21-25	LOOSE 21-23.5 MOSTLY FINE SAND PID 0.0 DRY

SEE PG 2. WELL GRADED REDDISH YELLOW.

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No.	SHEET No.
WSMR	SB001	2 OF 6

9. PROJECT: LC 38 Diesel Fuel Spill

11. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	22.5	ML	SILT, MOIST, MEDIUM 7.5 6/3 Light Brown MOSTLY SILT, LITTLE FINE SAND, TRACE CLAY	80%	S-5 21-25	HARDER MOVING 21-23.5 MOSTLY FINE SAND BP. 23.5 ML SILT HARD
0950	25	SP	~~POORLY GRADED SAND W/ SILT~~ ~~DRY, LOOSE,~~ 7.5YR 8/3 PINK MOSTLY FINE SAND, SOME SILT, ~~FEW~~	100%	S-6 25-30	PH, TOC / SIEVE 25-28
		ML	INCREASING TO MOSTLY SILT, LITTLE V. FINE SAND, TRACE CLAY	MOIST		29-30
0958	30	SM	SILTY SAND MED STIFF, DRY, 7.5YR 6/3 LT BROWN, MOSTLY FINE SAND, LITTLE SILT TRACE CLAY	HARD Drilling		TOC / PH / SIEVE NOTE HARD LONGER 30FT.
		SP	POORLY GRADED SAND LOOSE, DRY.	100%	(S-7 30-35)	LOOSE SAND 33½-34
10:23	35	CL	CLAY, STIFF, MOIST-DRY, 7.5YR 4/6 STRONG BROWN LITTLE FINE SAND/SILT			SIEVE @ 34-35 PID 0.00
				100%	S-8 35-40	
10:45	40	SP	POORLY GRADED SAND, LOOSE, DRY 7.5YR 7/6 REDDISH YELLOW, MOSTLY FINE SAND FEW SILT.			TOC / SIEVE / PH PID 0.00
			INCREASING SILT AND CLAY CONTENT W/ DEPTH	100%	S-9	HARD Drilling @ 41 ADDING 1-2 gal H2O TO GET CUTTINGS UP
11:10	45	CL	CLAY, MED-HIGH, MOIST-DRY 7.5YR 4/6 BROWN, MOSTLY CLAY, LITTLE FINE SAND, SILT			NO SAMPLE PID 0.00
				100%	S10	HARD Drilling @ 46 ADDING H2O PID 0.00
11:40	50	SP	POORLY GRADED SAND, MED-DRY 7.5YR 7/6 REDDISH YELLOW MOSTLY FINE SAND, LITTLE SILT TRACE CLAY @ 50	LOOSE		49-50 TOC / PH / SIEVE
			SEE PAGE 3 CHANGE SCALE TO 1 FT INCREMENTS.			
	55					

PID 0.0

LOOSE FINE SAND W/ SILT

INCREASED CLAY

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB001	SHEET No. 3 OF 6
1. PROJECT LC 38 DIESEL SPILL INVEST	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	50	ML	SANDY SILT, MEDIUM HARD, DRY, 7.5YR 6/6 REDDISH YELLOW, MOSTLY SILT, LITTLE FINE SAND, FEW CLAY,			SLOW DRILLING HAVING TO ADD WATER
	51					
	52		NOTE: WHITE CALICHE DEPOSITS VERTICALLY IN CORE.	100% REC.	S-11 50-55	DENSE MATERIAL WELL PACKED SLIGHT SMELL INDICATING ~~HIGH~~ CLAY CONTENT
	53		CORE IS DENSER PAST ONCE BROKEN IS MEDIUM			
	54					NO SAMPLE COLLECTED PID 0.00
12:10	55	SP	HARD CHERTY DENSE		S-12 55-60	HARD DRILL
	56		MOVE UP			
	57	SP	POORLY GRADED SAND WITH LOOSE, DRY 7.5YR 7/6 REDDISH YELLOW, MOSTLY FINE SAND, FEW SILT	40% RECOVERY		
	58	N R				
	59		LOSS RECOVERY DUE TO SHOE RETRACTED FOR HARDER MATERIAL			PH/SIEVE/TOC COLLECTED
Lunch 1330 12:50	60	CL	CLAY MEDIUM, MOIST-DRY, 7.5YR 6/6 BROWN, MOSTLY CLAY, LITTLE SILT			PID 0.00
	61					
	62	SP	POORLY GRADED SAND, LOOSE DRY, 7.5YR 7/6 REDDISH YELLOW, MOSTLY FINE SAND, LITTLE V. FINE SAND	58% REC.	S-13 60-65	
	63	N R				NO SAMPLE PID 0.00
	64					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB001	SHEET No. 4 OF 6
1. PROJECT LC 38 Diesel Fuel Spill	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	64		No Recovery	58%	60-65 S-13	Soft material No Recovery 62.5 - 65.0
	65	SP	Poorly graded sand Mostly fine sand as 60-65			No Recovery for 65-65.5
	66	CL	Clay (CL) medium stiff, Dry-moist, 7.5YR 4/6 Strong Brown		S-14	
	67		Lean clay with very little-few fine sand. To 70 ft.	~~100%~~	65-70	
	68			90%		
	69					
1430	70					TOC/PH/Sieve 69-70 PID 0.00
1448		CL	Sandy lean clay medium, Dry, 7.5YR 4/3-4/6 Light Brown to Strong Brown, mostly clay little fine sand, trace silt, trace white calcium carbonate nodules.			
	71					
	72			95%	S-15 70-75	Lean clay @ 72 ft ≈ 1 ft
	73					
	74					
1510	75					PID 0.00
1520		ML	Silt with sand medium, Dry, 7.5YR 7/3 Pink, mostly silt, some v. fine sand, few-trace clay, cemented nodules or layers ≈ 1-2 inches thick.	100%	S-16 75-80	PID 0.00 Geotech Sieve TOC PH 75-78 ft
	76					
	77					
	78					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB001	SHEET No. 5 OF 6
1. PROJECT LC 38 Diesel Fuel Spill	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	78	CL	SANDY LEAN CLAY, MEDIUM, Dry 7.5 YR 5/6 BROWN, MOSTLY CLAY, LITTLE V. FINE SAND, TRACE CLAY SLIGHT BEDDING OBSERVED 1/4 INCH LAYERS	100%	S-16	DIFFICULT DRILLING SLOW 79-80 SIEVE / PH / TOC PID 0.00
	79					
1540	80					
1600		ML	SILT WITH SAND, MED, Dry 7.5YR 5/4, LIGHT REDDISH BROWN MOSTLY SILT SOME FINE SAND, TRACE CLAY.			ARCHIVE CORE WAS VERY HOT FROM FRICTION DURING DRILLING
	81					
		CL	SANDY LEAN CLAY, MED DENSE, Dry-moist 5YR 5/6 YELLOWISH RED, MOSTLY CLAY, SOME FINE SAND, LITTLE SILT, 1	100%	S-17	PID 0.6 ARCHIVE
	82					
	83					
	84	ML	SILT WITH SAND, HARD, Dry. 7.5YR 5/6 REDDISH YELLOW, MOSTLY SILT, LITTLE FINE SAND			SLIGHT ODOR TPH SAMPLE COLLECTED PID 0.7 ARCHIVE
1642	85				ARCHIVE	STOP FOR EVENT 11-3-03 RESUME 0730 11-4 - 0743 CLEAR OUT CUTTINGS IN THE HOLE
0800						
	86					
	87				S-18	
			SAND LEAN CLAY 7.5YR 5/6 STRONG BROWN Dry, MOSTLY CLAY, LITTLE FINE SAND, SILT	100%		
	88	CL			ARCHIVE	
	89	SP	POORLY GRADED SAND W/ SILT LOOSE, Dry 7.5YR 5/6 REDDISH YELLOW, MOSTLY FINE SAND, LITTLE TO FEW SILT			
0818						TOC, PH, SIEVE 89-90
0846	90				ARCHIVE	
		SP				
	91	CL	SANDY LEAN CLAY HARD 7.5YR 6/6 STRONG BROWN Dry, MOSTLY CLAY, LITTLE FINE SAND, SILT	70%	S-19	PID READING 1.7 POTENTIALLY HEAT OF FRICTION? 160° TOP OF CORE WHITE CALCAREOUS MATERIAL ON FRACTURE AND BEDDING SURFACES
	92					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB001	SHEET No. 6 OF 6
1. PROJECT LC 38 DIESEL FUEL SPILL	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	92	ML	SILT WITH SAND, HARD DRY, 7.5YR 4/6 2500 PSI MEDIUM, MOSTLY SILT W/ LITTLE - SOME FINE SAND	70% 90-93.5	S-19	PHOTO TAKEN OF 92-93 INTERVAL AFTER TRUCK
	93					
	94	N R	DENSE HARD PLUG IN SHOE.			BIT PLUGGED @93.5 NR. FROM 93.5-95
0910	95					
0930		ML	SILT WITH SAND SAME AS ABOVE			
	96	CL	SANDY LEAN CLAY, DENSE LOW-MEDIUM, DRY, 7.5YR 5/6 STRONG BROWN, MOSTLY CLAY, LITTLE - FEW FINE SAND, SILT.	50% 95-97.5	S20	TOC, PH SIEVE 96.5-97.5
	97					
	98	N R				
	99					
0953	100					
			Bottom of Exploration @ 0953 11-4-03 PULL HSA AND GROUT TO SURFACE			

DRILLING LOG	DIVISION	INSTALLATION	HOLE No.	SHEET No.
		WSMR	SB-002	1 OF 8

1. PROJECT LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station)	12. MANUFACTURER'S DESIGNATION OF DRILL CME 75
3. DRILLING AGENCY RABA KISTNER	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
4. HOLE No. (As shown on drawing title and file number)	14. TOTAL NUMBER CORE BOXES N/A
5. NAME OF DRILLER MANNY DUENEZ	15. ELEVATION GROUND WATER EST. @ >200 FT
6. DIRECTION OF HOLE ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE — STARTED — COMPLETED 11-5-03 — — 11-7-03 / 1624
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK N/A	18. TOTAL CORE RECOVERY FOR BORING
9. TOTAL DEPTH OF HOLE 99.5 FT — 10. SIZE AND TYPE OF BIT 4.25 ID HSA 5.0 FT CONT. CORE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW, (7.5 YR 6/6), MOSTLY FINE SAND, LITTLE MED. SAND	34 % 0.0-1.7		PID: 0.0 ppm
	1		CALICHE, DRY, HARD, WHITE			
	2		N R			
	3					
	4					
0742	5	SP	POORLY GRADED SAND, AS ABOVE	20 % 5.0-6.0	TPH @ 6 FT	PID: 0.0 ppm
	6					
	7		N R			
	8					
	9					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-002	SHEET No. 2 of 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	9		N R			
0749	10	SP	POORLY GRADED SAND, HARD, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY FINE SAND, LITTLE SILT, TRACE CALICHE	30% 10.0-11.5		PID: 0.0 ppm
	11					
	12		N R			
	13					
	14					
0810	15	SP	POORLY GRADED SAND, HARD, DRY, REDDISH YELLOW (7.5 YR 6/8), MOSTLY FINE SAND, TRACE SILT, VUGS FILLED WITH GYPSUM.	40% 15.0-17.0		PID: 0.0 ppm 0830: TPH SAMPLE @ 17 FT
	16					
	17	CL	LEAN CLAY, HARD, DRY, STG BROWN (7.5 YR 5/6), MOSTLY CLAY, TRACE SAND/SILT			
	18		N R			
	19					
0820	20	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5 YR 7/6), MOSTLY FINE SAND, TRACE SILT	80% 20.0-24.0		PID: 0.0 ppm
	21					
	22					
	23					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-002	SHEET No. 3 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	23	SP	POORLY SORTED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY FINE SAND, TRACE SILT			
	24		N R			
0840	25	SP	POORLY GRADED SAND, AS ABOVE	50 % 25.0-27.5		PID: 0.0 ppm 0900: TPH SAMPLE @ 27.5 FT
	26					
	27					
	28		N R			
	29					
0855	30	SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 6/4), MOSTLY FINE SAND, LITTLE SILT, PEBBLE-SIZE CONCRETIONS	50 % 30.0-32.5		PID: 0.0 ppm
	31					
	32					
	33					
	34					
0911	35	SP	POORLY GRADED SAND, AS ABOVE	100 %		PID: 0.0 ppm 0930: TPH SAMPLE @ 40 FT DPH COLLECTED
	36	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), TRACE SAND/SILT			HARD DRILLING @ 36 FT
	37					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-002	SHEET No. 4 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	37		LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), TRACE SAND/SILT			
	38	SP	POORLY ~~SORTED~~ GRADED SAND, AS ABOVE			
	39	ML	SILT WITH SAND, LOOSE, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY SILT, LITTLE FINE SAND			
0930	40	ML	SILT WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY SILT, LITTLE FINE SAND, TRACE CLAY	60% 40.0-43.0		PID: 0.1 @ 41 FT NOTE: NO INDICATION OF IMPACT, ODOR OR VISUAL.
	41					
	42					
	43		N R			
	44					
1000	45	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), TRACE SILT	90% 45.0-49.5		PID: 0.0 ppm 1030 - TPH SAMPLE @ 49.5 FT
	46					
	47					
	48					
	49	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/8),			
1017	50	ML	MOSTLY FINE ~~GRAIN~~ SAND, LITTLE SILT	70% 50.0-53.5		PID: 0.0 ppm
	51					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-002	SHEET No. 5 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	51	ML	SILT WITH SAND, MEDIUM, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY SILT, TRACE CLAY			ROCK LODGED IN SHOE @ 53.5 FT
	52					
	53					HORIZONTAL BEDDING @ 52 FT (≈ 2 inches)
	54		N R			
1045	55	SP-SM	POORLY GRADED SAND WITH SILT, LOOSE, MOIST, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT, TRACE PEBBLES	90% 55.0-59.5		PID: 0.0 ppm 1120: TPH SAMPLE @ 59.5 FT
	56					
	57					
	58					
	59					HARD DRILLING @ 59 FT
			N R			
1107	60	CL	CLAY, LEAN, HARD, MOIST, STRONG BROWN (7.5YR 5/6) TRACE SILT, MOSTLY CLAY	60% 60.0-63.0		PID: 0.0 ppm SLIGHT BEDDING IN THE CLAY.
	61	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE			
		CL	LEAN CLAY, AS ABOVE			
	62	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE			
	63	CL	LEAN CLAY, AS ABOVE			
	64		N R			
1145	65					

DRILLING LOG (Continuation Sheet)

I. PROJECT	INSTALLATION	HOLE No.	SHEET No.
LC-38 INVESTIGATION	WSMR	SB-002	6 OF 8

II. ELEVATION OF TOP HOLE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	65	CL	LEAN CLAY, HARD, MOIST, STRONG BROWN (7.5YR 5/6) MOSTLY CLAY, TRACE SILT	60 % 65.0-68.0		1256: CUTTINGS READ 3.5 VOC
	65.7					
	66	SP-SM	POORLY GRADED SAND WITH SILT, LOOSE, MOIST, REDDISH YELLOW (7.5YR 6/6) MOSTLY FINE SAND, TRACE SILT, TRACE PEBBLES			PID: 297 ppm in sand.
	67	CL	LEAN CLAY, AS ABOVE			1306: TPH, VOC, SVOC SAMPLES @ 66.5 FT VISIBLY SATURATED, STRONG DIESEL ODOR.
	68		N R			1300: BREATHING ZONE VOC READINGS 1.3-2.0 PPM
	69					
1255	70	CL	LEAN CLAY, AS ABOVE	100 %		PID: 16.0 ppm
	71					1348: TPH, VOC, SVOC SAMPLES @ 70.5 FT AND 74.5 FT @ 1355
	72	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE S			
	73	CL	LEAN CLAY, AS ABOVE			
	74					
1328	75	CL	LEAN CLAY, AS ABOVE, INCREASING SAND	74 % 75.0-78.7		PID: 2.7 ppm
	76					1424: TPH, VOC, SVOC SAMPLES @ 78.0 FT
	77	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE			
	78	CL	LEAN CLAY WITH SAND, HARD DRY, STRONG BROWN (7.5YR 5/6) MOSTLY CLAY, LITTLE SAND			
	79		N R			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-002	SHEET No. 7 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	79	CL N R	LEAN CLAY WITH SAND, HARD DRY, STRONG BROWN (2.5YR 5/6), MOSTLY CLAY, LITTLE SAND.			
1408	80	CL	LEAN CLAY WITH SAND, AS ABOVE	5 % 80.0 - 80.5		PID: 0.0 ppm CEMENTED SILT/SILTSTONE IN CORE SHOE STOPPED RECOVERY.
	81		N R			
	82					
	83					
	84					
1452 ~~1449~~ ~~1437~~	85	SP-SM	POORLY GRADED SAND WITH SILT, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, TRACE SILT, TRACE CALICHE NODULES.	40 %		PID: 1.3 ppm VERY HARD DRILLING 1608: TPH SAMPLE @ 86.5 FT
	86					
	87					
	88		N R			
	89					
1553	90	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, TRACE SILT.	30 %		PID: 1.5 ppm 1700: TPH SAMPLE @ 91 FT
	91					
	92					
	93					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No.	SHEET No.
WSMR	SB-002	8 OF 8

10. PROJECT: LC-38 INVESTIGATION

11. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	93					
	94		N R			
1638 11-7-03 DRILLING RESUMED @ 1612	95	ML	SILT WITH SAND, LOOSE, DRY, ~~REDDISH~~ BROWNISH YELLOW (~~7.5~~ 10YR 6/6), MOSTLY SILT, INCREASING FINE SAND	90 % 95.0-99.5	TPH @ 95 FT TPH @ 99.5 FT	
	96					
	97		CALICHE, HARD, DRY, WHITE, CARBONATE CEMENT			
	98	SP	POORLY SORTED SAND, LOOSE, DRY, ~~BROWN~~ REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, FEW SILT			
	99					
1624	TD					
~~1624~~	~~100~~					

DRILLING LOG	DIVISION	INSTALLATION	HOLE No.	SHEET No.
		WSMR	SB-003	1 of 8

1. PROJECT LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station)	12. MANUFACTURER'S DESIGNATION OF DRILL CME 75
3. DRILLING AGENCY RABA KISTNER	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
4. HOLE No. (As shown on drawing title and file number)	14. TOTAL NUMBER CORE BOXES
5. NAME OF DRILLER MANNY DUENEZ	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE — STARTED 11-8-03 0729 — COMPLETED 11-8-03/1338
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK N/A	18. TOTAL CORE RECOVERY FOR BORING
9. TOTAL DEPTH OF HOLE 99 FT — 10. SIZE AND TYPE OF BIT 4.25 ID HSA 5.0 FT CONT. CORE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
0729	0	SP	POORLY SORTED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND.	36% 0.0-1.8	TPH @ 1.5FT	PID: 0.0 ppm
	1					
	2		N R			
	3					
	4					
0730	5	GM	SILTY GRAVEL WITH SAND, HARD, DRY, PINK (7.5YR 8/4) MOSTLY GRAVEL, LITTLE VERY FINE SAND, TRACE SILT	36% 5.0-6.8		PID: 0.0 ppm
	6					
	7		N R			
	8					
	9					

DRILLING LOG (Continuation Sheet)	INSTALLATION	HOLE No. SB-003	SHEET No. 2 OF 8
I. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	9	GM	N R			
0740	10	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY MEDIUM SAND	46 %	TPH @ 10 FT	PID: 0.0 ppm
	11	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN, (7.5YR 5/6), MOSTLY CLAY, FEW CALICHE, TRACE SAND			
	12					
	13		N R			
	14					
0750	15	SP	POORLY GRADED SAND, AS ABOVE	20 % 15.0-16.0		PID: 0.0 ppm
	16					
	17					
	18		N R			
	19					
0803	20	SP	POORLY ~~SORTED~~ GRADED SAND, AS ABOVE, LITTLE CLAY	70 % 20.0-23.5	TPH @ 20 FT	PID: 0.0 ppm
	21					
	22	CL	LEAN CLAY WITH SAND, AS ABOVE			
	23					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-003	SHEET No. 3 OF 8
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	23	SP	POORLY SORTED SAND, AS ABOVE			
	24		N R			
0815	25	SP	~~A5~~ POORLY SORTED SAND, ~~A5~~ LOOSE, DRY, REDDISH YELLOW, (7.5 YR 7/6), MOSTLY MEDIUM SAND	50% 25.0-27.5		PID: 0.0 ppm
	26					
	27					
	28		N R			
	29					
0827	30	SP	POORLY SORTED SAND, MEDIUM, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY FINE SAND WITH SOME CEMENTATION, TRACE SILT	60% 30.0-33.0	TPH @ 30 FT	PID: 0.0 ppm
	31					
	32	SP	POORLY SORTED SAND, LOOSE, DRY, REDDISH YELLOW (7.5 YR 7/6), MOSTLY MEDIUM SAND			
	33					
	34					
0841	35	SP	POORLY SORTED SAND, AS ABOVE	56% 35.0-37.8		PID: 0.0 ppm
	36					
	37					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-003	SHEET No. 4 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	37	SP	POORLY SORTED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY MEDIUM SAND			
	38		N R			
	39					
0850	40	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT	80% 40.0-44.0		PID: 0.0 ppm
	41	SP	POORLY ~~SORTED~~ GRADED SAND, MEDIUM, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY MEDIUM SAND.			
	42					
	43					HARDER DRILLING @ 43FT
	44		N R			
0904	45	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT.	100%	TPH @ 50FT	PID: 0.1 ppm
	46					
	47					
	48					
	49					
0914	50	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE	70% 50.0-53.5		PID: 0.0 ppm
	51					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-003	SHEET No. 5 OF 8
I. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	51	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY FINE SAND, TRACE SILT			
	52					
	53					
	54		N R			
0935	55	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE	70% 55.0-58.5	TPH @ 60 FT	PID: 0.0 ppm
	56					
	57					
	58	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), TRACE SAND, FEW PEBBLES			
	59		N R			
0952	60		LEAN CLAY, AS ABOVE, INCREASING SAND	80% 60.0-64.0		PID: 0.0 ppm
	61					
	62	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE			
		CL	LEAN CLAY, AS ABOVE			
	63					
	64		N R			
1015	65					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-003	SHEET No. 6 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	65	ML	SILT WITH SAND, HARD, MOIST, BROWN (7.5YR 5/4), MOSTLY SILT WITH INCREASING FINE SAND	80 % 65.0-69.0	TPH, VOC, SVOC @ 66.0 FT	PID: 803 ppm @ 67 FT
	66					
	67	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), TRACE SAND/SILT		TPH, VOC, SVOC @ 67.0 FT	
	68				EQUIPMENT BLANK COLLECTED	
	69		N R			
1035	70	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, MOIST, REDDISH YELLOW (7.5YR 7/6), MOSTLY FINE SAND, TRACE SILT	60% 70.0-73.0	TPH, VOC, SVOC @ 71.3 FT	PID: 603 ppm @ 71.3 FT
	71					
	72	CL	LEAN CLAY, AS ABOVE			
	73					
	74		N R			
1100	75	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6) MOSTLY CLAY, LITTLE SAND, TRACE PEBBLES, SLIGHT BEDDING.	68% 75.0-78.4	TPH, VOC, SVOC @ 78 FT	PID: 0.0 ppm
	76	CL	LEAN CLAY, AS ABOVE			
	77					
	78					
	79					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-003	SHEET No. 7 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	79		N R			
1133	80	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, LITTLE SAND, TRACE PEBBLES, SLIGHT BEDDING	80% 80.0-84.0	TPH @ 84.5 FT	PID: 0.0 ppm PEBBLES ARE CALCAREOUS, POSSIBLY CALICHE
	81					
	82					
	83					
	84		N R			
1202	85	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY VERY FINE SAND, TRACE SILT.	70%	TPH @ 88 FT	PID: 4.9 ppm @ 85.5 FT
	86					
	87					
	88	ML	SILT WITH SAND, MEDIUM, DRY, BROWN (7.5YR 5/4), MOSTLY SILT.			TRACE VERY FINE SAND.
	89		N R			
1236	90	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, TRACE SAND, SLIGHT BEDDING.	90%		PID: 4.9 @ 92 FT
	91					
	92					
	93					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-003	SHEET No. 8 OF 8
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	93	CL				
		SP-SM	~~SILT W/~~ POORLY GRADED SAND WITH SILT, HARD, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY VERY→			FINE SAND, TRACE SILT.
	94	ML	SILT WITH SAND, HARD, DRY, BROWN (7.5YR 5/4), MOSTLY SILT.			SLIGHT BEDDING.
			N R			
1309	95	SP	POORLY GRADED SAND, LOOSE, DRY, PINK (7.5YR 7/4), MOSTLY FINE SAND, TRACE SILT	80% 95.0-99.0	TPH @ 98.5 FT	PID: 0.4 ppm
	96					
	97	CL	LEAN CLAY WITH SAND, HARD, DRY, BROWN (7.5YR 5/4), →			MOSTLY CLAY, TRACE SAND.
		SP-SM	POORLY GRADED SAND WITH SILT, HARD, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY FINE SAND, TRACE SILT, SLIGHT BEDDING.			
	98					SAND/CLAY BEDDING.
		ML	SILT WITH SAND ~~W~~ HARD, DRY, BROWN (7.5YR 5/4), MOSTLY SILT, TRACE SAND			
1338	99	TD				
	100					

DRILLING LOG	DIVISION	INSTALLATION	HOLE No.	SHEET No.
		WSMR	SB-004	1 OF 8

1. PROJECT LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station)	12. MANUFACTURER'S DESIGNATION OF DRILL CME 75
3. DRILLING AGENCY RABA KISTNER	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
4. HOLE No. (As shown on drawing title and file number)	14. TOTAL NUMBER CORE BOXES
5. NAME OF DRILLER MANNY DUENEZ	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE — STARTED — COMPLETED 11-9-03 — 0735 — 11-9-03/1341
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK N/A	18. TOTAL CORE RECOVERY FOR BORING
9. TOTAL DEPTH OF HOLE 100 FT — 10. SIZE AND TYPE OF BIT 4.25 ID HSA 5.0 FT CONT. CORE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
0735	0		ASPHALT/ROAD BASE	50 %		PID: 0.0 ppm
		SP	POORLY GRADED SAND, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT	0-2.5		
	1					
	2		CALICHE, HARD, DRY, WHITE			
		SP	POORLY GRADED SAND, AS ABOVE			
	3		N R			
	4					
0749						
0754	5	SP	POORLY GRADED SAND, HARD, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, TRACE SILT	40 % 5.0-7.0	TPH@ 6 FT	PID: 0.0 ppm
	6					
	7		N R			
	8					
	9					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-004	SHEET No. 2 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
0758	9		N R			
0808	10	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), VERY FINE SAND.	84% 10.0-14.2		PID: 0.0 ppm
	11					
	12					
	13	SP	POORLY GRADED SAND, HARD, DRY, REDDISH YELLOW (7.5YR 7/6), VERY FINE SAND →			SLIGHT CEMENTATION, POSSIBLY CALICHE
	14				TPH@14FT	
0810			N R			
0823	15	SP	POORLY GRADED SAND, ~~AS ABOVE~~ MEDIUM, MOIST, REDDISH YELLOW (7.5YR 6/6), VERY FINE SAND.	50% 15.0-17.5		PID: 0.0 ppm
	16					
	17					
	18		N R			
	19					
0824	20					
0831		SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, INCREASED CEMENTATION	70% 20.0-23.5	TPH@20FT	PID: 0.0 ppm
	21					
	22					
	23					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-004	SHEET No. 3 OF 8
I. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	23	SP	POORLY GRADED SAND. AS ABOVE			
	24		N R			
0835	25	SP	POORLY GRADED SAND, MED., DRY, REDDISH YELLOW (7.5YR 6/6) MOSTLY VERY FINE SAND, INCREASING CEMENTATION.	64% 25.0-28.2		PID: 0.0 ppm
0845	26					
	27	ML				
	28	SP	POORLY GRADED SAND, AS ABOVE			
	29		N R			
0848	30	SP	POORLY GRADED SAND, ~~AS ABOVE~~ DECREASING CEMENTATION	70% 30.0-33.5	TPH@30 FT	PID: 0.0 ppm
0856	31					
	32	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY VERY FINE SAND, LITTLE SILT			
	33					
	34		N R			
0857	35	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY VERY FINE SAND, LITTLE SILT, TRACE PEBBLES.	70% 35.0-38.5		PID: 0.0 ppm
0914	36					
	37					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-004	SHEET No. 4 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	37	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, LITTLE SILT, TRACE PEBBLES.			
	38					
	39		N R			
0917						
0924	40	SP	POORLY GRADED SAND, AS ABOVE	60 % 40.0-43.0	TPH@40FT DUPLICATE @ 40FT	PID: 0.0ppm
	41					
	42					
	43					
	44		N R			
0931						
0939	45	SP	POORLY GRADED SAND, AS ABOVE	72 % 45.0-48.6		PID: 0.4 ppm @ 45.5 FT
	46					
		SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, FEW SILT, TRACE CLAY			
	47					
	48					
	49		N R			
0948						
0954	50	SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 6/4), MEDIUM SAND, TRACE PEBBLES	60 % 50.0-53.0	TPH@50FT	PID: 0.0ppm SLIGHTLY CEMENTED IN ISOLATED AREAS
	51					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-004	SHEET No 5 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	51	SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5 YR 6/4), MEDIUM SAND, TRACE PEBBLES.			
	52					
	53					
	54		N R			
0957	55					
1022		SP	POORLY GRADED SAND, AS ABOVE	80% 55.0-59.0		PID: 0.0 ppm
	56					
	57	SP-SM	POORLY GRADED SAND WITH SILT, MED., DRY, REDDISH YELLOW →			(7.5 YR, 6/6), MOSTLY FINE SAND, FEW SILT, TRACE CLAY.
		CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5 YR 5/6) →			MOSTLY CLAY, LITTLE SAND
	58	SP-SM	POORLY GRADED SAND WITH SILT, AS ABOVE			
		SP	POORLY GRADED SAND, AS ABOVE			
	59		N R			
1028						
1038	60	SP	POORLY GRADED SAND, AS ABOVE	94% 60.0-64.7		PID: 400 ppm @ 63.3 FT
		CL	LEAN CLAY WITH SAND, HARD, MOIST, STRONG BROWN (7.5 YR 5/6), MOSTLY CLAY, TRACE SAND			
	61					
	62					
	63					
		SP	POORLY GRADED SAND, AS ABOVE		TPH, VOC, SVOC @ 63.3 FT	SP-MOIST W/HIGH VOC
		CL	LEAN CLAY WITH SAND, AS ABOVE		TPH @ 64 FT	
	64					
1042	65		N R			

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No.	SHEET No
WSMR	SB-004	6 of 8

1. PROJECT: LC-38 INVESTIGATION

11. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
1058	65	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, LITTLE SAND	100 %		PID: 3.9 @ 65.5 FT SLIGHT BEDDING
	66					
	67					
	68					
	69	SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 6/4) →			MEDIUM SAND, TRACE SILT
1107		CL	LEAN CLAY WITH SAND, AS ABOVE			
1116	70	CL	LEAN CLAY WITH SAND, AS ABOVE	100 %	TPH @ 70 FT 75 FT	PID: 0.0 ppm
	71					
	72					
	73					
	74	CL	LEAN CLAY, HARD, DRY, ~~STRONG~~ BROWN (7.5YR 6/4), TRACE CALCAREOUS NODULES			
1127		ML	SILT WITH SAND, HARD, DRY, BROWN (7.5YR 5/4), TRACE SAND			
1146	75	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, LITTLE SAND	100 %		PID: 0.9 ppm @ 76 FT
	76					
	77					
	78					
	79					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-004	SHEET No. 7 of 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	79	CL	LEAN CLAY, HARD, DRY, LIGHT BROWN (7.5YR 5/4), TRACE CALCAREOUS NODULES			
1157						
1206	80	CL	LEAN CLAY, AS ABOVE	100 %		PID: 0.7 ppm @ 83 FT TRACE POSSIBLE ORGANIC MATERIAL
	81					
	82	SP	POORLY GRADED SAND, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, TRACE SILT			
	83					
	84				TPH@84FT	
1221						
1238	85	ML	SILT WITH SAND, HARD, MOIST, BROWN (7.5 YR 5/4), TRACE FINE SAND	70 % 85.0-88.5		PID: 0.4 ppm @ 86 FT
	86					
	87	CL	LEAN CLAY, AS ABOVE			
	88					
	89		N R			
1251						
1303	90	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY VERY FINE SAND, TRACE SILT	100 %	TPH@90 FT	PID: 0.0 ppm
	91	SP	POORLY GRADED SAND, AS ABOVE			
	92	CL	LEAN CLAY, AS ABOVE			
	93					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-004	SHEET No. 8 OF 8
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	93	CL	LEAN CLAY, AS ABOVE			
		~~SP~~ SP	POORLY GRADED SAND, AS ABOVE			
	94					
		CL	LEAN CLAY, AS ABOVE			
1318					TPH@95FT	
1335	95	SP	POORLY ~~SORTED~~ GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT	40% 95.0-97.0		PID: 0.0 ppm
	96					
	97				TPH@97FT	
	98		N R			
	99					
1341	100	TD				

DRILLING LOG	DIVISION	INSTALLATION	HOLE No.	SHEET No.
		WSMR	SB-005	1 OF 9

1. PROJECT: LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
2. LOCATION (Coordinates or Station):	12. MANUFACTURER'S DESIGNATION OF DRILL: CME 75
3. DRILLING AGENCY: RABA KISTNER	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED:
4. HOLE No. (As shown on drawing title and file number):	14. TOTAL NUMBER CORE BOXES:
5. NAME OF DRILLER: MANNY DUENEZ	15. ELEVATION GROUND WATER:
6. DIRECTION OF HOLE: ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE: STARTED: 11-10-03 1344 COMPLETED: 11-11-03/1231
7. THICKNESS OF OVERBURDEN:	17. ELEVATION TOP OF HOLE:
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: 80.4 FT (73.1%)
9. TOTAL DEPTH OF HOLE: 110 FT; 10. SIZE AND TYPE OF BIT: 4.25 HSA, 5.0 FT CONT. CORE	19. SIGNATURE OF INSPECTOR: Mark Maimer

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
1344	0	SP	ROAD GRAVEL. POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT	50% 0.0-2.5		PID: 0.0 ppm
	1		CALICHE, HARD, DRY, WHITE (7.5YR 8/1), FEW FINE SAND			
	2					
	3		N R			
	4					
1346	5		CALICHE, AS ABOVE (A/A)	80% 5.0-9.0		PID: 0.0 ppm
1352	6					
	7					
	8	ML	SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, SOME CALICHE		TPH@ 8.5 FT	TRACE BLACK POSSIBLY ORGANIC MATERIALS
	9					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No.	SHEET No
WSMR	SB-005	2 OF 9

1. PROJECT: LC-38 INVESTIGATION

11. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
1354	9	ML	N R			
1404	10		SILT, AS ABOVE, DECREASING CALICHE WITH DEPTH	50 % 10.0-12.5		PID: 0.0 ppm
	11					
	12	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5 YR 7/6), FINE SAND, TRACE SILT			
	13		N R			
	14					
1406						
1416	15		POORLY GRADED SAND, A/A AS ABOVE	46 % 15.0-17.3		PID: 0.0 ppm
	16					
	17					
	18		N R			
	19					
1417						
1424	20		POORLY GRADED SAND, A/A	68% 20.0-23.4	TPH@20 FT	PID: 0.0 ppm
	21					
	22	SP	POORLY GRADED SAND, HARD, DRY, LIGHT BROWN (7.5 YR 6/4), MEDIUM SAND, LITTLE CLAY			1/2" BEDDING FROM 22-23 FT
	23					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-005	SHEET No. 3 OF 9
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	23	SP				
	24		N R			
1425						
1432	25		POORLY GRADED SAND, A/A, INCREASING CLAY WITH DEPTH.	66% 25.0-28.3		PID: 0.0 ppm
	26					
	27					
	28	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 7/6), FINE SAND, TRACE SILT.			
	29		N R			
1434						
1445	30		POORLY GRADED SAND, A/A	60% 30.0-33.0	TPH@30FT	PID: 0.0 ppm
	31					
	32	SP	POORLY GRADED SAND, HARD, DRY, LIGHT BROWN (7.5YR 6/4), MEDIUM SAND, LITTLE CLAY.			1/2" BEDDING
	33					
	34		N R			
1446						
1456	35		POORLY GRADED SAND, A/A LOOSE, DRY, REDDISH YELLOW (7.5YR 7/6), FINE SAND, TRACE SILT.	50% 35.0-37.5		PID: 0.0 ppm
	36					
	37					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-005	SHEET No. 4 of 9
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	37	SP				
	38		N R			
	39					
1457	40					
1507			POORLY GRADED SAND, N/A	100 %	TPH@40FT	PID: 0.0 ppm
		ML	SILT, MEDIUM, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY SILT, TRACE SAND.			
	41					
	42					
	43	SP-SM	POORLY GRADED SAND WITH SILT, HARD, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY VERY FINE SAND, LITTLE SILT			
	44					
1509						
1529	45			100 %		PID: 1.9 ppm @ 49.5 FT
		ML	SILT, MEDIUM, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY SILT, TRACE CLAY			
	46					
	47	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5 YR 5/6), MOSTLY CLAY, TRACE SAND.			
	48					
	49					
		SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5 YR 7/6), FINE SAND, TRACE SILT			
1534						
1555	50			90 % 50.0-54.5		PID: 1.0 ppm
	51					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-005	SHEET No. 5 OF 9
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	51					
	52					
	53	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, LITTLE SILT.		TPH, VOC, SVOC @ 54 FT	
	54		N R			
1608	55					
11-11-03 0714		ML	POORLY SILT WITH SAND, MEDIUM, MOIST, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, LITTLE SAND	84 % 55.0-59.2		PID: 97.7 @ 58 FT
	56					SLIGHT CEMENTATION IN ISOLATED ZONES
	57					
	58					
	59				TPH, SVOC, VOC @ 59 FT	
			N R			
0720	60					
0728			SILT WITH SAND, A/A	98 % 60.0-64.9		PID: 805 @ 60.5 FT
	61	SP-SM	POORLY GRADED SAND WITH SILT, A/A			
	62	CL	LEAN CLAY WITH SAND, HARD, MOIST, STRONG BROWN, (7.5YR 5/6), MOSTLY CLAY, TRACE SAND.			
		SP-SM	POORLY GRADED SAND WITH SILT, A/A			
	63				TPH, SVOC, VOC @ 63 FT	
	64	CL	LEAN CLAY WITH SAND, A/A			
0740	65		N R		TPH, SVOC, VOC @ 64.5 FT	

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No.	SHEET No.
WSMR	SB-005	6 of 9

1. PROJECT: LC-38 INVESTIGATION

11. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
~~0806~~ 0752	65	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, MOIST, REDDISH YELLOW (7.5 YR 7/6), MOSTLY VERY FINE SAND, LITTLE SILT	70% 65.0-68.5		PID: 625 ppm @ 66 FT
	66					
	67					VISIBLE PRODUCT IN THIS INTERVAL (68-69 FT)
	68	CL	LEAN CLAY WITH SAND, HARD, WET, STRONG BROWN (7.5 YR 5/6), MOSTLY CLAY, TRACE VERY FINE SAND.		TPH, SVOC, VOC @ 68 FT	
	69		N R			
0806	70					
0819		CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5 YR 5/6), TRACE SILT	80% 70.0-74.0		PID: 396 ppm @ 73 FT BEDDED CLAY
	71					
	72	SP	POORLY SORTED SAND, LOOSE, MOIST, REDDISH YELLOW (7.5 YR 6/6), MOSTLY FINE SAND, TRACE SILT			
	73				TPH, VOC, SVOC @ 73.6 FT	
	74		N R			
0838	75					
0846		CL	LEAN CLAY, A/A	60% 75.0-78.0		PID: 11.1 ppm @ 75.5 FT
	76	SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, MOIST, REDDISH BROWN (7.5 YR 7/6), MOSTLY VERY FINE SAND, LITTLE SILT, LITTLE CLAY.			
	77				TPH @ 77.5	CLAY LAMINAE @ 76.5-77.0 FT
	78		N R			
	79					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-005	SHEET No. 7 OF 9
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	79		N R			
0900						
0916	80	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, TRACE FINE SAND, TRACE SILT, TRACE CALICHE.	100 %		PID: 11.2 ppm @ 80.5 FT
	81					
	82					INCREASING SILT TO END OF INTERVAL BEGINNING @ 82 FT.
	83					
	84					
0933					TPH@ 84.9 FT	
0944	85	ML	SILT WITH SAND, MEDIUM, DRY, BROWN (7.5YR 5/4), TRACE FINE SAND.	100 %		PID: 5.1 ppm @ 85.5 FT
	86					
	87					
	88	SP	POORLY ~~SORTED~~ GRADED SAND, MEDIUM, DRY, REDDISH BROWN (7.5YR 6/6), MOSTLY VERY FINE SAND, TRACE SILT, TRACE CALICHE PEBBLES.			
	89					
0958					TPH@ 89.8 FT	
0013	90		POORLY GRADED SAND, A/A	60 % 90.0-93.0		PID: 6.8 ppm @ 92.5 FT
	91					
	92	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, FEW SAND.			
	93					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-005	SHEET No. 8 OF 9
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	93					
	94		N R			
1032						
1049	95	SP	POORLY GRADED SAND, MEDIUM, DRY, LIGHT BROWN (7.5YR 6/4), MOSTLY FINE SAND, TRACE SILT	56% 95.0-97.8		PID: 2.4 @ 96 FT
	96					
	97				TPH, SVOC, VOC @ 97.5 FT	
	98					
	99		N R			
1059						
1134	100		POORLY GRADED SAND, AIA	70.0 % 100.0-103.5		PID: 2.3 ppm @ 101 FT
	101					TRACE CALICHE @ 102.2 FT - 102.4 FT
	102				TPH, SVOC, VOC @ 103 FT	
	103	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, FEW SAND.			
	104		N R			
1140						
1203	105	SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 6/4), MOSTLY FINE SAND, TRACE SILT, FEW CLAY.	70.0 % 105.0 - 108.5		PID: 0.4 ppm @ 106 FT
	106					INCREASING CLAY W/DEPTH
	107					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-005	SHEET No. 9 OF 9
I. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	107	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5 YR 5/6), MOSTLY CLAY, LITTLE SAND			
	108				TPH, SVOC, VOC DUPLICATE @ 108 FT	
	109		N R			
1231	110					
	TD					

DRILLING LOG	DIVISION	INSTALLATION	HOLE No.	SHEET No.
		WSMR	SB-006	1 OF 8

1. PROJECT LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station)	12. MANUFACTURER'S DESIGNATION OF DRILL CME 75
3. DRILLING AGENCY RABA KISTNER	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN — DISTURBED: — UNDISTURBED:
4. HOLE No. (As shown on drawing title and file number)	14. TOTAL NUMBER CORE BOXES
5. NAME OF DRILLER MANNY DUENEZ	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE — STARTED: 11-11-03 1534 — COMPLETED: 11-12-03/1113
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK N/A	18. TOTAL CORE RECOVERY FOR BORING 73.2 FT (73.2 %)
9. TOTAL DEPTH OF HOLE 100.2 FT — 10. SIZE AND TYPE OF BIT	19. SIGNATURE OF INSPECTOR Mark Maine

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
1534	0	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5 YR 6/6), MOSTLY FINE SAND, TRACE SILT.	70% 0.0-3.5		PID: 0.0 ppm
	1					
	2		CALICHE, HARD, DRY, WHITE (7.5 YR 8/1), FEW FINE SAND.			
	3					
	4		N R			
1535						
1541	5			46% 5.0-7.3		PID: 0.0 ppm
	6	SP	POORLY GRADED SAND, ~~AS A~~ AS ABOVE (A/A)			
	7				TPH@7.0 FT	
	8		N R			
	9					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-006	SHEET No. 2 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	9		N R			
1542						
1555	10	SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 6/4), MOSTLY FINE SAND, TRACE SILT.	38 % 10.0-11.9		PID: 0.0 ppm
	11					
	12		N R			
	13					
	14					
1556	15					
1605		CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, TRACE FINE SAND, TRACE CALICHE	54 % 15.0-17.7		PID: 0.0 ppm
	16					
	17	SP	POORLY GRADED SAND, A/A			
	18		N R			
	19					
1606	20					
1615			POORLY GRADED SAND, A/A	50 % 20.0-22.5	TPH @ 20 FT	PID: 0.7 ppm @ 20.5 FT
	21					
	22					
	23		N R			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-006	SHEET No. 3 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	23					
	24		N R			
1615						
1624	25	SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 7/6), MOSTLY FINE SAND, TRACE SILT.	50% 25.0-27.5		PID: 0.0 ppm
	26					
	27					
	28		N R			
	29					
1625						
1634	30		POORLY GRADED SAND, A/A	58% 30.0-32.9	TPH@30FT	PID: 0.0 ppm
	31					
	32					
		CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), →			MOSTLY CLAY, TRACE FINE SAND.
	33					
	34		N R			
1635						
~~1634~~ 1645	35	SP	POORLY GRADED SAND, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT, FEW CALICHE	92% 35.0-39.6		PID: 0.0 ppm
	36					
	37					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-006	SHEET No. 4 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	37	ML	SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, TRACE CALICHE.			
	38					
	39					
1646			N R			
11-12-03 0703	40		SILT, A/A	54% 40.0-42.7		PID: 0.0 ppm
	41	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT			
	42					
	43		N R			
	44					
0705	45					
0713			POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 6/4), MOSTLY MEDIUM SAND, TRACE FINE SAND. →	40% 45.0-47.0		PID: 0.0 ppm COARSER W/DEPTH.
	46					
	47		N R			
	48					
	49					
0715						
0729	50		POORLY GRADED SAND, A/A	84% 50.0-54.2	TPH@50FT	PID: 0.0 ppm
	51					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-006	SHEET No. 5 OF 8
I. PROJECT LC-38 INVESTIGATION	H. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	51	SP				
	52	ML	SILT, HARD, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, TRACE SAND.			
	53					
		SP	POORLY GRADED SAND, LOOSE, DRY, LIGHT BROWN (7.5YR 6/4)			MOSTLY FINE SAND, TRACE SILT.
	54		CALICHE, HARD, DRY, WHITE →			(7.5YR 8/1)
			N R			
0731	55					
0738		CL	CALICHE, AS ABOVE LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, TRACE SILT, TRACE CALICHE.	100 %		PID: 0.0 ppm
	56					
	57	ML	SILT, HARD, DRY, REDDISH YELLOW (7.5YR 6/6) MOSTLY SILT, TRACE CLAY.			
	58					
		CL	LEAN CLAY, A/A.			
	59	ML	SILT, A/A			
		SP	POORLY GRADED SAND, A/A			
0744	60					
0758		CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, FEW SAND.	64 % 60.0-63.2	TPH @ 60 FT	PID: 1.4 @ 63.0 FT
	61					
		ML	SILT, A/A, MOIST			
	62					
	63	CL	LEAN CLAY WITH SAND, A/A			
	64		N R			
0802	65					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-006	SHEET No. 6 OF 8
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
0813	65	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), TRACE SAND, TRACE CALICHE.	100%		PID: 0.2@66/69 FT TRACE SAND OCCURRED IN LENSES WITHIN THE RUN.
	66					
	67					
	68					
	69					
0820	70				TPH@70 FT	
0831	70		LEAN CLAY, A/A	80% 70.0-74.0		PID: 0.0ppm
	71					
	72	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5 YR 5/6), MOSTLY CLAY, FEW FINE SAND, TRACE CALICHE.			
	73	ML	SILT, HARD, DRY, LIGHT BROWN (7.5 YR 6/4), MOSTLY SILT, TRACE CLAY. →			INCREASED CLAY W/DEPTH.
	74		N R			
0841	75					
0851				100%		PID: 0.0 ppm
	76	CL	LEAN CLAY, A/A			
	77	ML	SILT, A/A			
	78	CL	LEAN CLAY WITH SAND, A/A			
	79	CL	LEAN CLAY, A/A			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-006	SHEET No. 7 OF 8
I. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	79	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5 YR 5/6), MOSTLY CLAY, TRACE SILT.			
0904	80				TPH@80FT	
0916		SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY VERY FINE SAND, LITTLE SILT, TRACE CLAY.	96% 80.0-84.8		PID: 0.0 ppm
	81					
	82	CL	LEAN CLAY, A/A			
		SP	POORLY GRADED SAND, HARD, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY VERY FINE SAND, LITTLE CLAY, TRACE SILT. →			
	83					INCREASED CLAY CONTENT WITH DEPTH.
	84					
0933	85					
0948			POORLY GRADED SAND, A/A	100%		PID: 0.0 ppm
	86					
	87	ML	SILT, HARD, DRY, LIGHT BROWN (7.5YR 6/4), MOSTLY SILT, TRACE SAND.			
	88	SP	POORLY GRADED SAND, HARD, DRY, REDDISH YELLOW (7.5YR 6/6) MOSTLY VERY FINE SAND, LITTLE SILT, TRACE CALICHE.			
	89					
1002	90				TPH@90FT	
1015				100%		PID: 0.0 ppm
	91		CALICHE, HARD, DRY, WHITE →			(7.5YR 8/1)
		SP-SM	POORLY GRADED SAND WITH SILT, A/A			
	92		CALICHE, A/A			
		ML	SILT, A/A			
	93					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-006	SHEET No. 8 OF 8
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	93	ML				
		SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 7/6), MOSTLY VERY FINE SAND, LITTLE SILT			
	94					
1038	95					
1058				88% 95.0-99.4		PID: 0.0 ppm
	96	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT.			
	97					
		ML	SILT, HARD, DRY, LIGHT BROWN (7.5YR 6/4), MOSTLY SILT, TRACE-?			SAND.
	98	SP	POORLY GRADED SAND, A/A			
	99	ML	SILT, A/A		TPH, BVOC, SVOC @ 99 FT	
1113	100		N R			
	TD @ 100.2					

DRILLING LOG

DIVISION	INSTALLATION: WSMR	HOLE No.: SB-007	SHEET No.: 1 OF 9
1. PROJECT: LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
2. LOCATION (Coordinates or Station)	12. MANUFACTURER'S DESIGNATION OF DRILL: SME 75		
3. DRILLING AGENCY: RABA KISTNER	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN	DISTURBED	UNDISTURBED
4. HOLE No. (As shown on drawing title and file number)	14. TOTAL NUMBER CORE BOXES		
5. NAME OF DRILLER: MANNY DUENEZ	15. ELEVATION GROUND WATER		
6. DIRECTION OF HOLE: ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE	STARTED: 1339	COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE		
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: 79.55 (72.3%)		
9. TOTAL DEPTH OF HOLE	10. SIZE AND TYPE OF BIT	19. SIGNATURE OF INSPECTOR: Mark V. Maimer	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
1339	0		N R	0 %		PLUGGED CORE SHOE, NO RECOVERY THROUGH 5 FT.
	1					
	2					
	3					
	4					
1340	5	SP	POORLY GRADED SAND, LOOSE, MOIST, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT.	56 % 5.0-7.8		PID: 0.0 ppm SAND COARSENING TO MEDIUM W/DEPTH, SOME ISOLATED CEMENTATION.
1350	6					
	7					
	8		N R			
	9					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-007	SHEET No. 2 of 9
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	9		N R			
1351						
1357	10	SP	POORLY GRADED SAND, LOOSE, MOIST, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT.	50% 10.0-12.5	TPH@10 FT	PID: 0.0 ppm
	11					
	12	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5 YR 5/6), TRACE SAND.			
	13		N R			
	14					
1359						
1411	15	SP	POORLY GRADED SAND, A/A →	52% 15.0-17.6		PID: 1.2 ppm @ 16.3 FT COARSENING TO MEDIUM SAND @ 17.1 FT.
	16					
	17					
	18		N R			
	19					
1413						
1421	20		POORLY GRADED SAND, A/A →	50% 20.0-22.5	TPH, VOC, SVOC @ 20 FT	PID: 5.9 ppm @ 21.5 FT SAND FINING W/DEPTH.
	21					
	22					
	23		N R.			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-007	SHEET No. 3 OF 9
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	23					
	24		N R			
1423	25	SP	POORLY GRADED SAND, LOOSE, MOIST, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, FEW SILT. →	60 % 25.0-28.0	~~TPH~~, VOC, SVOC @ 25 FT	PID: 9.8 @ 27 FT
1430	26					FINING TO SILT @ 27.2 FT, THEN BACK TO FINE SAND.
	27					
	28					
	29		N R			
1432	30		POORLY GRADED SAND, A/A	56 % 30.0-32.8	TPH, VOC, SVOC @ 30 FT	PID: 7.3 ppm @ 32 FT
1440	31					
	32	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5 YR 5/6), MOSTLY →			CLAY, FEW SILT, FEW CALICHE.
	33					
	34					
1442	35		LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6). MOSTLY CLAY, LITTLE SAND.	75 % 35.0-38.75		PID: 0.8 ppm @ 36 FT
1453	36					
	37					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-007	SHEET No. 4 OF 9
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	37					
	38	CL	LEANCLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, TRACE SAND.			
	39		N R			
1455	40					
1505		ML	SILT, HARD, MOIST, REDDISH YELLOW (7.5YR 6/6, MOSTLY SILT, TRACE SAND.	64 % 40.0-43.2	TPH, VOC, SVOC @ 40 FT	PID: 18.2 @ 42.2 FT
		SP	POORLY GRADED SAND, LOOSE, MOIST, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT →			SAND COARSENING W/DEPTH.
	41					
	42					
	43	ML	SILT, A/A			
	44		N R			
1507	45					
1521			SILT, A/A	90 % 45.0-49.5	VOC, SVOC @ 45 FT	PID: 7.0 ppm @ 47.0 FT
	46					
	47					
			CALICHE, HARD, DRY, WHITE, (7.5YR 8/1), SOME SILT.			
	48					
		ML	SILT, A/A			
	49					
			N R			
1529	50					
1535			SILT, A/A	70 % 50.0-53.5	TPH, VOC, SVOC @ 50 FT	PID: 130 ppm @ 52.3 FT
	51					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-007	SHEET No. 5 OF 9
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	51	CL	LEAN CLAY, HARD, DRY, STRONG BROWN (7.5 YR 4/6), MOSTLY CLAY, TRACE FINE SAND.			
	52	ML	SILT, MEDIUM, MOIST, REDDISH YELLOW (7.5 YR 6/6), MOSTLY SILT, →			FEW SAND.
		SP-SM	POORLY GRADED SAND WITH SILT, MEDIUM, DRY, REDDISH YELLOW (7.5 YR 7/6), MOSTLY VERY FINE SAND, LITTLE SILT, TRACE CLAY.			
	53					
	54		N R			
1542						
1606	55			92% 55.0-59.6	VOC, SVOC @ 55 FT	PID: 316 @ 55.5 FT
	56	CL	LEAN CLAY, A/A			
	57					
		SP-SM	POORLY GRADED SAND WITH SILT, A/A			
	58	SP	POORLY GRADED SAND, LOOSE, MOIST, REDDISH YELLOW (7.5 YR 6/6), MOSTLY FINE SAND, TRACE SILT.			
	59	CL	LEAN CLAY, A/A		TPH, SVOC, VOC @ 59 FT	
1611			N R			
1629	60	ML	SILT, A/A	70% 60.0-62.5		PID: 555 ppm @ 61.5 FT
	61	CL	LEAN CLAY, A/A			
		ML	SILT, A/A			
	62	CL	LEAN CLAY, A/A →		TPH, SVOC, VOC @ 62.5 FT	VISIBLE PRODUCT IN THIS CLAY LAYER.
	63					
	64		N R			
1637	65					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-007	SHEET No. 6 OF 9
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
1657	65	CL	LEANCLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, TRACE SILT.	100%		PID: 419 ppm @ 66 FT
	66	ML	SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, TRACE CLAY.			
	67	CL	LEAN CLAY, A/A			
	68					
	69				TPH, SVOC, VOC @ 69.5 FT	
1304	70		LEAN CLAY, A/A			
11-13-03 0725				96% 70.0-74.8	~~TPH, SVOC, VOC @ 70 FT~~ ~~AM 6~~ TPH, SVOC, VOC @ 70 FT	PID: 0.4 ppm @ 74 FT INCREASING SILT/SAND CONTENT W/DEPTH.
	71					
	72					
	73					
		ML	SILT, A/A			
	74	CL	LEAN CLAY, A/A			
0731	75				SVOC, VOC @ 74.8 FT	
0744				86% 75.0-79.3		PID: 0.2 ppm @ 76 FT
	76	ML	SILT, A/A			
	77	CL	LEAN CLAY, A/A			
	78	SP	POORLY GRADED SAND, HARD, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE →			
	79					SILT, TRACE CLAY.

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-007	SHEET No. 7 of 9
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	79	SP				
0756	80		N R			
0812		SP-SM	POORLY GRADED SAND WITH SILT, HARD, MOIST, REDDISH YELLOW (7.5YR 7/6), MOSTLY FINE SAND, LITTLE SILT, TRACE CALICHE.	100 %		PID: 13.0 ppm @ 82.3 FT
	81					
	82					
	83	SP	POORLY GRADED SAND, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, TRACE SILT.		TPH, SVOC, VOC @ 83.3 FT	
	84				TPH @ 84 FT	
0823	85					
0830		CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, LITTLE SAND, FEW SILT, TRACE CALICHE	88 % 85.0-89.4		PID: 5.6 @ 87.7 FT
	86					
	87	ML	SILT, MEDIUM, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, TRACE SAND, TRACE CLAY, TRACE CALICHE NODULES			
	88					
	89				TPH, SVOC, VOC @ 89.5 FT	
0846	90		N R			
0859				90 % 90.0-94.5		PID: 13.0 ppm
	91					
	92	SP	POORLY GRADED SAND, A/A			
		ML	SILT, A/A			
	93	SP	POORLY GRADED SAND, A/A			BEDDING

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. SB-007	SHEET No. 8 of 9
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	93	SP				
	94	ML	SILT, HARD, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, TRACE CLAY			
0912			N R			
0930	95	SP	POORLY GRADED SAND, LOOSE, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY FINE SAND, FEW CLAY.	66 % 95.0-98.3		PID: 2.8 ppm @ 96.5 FT
	96					CLAY BEDDING @ 97.3 FT. INCREASED CLAY W/DEPTH.
	97				TPH, SVOC, VOC @ 97 FT	
	98					
	99		N R			
0942	100					
1003				90 % 100.0-104.5		PID: 0.4 @ 102.8 FT NO OTHER VOC HITS THIS RUN.
	101	CL	LEAN CLAY WITH SAND, HARD, DRY, STRONG BROWN (7.5YR 5/6), →			MOSTLY CLAY, LITTLE SAND/SILT.
	102	SP CL	POORLY GRADED SAND, A/A LEAN CLAY, HARD, DRY, STRONG BROWN (7.5YR 5/6), MOSTLY CLAY, TRACE SILT.			
	103				TPH & DUPLICATE @ 103.3 FT	
	104					
1024			N R			
1057	105		LEAN CLAY WITH SAND, A/A	90 % 105.0-109.5		PID: 0.0 ppm
	106					
	107					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No.	SHEET No.
WSMR	SB-007	9 OF 9

I. PROJECT: LC-38 INVESTIGATION

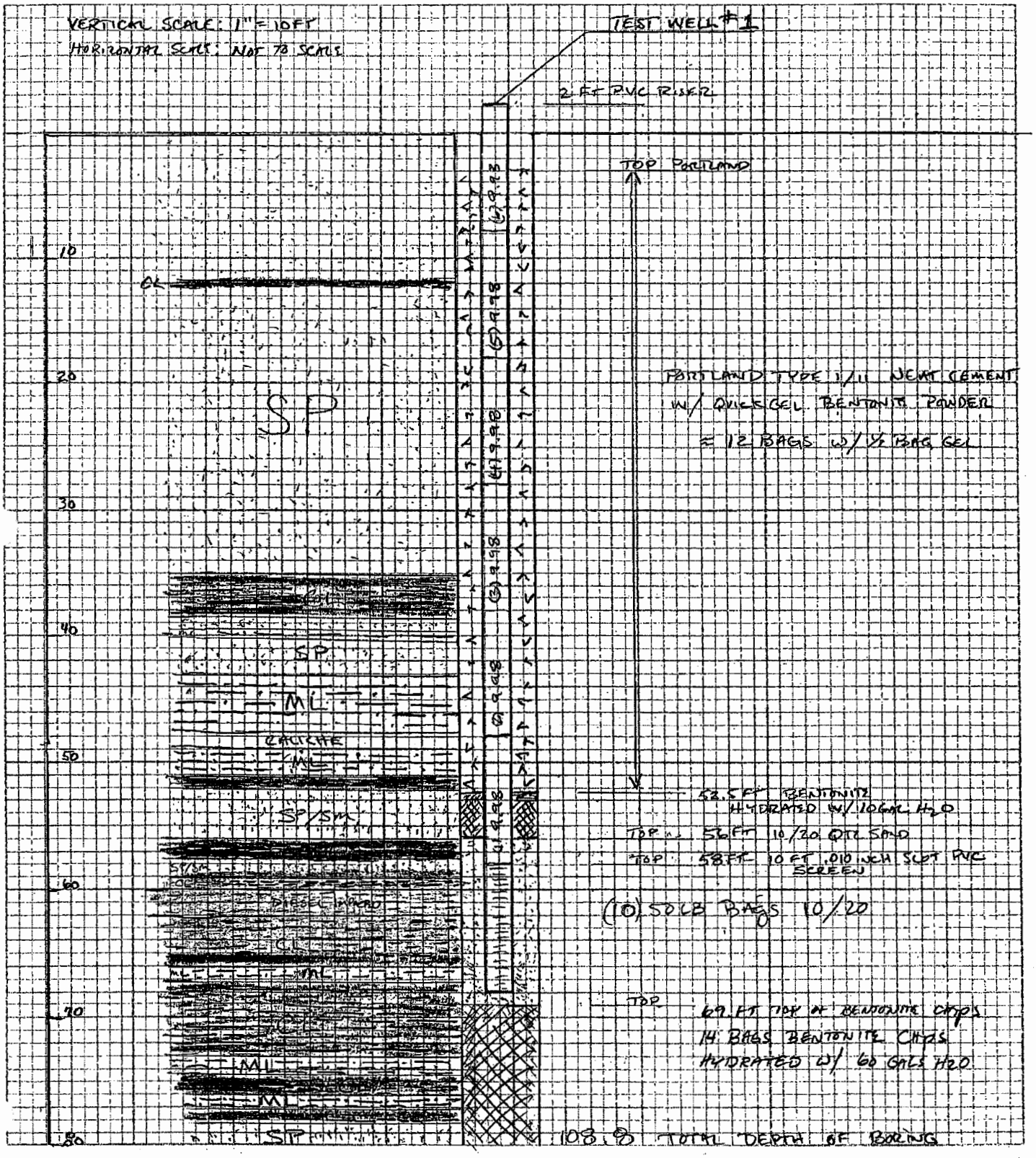
11. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	107	CL				
	108	SL	SILT, HARD, DRY, REDDISH YELLOW (7.5YR 6/6), MOSTLY SILT, TRACE CLAY.		TPH, SVOC, VOC @ 108.5 FT	
1116	109					1½" LEAN CLAY @ 109 FT
			N R			
	110					
	1					

PAGE ____ OF ____
PROJECT NO. ____
Prepared by ____ Date ____
Reviewed by ____ Date ____
Approved by ____ Date ____

CALCULATION SHEET

CLIENT ____ SUBJECT ____
PROJECT ____



Upstate Business Forms

SCALE: 10 sq./in

GROUND WATER MONITORING WELL INSTALLATION DETAIL

PROJECT: LC 38 DIESEL SPILL INVESTIGATION

LOCATION: WHITE SANDS MISSILE RANGE

CLIENT: BAE SYSTEMS

CONTRACTOR: NORTHWIND / RABA KISTNER

DRILLER: MANNY DUENEZ CERTIFICATION NO:

JOB NO

INSTALLATION NO WSMR

TYPE OF INSTALLATION REMEDIATION TEST WELL

BORING NO. TEST WELL #1

LOCATION SB007

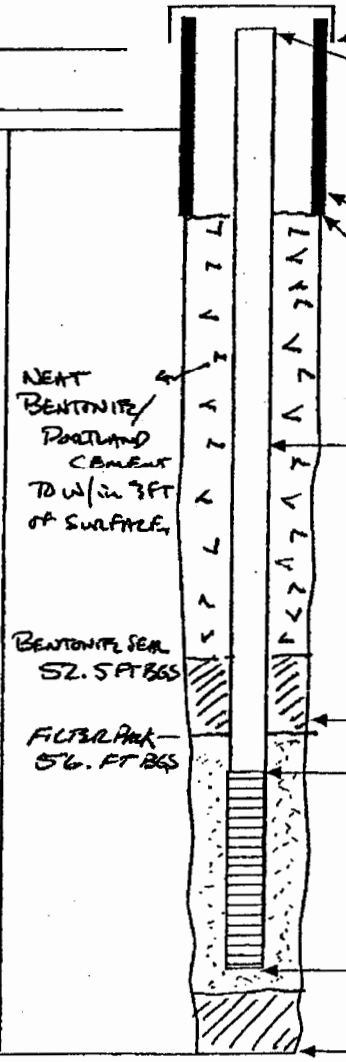
INSTALLATION DATE 11-13-03

SURVEY DATUM:

GROUND SURFACE ELEVATION:

SUMMARIZE CASING LENGTH, LOCATION OF JOINTS, CENTRALIZERS, ETC. (NOT TO SCALE)

CASING (6) 9.98 FT
SCREEN (1) 9.99 FT



TOP OF PROTECTIVE CASING

TOP OF WELL CASING OR RISER PIPE

EL. STICKUP

TYPE OF SURFACE SEAL NEAT/BENTONITE/CEMENT

THICKNESS OF SURFACE SEAL # 50 FT

TYPE OF PROTECTIVE CASING

INSIDE DIAMETER

BOTTOM OF PROTECTIVE CASING

EL. DEPTH

TYPE OF WELL CASING OR RISER 2.0" SCH40 PVC

INSIDE DIAMETER .163" ID

APPROXIMATE DIAMETER OF BOREHOLE NOMINAL 8 INCH

TOP OF WELLPOINT

EL. DEPTH 58 FT

TYPE OF WELLPOINT SCH40 PVC

SCREEN GAUGE OR SIZE OF OPENINGS .010 INCH

INSIDE DIAMETER .163

TYPE OF BACKFILL AROUND POINT 10/20 QTZ SAND

BOTTOM OF WELL

EL. DEPTH 68 FT

BOTTOM OF BOREHOLE

EL. DEPTH 108 FT

• FIGURES ABOVE REFER TO DEPTH IN FEET

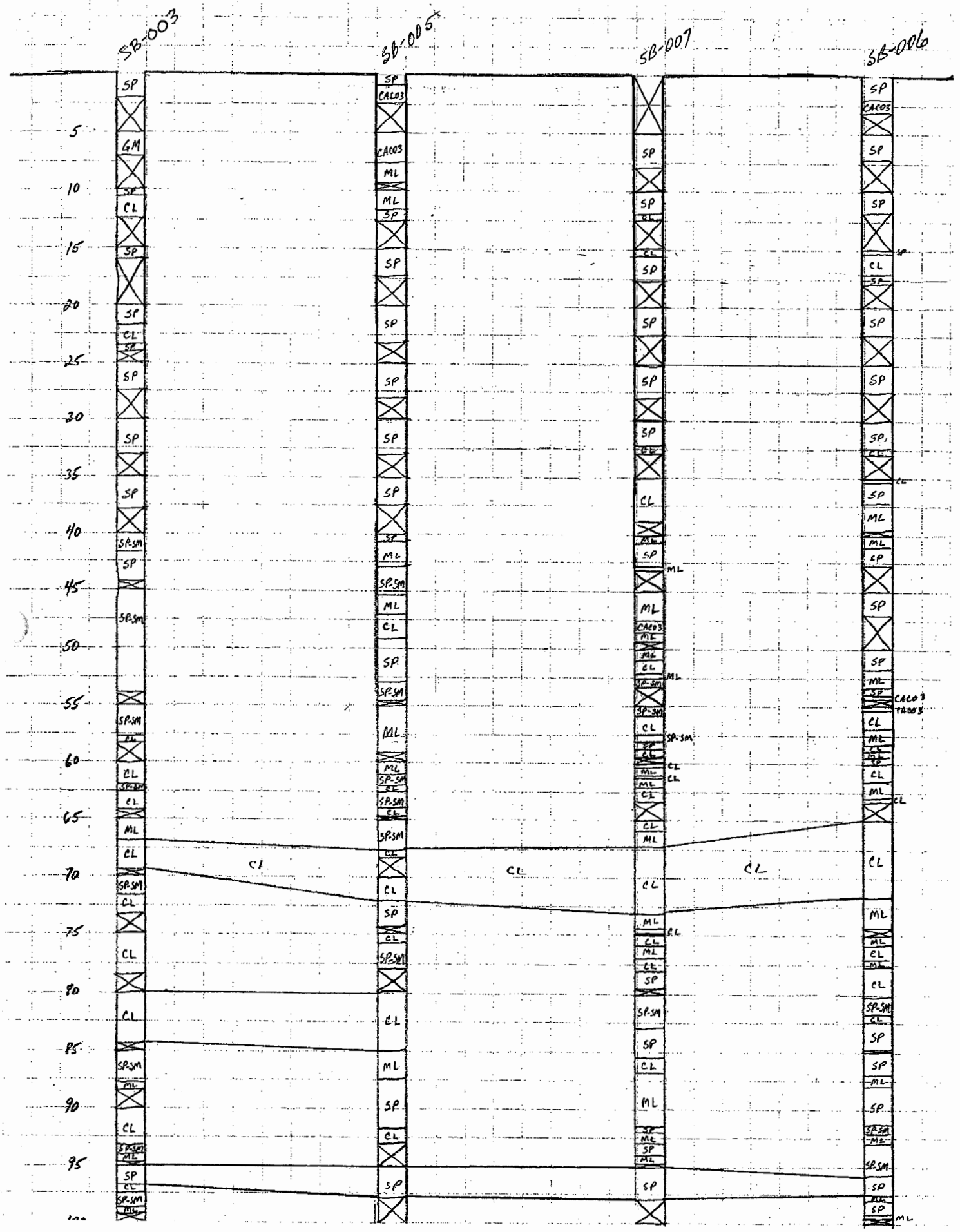
• ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

59.88 (LENGTH OF CASING) + 9.99 FT (LENGTH OF SCREEN AND PLUG) = 69.87 (TOTAL TO TOC)

BENTONITE SEALS

Rev. 5/93

Data/graphics/Tynda/F_GrdWtrDtl.fh8


SB-003
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SB-007
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APPENDIX C

Monitoring Well Lithologic Logs and Well Completion Diagrams
from the SWMU Assessment

DRILLING LOG	DIVISION	INSTALLATION	HOLE No.	SHEET No.
	BAE	LC 38	MW001	1 OF 10

1. PROJECT: LC 38 Diesel Fuel Spill	11. DATUM FOR ELEVATION SHOWN (TBM or MSL): TBD.
2. LOCATION (Coordinates or Station): E of BLDG 2608	12. MANUFACTURER'S DESIGNATION OF DRILL: GARDNER DENVER 1500
3. DRILLING AGENCY: GEO PROJECTS	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN: N/A; DISTURBED: ; UNDISTURBED:
4. HOLE No. (As shown on drawing title and file number): MW001 BACKGROUND (UPGRADIENT)	14. TOTAL NUMBER CORE BOXES: N/A
5. NAME OF DRILLER: LEE GERBERT	15. ELEVATION GROUND WATER: TBD ≈ 235 FT
6. DIRECTION OF HOLE: ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE: STARTED 12/6/03; COMPLETED 12/7/03
7. THICKNESS OF OVERBURDEN: > 1000 FT	17. ELEVATION TOP OF HOLE: TBD
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: N/A
9. TOTAL DEPTH OF HOLE: 261.75 FT; 10. SIZE AND TYPE OF BIT: 7 7/8 TRICONE BUTTON	19. SIGNATURE OF INSPECTOR: J.E. Gillespie

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
0						0710
			RED, MOTTLED MEDIUM - FINE SAND LITTLE BLACK MINERALS CALICHE. LENS			SAMPLE @ 5 FT. BLACK - HEMATITE/ MAGNETITE HEAVY MINERALS.
	10		CALICHE. W/ MEDIUM TO FINE SAND. SILT AND CLAY AS A MINOR CONSTITUENTS			0730
			COBBLY LAYER @ 15.5			

DRILLING LOG (Continuation Sheet)	INSTALLATION LC 38	HOLE No MW001	SHEET No 2 OF
I PROJECT LC 38 MONITORING WELLS	II ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			CALICHE. WITH MORE CLAY CONSTITUENT.			0735
	20		PURE SAND.		- 20	ADDING ROD #1 0745 20-40
				N/A	- 25	NOTE: 6X9 MUD PUMP Pumping 250 gpm ASCENDING RATE of cuttings ≈ 120 FT/MIN ASCENDING VELOCITY CONSOLIDATED CUTTINGS 1/4" CHIPS
			SILT FINE SAND SEMI CONSOLIDATED LIGHT BROWNISH RED			
	30		FINE SAND. FEW DARK MINERALS NO CALICHE MED-FINE SAND		- 30	0750
				N/A	- 35	Drilling Rate LESS THAN 1 min/ft Average over 30-40 INTERBEDDED MATERIALS
			CLAY WITH SAND INTERBEDDED CONDITIONS FEW CALICHE			
	40		SAND, MOSTLY MED. CALICHE, HARD @ 41 FT HARD DRILLING CORBELS CALICHE CEMENTED ZONES ≈ 2 FT	N/A	40	0753 ADDING ROD #2 40-60 FT. 0759
			CLAY			

DRILLING LOG (Continuation Sheet)	INSTALLATION LC 38	HOLE No	SHEET No 3 OF
I PROJECT LC 38 MONITORING WELL INSTALLATION	II ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			HARD Rillin CEMENTED SAND PER GRAVEL SIZE ≈ 1 FT			CALICHE CARBONATE CEMENTED LAYER
	50		BACK INTO CLAY w/ FINE - MED SAND. LITTLE TO FEW SILT.	50		
			NOTE: WHITE CARBONATE CALICHE NODULES THROUGHOUT.	55		
			SAME MATERIAL	60		0810 Down @ 60
	60					ADD ROD # 3 0829 60-80 FT
			CEMENTED GRAVEL OR MORE CONSOLIDATED MATERIAL			
	70		CONTINUING TO BE CONSOLIDATED			
			SMOOTHER Drillin PERHAPS MORE SAND CONTENT.			
	76					

DRILLING LOG (Continuation Sheet)	INSTALLATION LC 38	HOLE No MW001	SHEET No 4 OF
1 PROJECT LC 38 MONITORING WELL INSTALLATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	76					
	~~85~~		CLAY @ 75 - TRACE LEAN LAYER FINE SAND TRACE SILT			SMOOTH DRILLING ADDING WATER. DRILLING RATE IN CLAY ≈ 2 MIN/FT
	80					0857 @ 80 FT
			CLEAN CLAY, TRACE FINE SAND / SILT.			ADDING ROD # 4 80-100 FT. 0909 DRILLING 81-82 FT DRILLING RATE 5 MIN/FT
			LEAN CLAY TRACE V. FINE SAND / SILT. SOME INTERBEDDED SANDS.			AVG. 2-3 MIN/FT DRILL RATE
	~~90~~					
	90		INCREASED SAND CONTENT			0932
			@94 SLOWED DRILL RATE LEAN CLAY.			NOTE: CLAY cuttings MAY BE ONLY cuttings OBSERVED DUE TO SAND/SILT IN SUSPENSION IN DRILLING FLUID
	100		DROP OUT OF CLAY! INTO SANDS @ ≈99 FT.			AVG OVER 20 FT 1.5 MIN/FT 0943 @ 100 FT
						ADDING ROD # 5 0951 DRILLING 100-120
			LEAN CLAY @ 101-102 TRACE SILT / FINE SAND			

848/0851

DRILLING LOG (Continuation Sheet)	INSTALLATION: WSMR	HOLE No: MW001	SHEET No: 5 OF
1 PROJECT: LC38 Monitoring well installation	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
			0951 Drilling @ 100			Slow Drilling 3-4 min/FT
						INTERBEDDED SANDS/CLAY
			LEAN Clay, Little Fine Sand			106.5 - 1/2 FT SAND Clay.
			Drag into Sand Lens			
	110					
			-@114.5 Lean Clay.			- 10:22:00/10:26:20 4min 20" Drill Rate in Lean Clay
						Avg Drilling Rate 2.3 min/FT from 100 - 120
	120		Lean Clay with few fine sand/silt.			10:38:20 @ 120
			INTERBEDDED SANDS w/silts & Clay lenses			Adding Rod # 6 120-140 FT. 10:47:30 Drilling
			Slight increase in Sand @ Beginning of Run.			
			- INCREASED SAND Content @ 129 Fine to Medium Sand.			11:04:00 INCREASE in Drill Rate
	130					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW001	SHEET No 6 OF
I PROJECT LC38 MW INSTALLATION	II ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	132		-@134 FT CLAY LEAN - LITTLE - TRACE FINE SAND/SILT.			NOTE: INTERBEDDED SILTY SAND AND LEAN CLAY LAYERS POSSIBLY LESS THAN 1 FT THICK CUTTINGS FROM CLAY LAYERS ONLY.
			SILTY CLAY TO 140			AVG DRILLING RATE 2.25 min/FT
			NOTE: CLEAN OUT MUD PAN & ADD FRESH WATER TO THIN DOWN MUD. ≈ 250 GALLONS	-300gm.		Begin 10:47:30 Down @ 11:33:34
	140					ADD ROD # 7 140-160 12:20:00 Drill
			- DROP OUT OF CLAY INTO SAND FAIR 1-2 FT FINE - MED SAND			SAND NOT OBSERVED IN CUTTINGS.
			- OUT OF SAND @ 149			
	150		SILTY CLAY			
			- 153 → 154.5 SAND			
			SILTY CLAY			
			- 155 → 158 SAND			
			SILTY CLAY			
	160					13:02 Down @ 160

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW001	SHEET No 7 OF
I PROJECT LC 38 MW INSTALLATION	II ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	160		LEAN CLAY w/ SILT & TRACE FINE SAND.			ADDING ROD # 8 160 - 180 13:11:00 Drilling
			- SAND LENS @ 164 - 167 & @ 167.5 - 176			Rig chattering Drilling through softer material increased silt & sand content
	170					
			Drop out of sand @ ≈176			
			LEAN CLAY WITH SILT AND TRACE FINE SAND			AVG DRILLING RATE 160-180 1.15 min/FT. 1334 @ 180FT
	180		SAME MATERIAL			ADDING ROD # 9 180 - 200 FT. ADDING FRESH WATER Begin Drilling @ 13:47:00
			@ 185FT Drop into SAND LENS 185 - 188 FT			3FT SAND LAYER
	190					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW001	SHEET No 8 OF
PROJECT LC 38 MW INSTALLATION	ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	188					180 13:47:00
	190		LEAN Clay WITH TRACE SILT AND FINE SAND.			
						ADDING 30-40 gal FRESH WATER
			@195 196FT SILTY SAND LAYER			INTERBEDDED THIN SAND / SILTY CLAY LAYERS.
			THEN SILTY SAND TO 200 FT INCREASED Drilling			AVG DRILLING RATE 2.5 min/FT
	200					Done @ 200FT 14:37:00
			SAND. SILTY SAND WITH TRACE CLAY DK Brown SILTY Clay LENSES.			ADD ROD # 10 14:56:00 Drilling
						ADDING 30-40 gal FRESH WATER.
			@206FT HARD RESISTANT Drilling.			±.5FT Thick CEMENTED SAND.
			@208FT HARD RESISTANT Drilling			±.5FT Thick CEMENTED SAND
	210		LEAN CLAY WITH TRACE SILT AND FINE SAND.			
	216		LEAN CLAY WITH TRACE SILT AND FINE SAND			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW001	SHEET No 9 OF
1 PROJECT LC 38 MW INSTALLATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH h	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	216		LEAN CLAY WITH TRACE SILT AND FINE SAND RELATIVELY SLOW DRILLING			14:56:00 42/20 = 2.1 min/ft AVERAGE DRILL RATE
	220					Down @ 220 15:38
			INCREASING GRAIN SIZE LITTLE SILT OR SAND.			15:48:00 Drilling ADD 200 # 11 220 - 240 15:53 Thin Drilling MUD. 15:58 Resume Drilling
			ENTER SAND/SILTY SAND UNIT @ 226 - 229 FT.			
						≈ 228 BENTONITE SEAL
	230		LEAN CLAY WITH TRACE SILT AND FINE SAND ENTER SAND/SILTY SAND @ 231. - 231.5 LEAN CLAY.			233
			ENTER SAND/SILTY SAND @ 234. - 236			235 SCREEN
			LEAN CLAY	SCREEN	SAND/FILTER PACK	
	240		SAND/SILTY SAND @ 239 - 250			16:35 @ 240 FT
	244		SAND. FINE - MED INTERBEDDED W/ SILTY SAND OR SILTY CLAY LENS.			END OF 12/6/03 0738 Drilling

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW001	SHEET No 10 OF 10
9 PROJECT LC 38 MW INSTALLATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	244					
			SAND MED - FINE w/ INTERBEDDED SILTY CLAY	SCREEN		DRILLING RATE ≈ 1 min/FT Rig MAST "Chattering"
	250		SILTY CLAY w/ FINE SAND			SLOWER DRILLING FOR APPROX. 1.5 FT
			SAND MED - FINE			"CHATTERING"
			SILTY CLAY w/ FINE SAND @ ≈ 253 -			SLOWER DRILLING @ 254. ≈ 3 min/FT
					255	
				SUMP		
	260				260	
						0815 ON BOTTOM
						CONSTRUCT MONITORING WELL FROM 235 - 255 FT w/ 5 FT SS SUMP.
	270					

DRILLING LOG	DIVISION	INSTALLATION: WSMR	HOLE No.: MW002	SHEET No.: 1 OF 10

1. PROJECT: LC 38 MW INSTALLATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
2. LOCATION (Coordinates or Station): DOWN GRADIENT	12. MANUFACTURER'S DESIGNATION OF DRILL: GARDNER DENVER 1500
3. DRILLING AGENCY: GEO PROJECTS	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN: EVERY 5 FT — DISTURBED ✓ — UNDISTURBED
4. HOLE No. (As shown on drawing title and file number): MW 002	14. TOTAL NUMBER CORE BOXES: N/A
5. NAME OF DRILLER: LEE GIBBERT	15. ELEVATION GROUND WATER: ≈ 235 FT
6. DIRECTION OF HOLE: ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE — STARTED: 12/8/03 — COMPLETED: 12/9/03
7. THICKNESS OF OVERBURDEN: > 1000 FT	17. ELEVATION TOP OF HOLE: TBD
8. DEPTH DRILLED INTO ROCK: N/A — 3½ IF EXT. UPSET	18. TOTAL CORE RECOVERY FOR BORING: N/A
9. TOTAL DEPTH OF HOLE: 254.00 FT — 10. SIZE AND TYPE OF BIT: 7⅞ TRICONE Button	19. SIGNATURE OF INSPECTOR: [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Drilling w/out mud just plain water
	2		CARBONATE - Gypsum CALICHE.			50/50 Sand/Caliche mix.
	4		ORANGE BROWN FINE - V. FINE SAND.			
	6					INTERBEDDED Silty SANDS/CLAY
	8		MED DENSE SILTY SAND MATERIAL			THROUGHOUT
	10		FINE MED GRAY SAND			
	12		FINE SAND.			FAST DRILL
	14					.1 min/FT 13:40:42 = 13:41
	16		SILTY SAND MATERIAL			
	18					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No	SHEET No
WSMR	MW002	2 of 10

I PROJECT: LC 38 MW INSTALLATION

II ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	18		INCLUDED CLAY SILTY SAND			TELLY BIT/SUB 13:44 DOWN @ 20
	20		LOOSE SILTY SAND.			ADD ROD #1 13:49:42 DRILL
	22		CEMENTED LT BROWN SILTY FINE SAND.			INTERBEDDED SAND/SILTY SAND/ CEMENTED LAYERS w/ CLAY
	24					
	26		INTERBEDDED SAND/SILTY SAND/ CEMENTED FINE SAND			NOTE:
	28		CLAY @ 29 LT TAN YELLOWISH BROWN.			Cuttings observed CEMENTED SAND CLAY - OR SEMI CONSOLIDATED MATERIAL LOOSE SAND REMAINS IN SUSPENSION.
	30					
	32					
	34		FINE SAND - SILTY FINE SAND WITH LITTLE CLAY STRINGERS.			
	36		INCLUDED CLAY CUTTINGS. @ 36 YELLOWISH BROWN MNO2 STAINING CUTTINGS.			SEMI CONSOLIDATED CLAY CHIPS
	38					1.11 MIN/FT D.R. 14:08 DOWN @ 40
	40		LT BROWN CLAY LSAN w/ FINE SAND ? SILTY SAND INTERBEDDED 2 1 FT THICK			14:12 DRILL ROD # 3 (40-60)
	42					
	44		STRAY BROWN LSAN CLAY TO 46			
	46					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW 002	SHEET No 3 OF 10
1 PROJECT LC 38 MW INSTALLATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			SAND SILTY SAND FINE-MED.			(14:12) START NOTES
			LEAN STRONG BROWN CLAY TRACE SILT FINE SAND			INTERBEDDED LEAN clay/SILTY SAND LENS.
	50					
	2		SAND FINE/SILTY SAND			
	4		CEMENTED SILTY FINE SAND LAYER.			CEMENTED SILTY FINE SAND 54-56
	6		FINE SILTY SAND LOOSE. FAST DRILLING TO			SOME FLUID LOSS IN LOOSE
	8		60 FT			
	60		LOOSE SAND w/ MATRIX FINE TO MED SAND			14:26 ADD ROD # 9 (60-80) 14:30:00
	2		CLAY			
	4		SAND FINE-MED CEMENTED LAYER ~.5' thick CLAY LEAN TRACE SILT.			FAST DRILLING
	6		SAND FINE/MED. LOOSE.			
	8		LEAN CLAY TRACE @66 FINE SAND SILT. MnO2 STAINING on SURFACE			
	70		SAND. FINE-MED			
	2		CLAY LEAN STRONG BROWN. TRACE SILT V. FINE SAND			SLOW DRILLING
	4					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No	SHEET No
WSMR	MW-002	4 of 10

1 PROJECT: LC38 MW INSTALLATION

11 ELEVATION OF TOP HOLE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	4		LEAN CLAY STRONG BROWN. TRACE V. FINE SAND			CONSISTENT CLAY SLOW DRILLING.
	6		FINE SAND			
			LEAN CLAY SAME AS ABOVE MED DENSE STRONG BROWN.			
	8		@79 HARD DRILLING			CLAY DENSE
	80		LEAN CLAY TRACE SILT V. FINE SAND			14:47 DRILLING SOFT
						ADD ROD # 5 80 - 100 FT 14:50:00 DRILLING
	2					
	4		INCREASED FINE SAND SILT CONTENT DENSE 30 - 40% V. FINE SAND.			HARD DRILLING STRONG BROWN COLOR
	6					
						EASIER DRILL - DUE TO INCREASED SAND FINE - MED. < .5 FT
	8		LEAN CLAY WITH FINE SAND			HARD RESISTANT DRILLING
	90					
			SAND FINE - MED @ ≈ 91. THIN CONSOLIDATED AREAS CALCITE			
	2					
	4					FAST DRILLING
	6		LOOSE DRILL			
	8					
			LEAN CLAY LENS < .5 SAND. LOOSE FINE MED.			
	100					15:07:13 DRILL @ 100
						ADD ROD # 6 100 - 120

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW002	SHEET No 5 OF 10
I PROJECT LC 38 Drilling MW INSTALLATION	II ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					15:12 Drilling
	4					NOTE: Easy Drilling interbedded Lean Clay / Sandy Clay to 106.
	6		— Lean Clay trace to few fine v. fine sand trace m. sand			
	8					— Hard Drilling @108
	110		— Sand med-fine loose drilling — 2.5 ft — Lean Clay w fine sand. trace silt			
	2		— less increasing sand. — Sand med-fine loose sand.			
	4					
	6		— Lean Clay hard drilling trace silt med-fine sand			Less sand than above
	8					
	120		— Silty sand little clay — Lean Clay with little - few fine sand silt			15:30:50 @120 Add Rod #7 120-140 15:39:40
	2					
	4					
	6					
	8					
	130		— Sand fine			130

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. MW002	SHEET No. 6 OF 10
1 PROJECT LC 38 MW INSTALLATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	130		CEMENTED LARGER FRACTURED SAND CAPPED			HARD DRILLING
	2		LEAN CLAY W SAND & SILT. slightly CEMENTED.			
	4		INTERBEDDED LEAN CLAY, SILTY SAND.			HARD DRILLING
	6		SAND. FINE LOOSE			LOOSE .5-1.0 FT
			LEAN CLAY W/ FINE SAND.			
	8					
	140					16:03:57
						12-9-03 0940 DRILL 140-160 ROD # 8
	2					
	4					
	6		.5FT THICK SAND.			
	8		BACK INTO LEAN CLAY W/FINE SAND LT YELLOWISH BROWN - STRONG BROWN			
	150					
	2		.5FT SILTY SAND CONTAMINATED AREA			CEMENTED 152-152.5 CARBONATE AREA REDDISH SANDY CLAY SLOW DRILL
	4		LEAN SANDY CLAY IN CRUSHED SAND			FAST DRILL SAND LENS 156-159
	6		SAND .5FT SILTY			
	8					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW002	SHEET No 7 of 10
1 PROJECT LC 38 Monitoring Well Installation	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	158					
			Silty Sand, Sandy Clay			@ 160 0802 Dam
	160		Thinner Drilling Fluid increased penetration rate.			Add Rod #9 160-180 0813 Drilling
	2					
	4		Lean Clay			
	6		Sand, Loose. Fine - Med Sand			Fast Drilling Cuttings
	8					
	170					
	2		Loss of 50-75 gal of water in 15 ft of Sand			Thick Sand Lens Loose Fast Drill
	4					
	6					
	8					
	180					0823 @ 180 0833 Drilling Add Rod #10
	2					
			Lean Clay. Little			
	4					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW002	SHEET No 8 of 10
1 PROJECT LC 38 MW INVESTIGATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	186		SAND FINE-MED			
			LOOSE FAST DRILL			
	8					
	190					
			LEAN CLAY WITH FIN SAND TRACE SILT			
	2		CEMENTED LAYER @ 193 SILTY SAND!			
	4		SLOW HARD DRILL LEAN CLAY. @ 195			
	6		@196			
			SAND LOOSE DRILL			
	8					
	200		LOOSE DRILLING			0845 Down @ 200
						0858 Drill
	2		LOSS FLUID 50-75			ADD ROD #4
			GALLONS. INTO			
	4		CEMENTED ZONE @ 206-207			
	6		CEMENTED <.5 FT			- SAME LITHOLOGY AS MW001 ≈ 1 FT THICK CEMENTED AREA.
			HARD DRILLING @207.5 CLAY LEANS			
	8					
	210					
	2		INCREASED DRILL RATE INCREASED SAND CONTENT			
	4					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No	SHEET No
WSMR	MW002	9 of 10

10 PROJECT: LC 38 Drilling MW INSTALLATION

11 ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	214					
	6		LEAN STIFF CLAY SLOW DRILLING			≈ 1 FT THICK CLAY
	8		INCREASING SAND CONTENT.			
			SAND.			0910
	220		LEAN CLAY w/FINE SAND.			~~CLEAN~~ Reaming & MUD CONDITION ADD ROD # 12 0928 DRILLING
	2					
	4		CEMENTED SAND @ 229 LEAN CLAY			
	6					
	8					ADDING WATER TO MUD PAN. THICKEN MUD. ≈ 50-60 gal
			SILTY SAND CEMENTED LAYER @ 230			
	230		INCREASING FINE - MED SAND.			
	2					
			CEMENTED AREA. <.5 SAND.			
	4					
			CLAY @ 235			
	6		SAND, SILTY			FASTER DRILLING CHATTERING @ 239
	8					
			CLAY CONT. 239.5			
	240					DOWN @ 0952
			- <.5FT SAND LENS			ADD ROD # 13 240-260 10:03 CONDITIONING HOLE

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW002	SHEET No 10 OF 10
1 PROJECT LC 38 MW INSTALLATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	242					10:03
			1.5 SAND LENS			
			LEAN CLAY WITH TRACE SILT/FINE SAND. SLOW DRILLING			INTERBEDDED SILTY SAND/CLAY LENS 239-242
	4					
			SAND @ 245.5 SILTY, ~~5FT~~ 1.5FT			
	6		INCREASED CLAY CONTENT			SLOWER DRILLING @ 246
	8		CLAY @ 248.5			
	250		SAND LENS			
			CLAY OR CEMENTED LAYER			@ 251.
	2		SAND LENS 4.5 CLAY SAND.			
	4		LEAN CLAY			10:25 @ 254 TD
			TOTAL DEPTH OF EXPLORATION @ 254 FT			
	6		BACK FILL W/ 20/40 OON SAND.			
	8		CONSTRUCT 4" MONITOR WELL W/ SS .010 INCH SCREEN			
	260		FROM 225-245.0 5.0 FT SS SUMP.			

DRILLING LOG

DIVISION	INSTALLATION	HOLE No.	SHEET No.
	WSMR	MW003	1 OF 10

1. PROJECT: LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
2. LOCATION (Coordinates or Station): DOWN GRADIENT	12. MANUFACTURER'S DESIGNATION OF DRILL: GARDNER DENVER 1500
3. DRILLING AGENCY: GEO PROJECTS	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN: EVERY 6 FEET — DISTURBED: ✓ — UNDISTURBED:
4. HOLE No. (As shown on drawing title and file number): MW 003	14. TOTAL NUMBER CORE BOXES: N/A
5. NAME OF DRILLER: LEE GEBBERT	15. ELEVATION GROUND WATER: TBD ≈ 236 FT
6. DIRECTION OF HOLE: ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE — STARTED: 12/11/03 1116 — COMPLETED: 12/12/03 0846
7. THICKNESS OF OVERBURDEN: >1000 FT	17. ELEVATION TOP OF HOLE: TBD
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: N/A
9. TOTAL DEPTH OF HOLE: 255.00 — 10. SIZE AND TYPE OF BIT: 7 7/8 TRICONE BUTTON, 3 1/2 IF EXT. UPSET	19. SIGNATURE OF INSPECTOR: Neil V. Marino

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
1116	0					DRILLING W/NATURAL MUD, NATIVE SOIL & H2O MIX.
			CALICHE, BROWNISH WHITE			
	2					
	4					
			CALICHE, BROWNISH WHITE WITH FEW FINE/VERY FINE SANDS			
	6					
			SAND, ~~SLIGHTLY~~ VERY CEMENTED, REDDISH BROWN, FEW CLAY, FEW CALICHE			
	8					
1128	10					
			SAND, REDDISH BROWN, VERY FINE, INTERBEDDED WITH CEMENTED SANDS AND CARBONATES, FEW SILT.			
	12					
	14					
	16					
	18					

DRILLING LOG (Continuation Sheet)

I PROJECT: LC-38 INVESTIGATION	INSTALLATION: WSMR	HOLE No: MW 003	SHEET No: 2 of 10
	II ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	18		SAND, REDDISH BROWN, VERY FINE TO FINE, LITTLE CALICHE			INTERBEDDED THROUGHOUT, CEMENTED.
1130	20					1135: TRIPPING IN ROD #1
	22					
	24					
	26		CEMENTED SAND, VERY FINE TO FINE, LITTLE CLAY/SILT @27 FT, INCREASING SILT			
	28					
1146	30		CEMENTED SAND, AS ABOVE. (A/A)			
	32		@31 FT, INCREASING CLAY @32 FT, CLAY, LEAN WITH FEW SILT, TRACE SAND			
	34					
	36		@36, SAND LENSE, FINE TO VERY FINE, ≈ 8".			
	38		SAND, A/A			
1158	40		CLAY, WITH SILT, FEW SAND.			1201: TRIPPED IN ROD #2
	42					
	44					
	46		LEAN CLAY, FEW SILT, TRACE SAND			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW 003	SHEET No 3 OF 10
1 PROJECT LC-38 INVESTIGATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	46		LEAN CLAY, FEW SILT, TRACE SAND, STRONG BROWN.			
	48		@48, SAND LENSE, FINE SAND, 6"			
1211	50					
	52		SAND, FINE TO VERY FINE, YELLOWISH BROWN, TRACE SILT			
	54		LEAN CLAY, A/A			
	56					
	58		SAND, FINE TO VERY FINE, SOME SILT/CLAY, ~~INCREASING CLAY WITH DEPTH~~			INCREASING CLAY W/DEPTH
1219	60		CEMENTED SAND, VERY FINE, SOME CLAY/SILT			1223: ROD #3 TRIPPED IN.
	62					
	64					
	66		SAND, A/A			
	68		LEAN CLAY, A/A			
1231	70					
	72					
	74					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No	SHEET No
WSMR	MW003	4 OF 10

1 PROJECT: LC-38 INVESTIGATION

11 ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	74		LEAN CLAY, FEW SILT, TRACE SAND, STRONG BROWN			SLOW DRILLING
	76					
	78					
1249	80					1301: ROD #4 TRIPPED IN.
	82					
	84					
	86					
	88					
1318	90		SAND, VERY FINE, FEW SILT, FEW CLAY			
			LEAN CLAY, A/A			
	92					@93, INCREASED SAND, ≈ 9".
	94					
	96					
	98		SAND, A/A			
1330	100		LEAN CLAY, A/A			@98.5, SAND LENSE, 6"
						1334: TRIPPED IN ROD #5
	102		SAND, A/A			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW003	SHEET No 5 OF 10
1 PROJECT LC-38 INVESTIGATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	102		LEAN CLAY, FEW SILT, TRACE SAND, STRONG BROWN			SLOW DRILLING
	104					
	106					
	108					
1352	110					
	112		SAND, VERY FINE, TRACE SILT			
	114		LEAN CLAY, FEW SILT, A/A.			@113, CEMENTED SAND LAYER, ≈6", POSSIBLY SILT.
	116					
	118					
1406	120					1412: ROD #6 TRIPPED IN.
	122					
	124		SILTY SAND, VERY FINE SAND, FEW SILT, STRONG BROWN			@123.5, ≈8" SAND, BLEAN BECOMING MORE SILTY.
	126					
	128					
1423	130					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW003	SHEET No 6 OF 10
1 PROJECT LC-38 INVESTIGATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	130		SILTY SAND, VERY FINE SAND, FEW SILT, STRONG BROWN			
	132		LEAN CLAY, FEW SILT, TRACE VERY FINE SAND, STRONG BROWN			
	134					
	136					
	138					
1431	140					1444: ROD #7 TRAPPED
	142					
	144					
	146					@145: SAND LENSE, ≈8"
	148					
1503	150					
	152					
	154					
	156		LEAN CLAY, SOME VERY FINE SAND, TRACE SILT.			
	158					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW 003	SHEET No 7 OF 10
1 PROJECT LC-38 INVESTIGATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	158		LEAN CLAY, SOME VERY FINE SAND, TRACE SILT			
1521	160		LEAN CLAY, FEW SILT, TRACE SAND, STRONG BROWN			1555: TRIPPED ROD #8.
	162					
	164					
	166		SAND, LOOSE, VERY FINE TO MEDIUM, TRACE SILT TRACE SAND			MUD PIT LOST ≈50 GALS.
	168					
1606	170					
	172					
	174					
	176					
	178					
1609	180					1616: TRIPPED ROD #9
	182					
	184					
	186		LEAN CLAY, A/A			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW003	SHEET No 8 OF 10
1 PROJECT LC-38 INVESTIGATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	186		LEAN CLAY, FEW SILT, TRACE SAND, STRONG BROWN			
	188					
1624	190					INCREASING SILT OR SAND CONTENT W/DEPTH.
	192					
	194					
	196					
	198		SAND, LOOSE, FINE TO VERY FINE			
1632	200		LEAN CLAY, LITTLE SILT, TRACE SAND, STRONG BROWN			12/0704: ROD #10 TRIPPED.
	202		SAND, LOOSE, FINE TO VERY FINE			
	204					
	206		LEAN CLAY, A/A			
	208					
12/0735	210					
	212					
	214					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW003	SHEET No 9 OF 10
1 PROJECT LC-38 INVESTIGATION	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	214		LEAN CLAY, FEW SILT, TRACE SAND, STRONG BROWN			
	216					SLIGHT INCREASE IN SAND W/DEPTH
	218					
12/0746	220					12/0758: TRIPPED IN ROD #11
	222					
	224					
	226		SILTY CLAY, MOSTLY CLAY, STRONG BROWN, SOME SILT, LITTLE SAND			
	228					
12/0818	230					
	232					
	234					
	236					
	238		237-238.5, INCREASED SILT/SAND			
12/0828	240		SILT, SOME CLAY, LITTLE SAND			12/0838: TRIPPED IN ROD #12
	242					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No MW003	SHEET No 10 OF 10
I PROJECT LC-38 INVESTIGATION	II ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	242		SILT, SOME CLAY, LITTLE SAND			
	244					
	246					
	248					
12/0843	250					
			SILTY CLAY, MOSTLY CLAY, STRONG BROWN, SOME SILT, LITTLE SAND			
	252					
			SAND, LOOSE, TRACE SILT			
	254		SILTY CLAY, A/A			
TD @ 255 12/0846	255					

DRILLING LOG

DIVISION	INSTALLATION	HOLE No.	SHEET No.
	WSMR	MW004	1 OF 10

1. PROJECT: LC-38 INVESTIGATION	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
2. LOCATION (Coordinates or Station): DOWN GRADIENT	12. MANUFACTURER'S DESIGNATION OF DRILL: GARDNER DENVER 1500
3. DRILLING AGENCY: GED PROJECTS	13. TOTAL No. OF OVERBURDEN SAMPLES TAKEN: EVERY 5 FEET — DISTURBED: ✓ — UNDISTURBED:
4. HOLE No. (As shown on drawing title and file number): MW004	14. TOTAL NUMBER CORE BOXES: N/A
5. NAME OF DRILLER: LEE GEBBERT	15. ELEVATION GROUND WATER: TBD
6. DIRECTION OF HOLE: ☑ Vertical ☐ Inclined _____ Degrees from Vertical	16. DATE HOLE: ~~13/160~~ 12/13/03 — STARTED: 1602 — COMPLETED: 12/14/03 1315
7. THICKNESS OF OVERBURDEN: > 1000 FT	17. ELEVATION TOP OF HOLE: TBD
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: N/A
9. TOTAL DEPTH OF HOLE: 257.00 FT — 10. SIZE AND TYPE OF BIT: 7 7/8 TRICONE BUTTON, 3 1/2 IF EXT. UPSET	19. SIGNATURE OF INSPECTOR: Mark Maine

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
1312	0		CALICHE, BROWNISH WHITE, SOME SILT/SAND			
	2					
	4					
	6		SILTY SAND, REDDISH BROWN, VERY FINE SAND, SOME SILT			
	8					
1616	10		SAND, REDDISH BROWN, VERY FINE, INTERBEDDED CEMENTED SANDS AND CARBONATES, FEW SILT			
	12					
	14					
	16					
	18					

DRILLING LOG (Continuation Sheet)	INSTALLATION	HOLE No	SHEET No
1 PROJECT LC-38 INVESTIGATION	WSMR	MW004	2 OF 10
	11 ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	18		SAND, REDDISH BROWN, VERY FINE, FEW SILT			
1619	20					1624: ROD #1 TRIAPED IN.
	22					
	24					
	26		SAND, REDDISH BROWN, FINE TO MEDIUM, FEW CARBONATES			
	28		CLAY, STRONG BROWN, FEW SILT, TRACE SAND			SLIGHTLY CEMENTED SANDS.
1629	30					
	32		SAND, REDDISH BROWN, VERY FINE, FEW SILT			
	34					
	36					
	38		CLAY, STRONG BROWN, AS ABOVE (A/A)			
			SAND, AS ABOVE (A/A)			
1635	40		SILTY CLAY, STRONG BROWN, MOSTLY CLAY, SOME FEW SILT, TRACE SAND			1637: ROD #2 TRIAPED IN
	42					
	44					
	46		LEAN CLAY, STRONG BROWN, MOSTLY CLAY, TRACE SILT			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. MW004	SHEET No. 3 of 10
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	46		LEAN CLAY, STRONG BROWN, TRACE SILT			
	48		SAND, VERY FINE, LOOSE			
1644	50		LEAN CLAY, A/A			
	52					@52 FT, SAND LENSE, 8"
	54					
	56					@56 FT, SAND LENSE, 6"
	58					
1649	60					1652: TRIPPED IN ROD #3
	62		SAND, A/A			
			LEAN CLAY, A/A			
	64		SAND, A/A			
	66		LEAN CLAY, A/A			SLOW DRILLING
	68					
1703	70					
	72					
	74					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No	SHEET No
WSMR	MW-004	4 OF 10

I PROJECT: LC-38 INVESTIGATION

11. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	74		LEAN CLAY, STRONG BROWN, TRACE SILT/SAND			
	76					
	78					
14/0750	80					0754: ROD #4 TRIPPED IN
	82					
	84					
	86					
	88					089 FT, SAND LENSE, 9"
0804	90		LEAN CLAY, STRONG BROWN, FEW SILT, TRACE SAND			
	92					
	94		SAND, LOOSE, REDDISH BROWN, SOME CLAY, TRACE SILT			SLIGHT CEMENTATION IN LENSES.
	96					
	98		LEAN CLAY, A/A			
0816	100					0821: ROD #5 TRIPPED IN
	102		SAND, HARD, LITTLE SILT/CLAY			CEMENTED, HARD DRILLING

DRILLING LOG (Continuation Sheet)	INSTALLATION	HOLE No.	SHEET No.
	WSMR	MW004	5 OF 10

1. PROJECT	11. ELEVATION OF TOP HOLE
LC-38 INVESTIGATION	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	102		LEAN CLAY, STRONG BROWN, LITTLE SILT/SAND			SLOW DRILLING
	104					
	106					
	108					
0829	110					
			SILTY CLAY, MOSTLY CLAY, SOME SILT, FEW SAND			INTERBEDDED WITH THIN SAND LENSES
	112					
	114					
	116		LEAN CLAY, STRONG BROWN, FEW SILT, TRACE SAND, TRACE CARBONATES			
	118					
0848	120					0856: TRAPPED IN ROD #6
	122					
	124					INCREASING SAND W/DEPTH, SOME CEMENTATION
	126					
	128					
0908	130					

DRILLING LOG (Continuation Sheet)

INSTALLATION	HOLE No.	SHEET No.
WSMR	MW 004	6 OF 10

I. PROJECT: LC-38 INVESTIGATION

II. ELEVATION OF TOP HOLE:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	130		LEAN CLAY, STRONG BROWN, SOME SAND, LITTLE SILT			
	132					
	134		LEAN CLAY, LITTLE SAND/SILT			
	136					
	138					
0923	140		LEANCLAY, STRONG BROWN, LITTLE SILT, TRACE SAND			0935: TRIPPED IN ROD #7
	142					
	144					
	146					
	148		SAND, LOOSE, LITTLE SILT			
0953	150		LEANCLAY, A/A			
	152					
	154					153-155 INTERBEDDED CEMENTED SANDS
	156					
	158					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. MW004	SHEET No. 7 OF 10
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	158		LEAN CLAY, STRONG BROWN, LITTLE SAND, TRACE SILT			
1008	160					1102: TRIPPED IN ROD #8
	162					
	164					
	166		SAND, LOOSE, VERY FINE TO FINE, LITTLE SILT/CLAY			INTERBEDDED SAND/ SILT/CLAY
	168					
1117	170					
	172		SILTY CLAY, STRONG BROWN, SOME SILT, TRACE SAND			
	174		SILTY SAND, VERY FINE TO FINE, SOME SILT, LITTLE CLAY			
	176		SILTY CLAY, A/A			
	178					
1127	180		SAND, LOOSE, VERY FINE TO FINE, LITTLE SILT/CLAY			1133: ROD #9 TRIPPED IN
	182					
	184					
	186		SILTY CLAY, A/A			

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. MW 004	SHEET No 8 OF 10
I. PROJECT LC-38 INVESTIGATION	II. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	186		SILTY CLAY, STRONG BROWN, SOME SILT, LITTLE SAND			INTERBEDDED SANDS
	188					
1139	190					
	192					
	194		SAND, LOOSE, VERY FINE TO FINE, SOME SILT, LITTLE CLAY			
	196					
	198					
1145	200					1151: TRIPPED IN ROD #10
	202					
	204					
	206					
	208					
1158	210					
	212					
	214					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. MW004	SHEET No. 9 OF 10
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significent) g
	214		SAND, LOOSE, VERY FINE TO FINE, LITTLE SILT			
			SILTY CLAY, STRONG BROWN, SOME SILT, LITTLE SAND			
	216					
	218					
1205	220					1210 Tripped in Rod # 11
	222					
	224					
			Silty clay, strong brown Little V. Fine Sand			
	226					
	228					Hard drilling @ 228 FT
1232	230					
						231 FT Sand zone ≈ 6 in Interbedded Sand lenses.
	232					
						233 FT Sand zone ≈ 6 in
	234					
	236					Harder drilling @ 237 ft
	238					
1244	240					1308: TRIPPED IN ROD #12
	242					

DRILLING LOG (Continuation Sheet)	INSTALLATION WSMR	HOLE No. MW 004	SHEET No. 10 OF 10
1. PROJECT LC-38 INVESTIGATION	11. ELEVATION OF TOP HOLE		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (description) d	% CORE RECOVERY e	BOX OR SAMPLE NUMBER f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	242		SAND, LOOSE, VERY FINE TO FINE, FEW SILT			FAST DRILLING, FEW CEMENTED SAND LENSES.
	244					
	246					
	248					
1314	250					
	252					
	254					
	256					
1315	257		TD@257FT, 1315			

MONITORING WELL CONSTRUCTION DETAILS

WELL NUMBER: MW 001

WELL NAME: _____

KEYED NOTES:

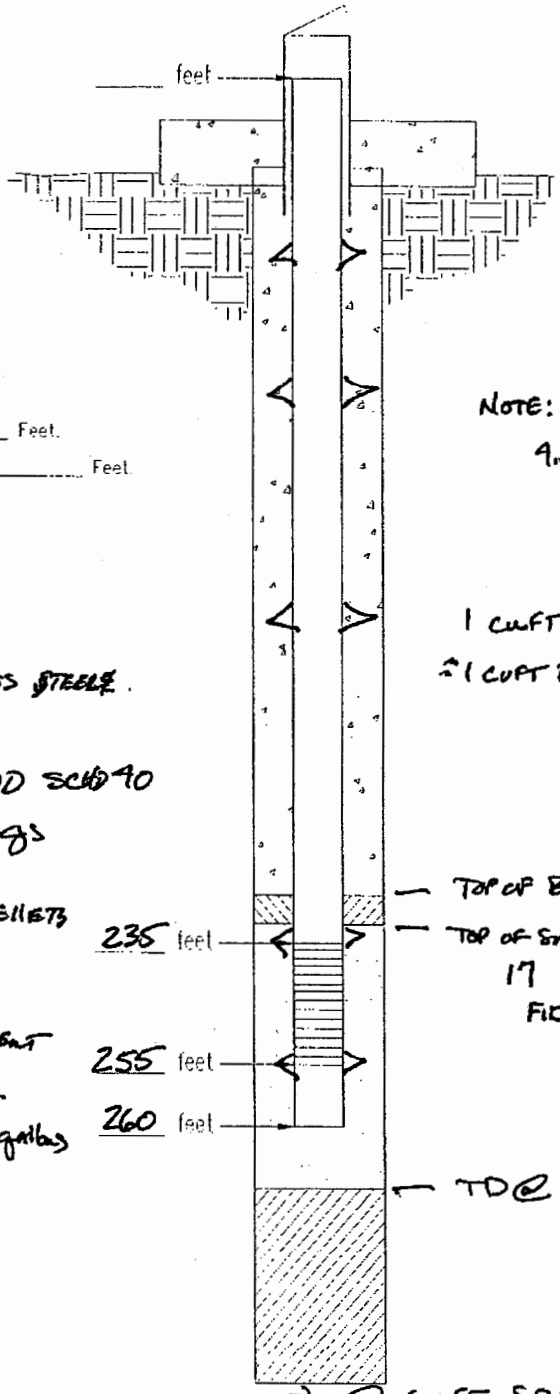
1. CONCRETE PAD W/ EMBEDDED BRASS MARKER
   ELEVATION _____ FEET (NAVD 1988).
   LAT. _____
   LONG. _____
2. TOP OF WELL CASING ELEVATION _____ Feet.
3. TOTAL DEPTH (feet below top of casing) _____ Feet.
4. CASING DIAMETER 4" ID Inches.
5. SCREEN INTERVAL (feet below top of casing):
   235 Feet to 255 Feet.

SCREEN: .010 INCH SLOT STAINLESS STEEL WIRE WRAP

CASING: 4" NOMINAL ID 4.5" OD SCH 40 FLUSH THREAD W/ O RINGS

BENTONITE: NON-COATED 1/2" PELLETS 50LB BUCKETS

GROUT: PORTLAND TYPE I/II CEMENT 2-3% BENTONITE PER 5 94LB BAGS 5-6 gallons PER BAG.



NOTE: ANNULAR SPACE 4.5" OD CASING IN 7 7/8" HOLE (.23 CUFT PER.

1 CUFT PER 100LBS SAND

≈ 1 CUFT PER 99LB SACK PORTLAND.

TOP OF BENTONITE EST. @ 6F1 & 227.0

TOP OF SAND @ 233
17 50LB BAGS
FILTERSIL 20/40

TD @ 261

GENERAL NOTES:

1. DRAWING NOT TO SCALE.

500bb046 CENTRALIZERS TOP/BOT OF SCREEN 3) @ 60FT SPACING ABOVE SCR

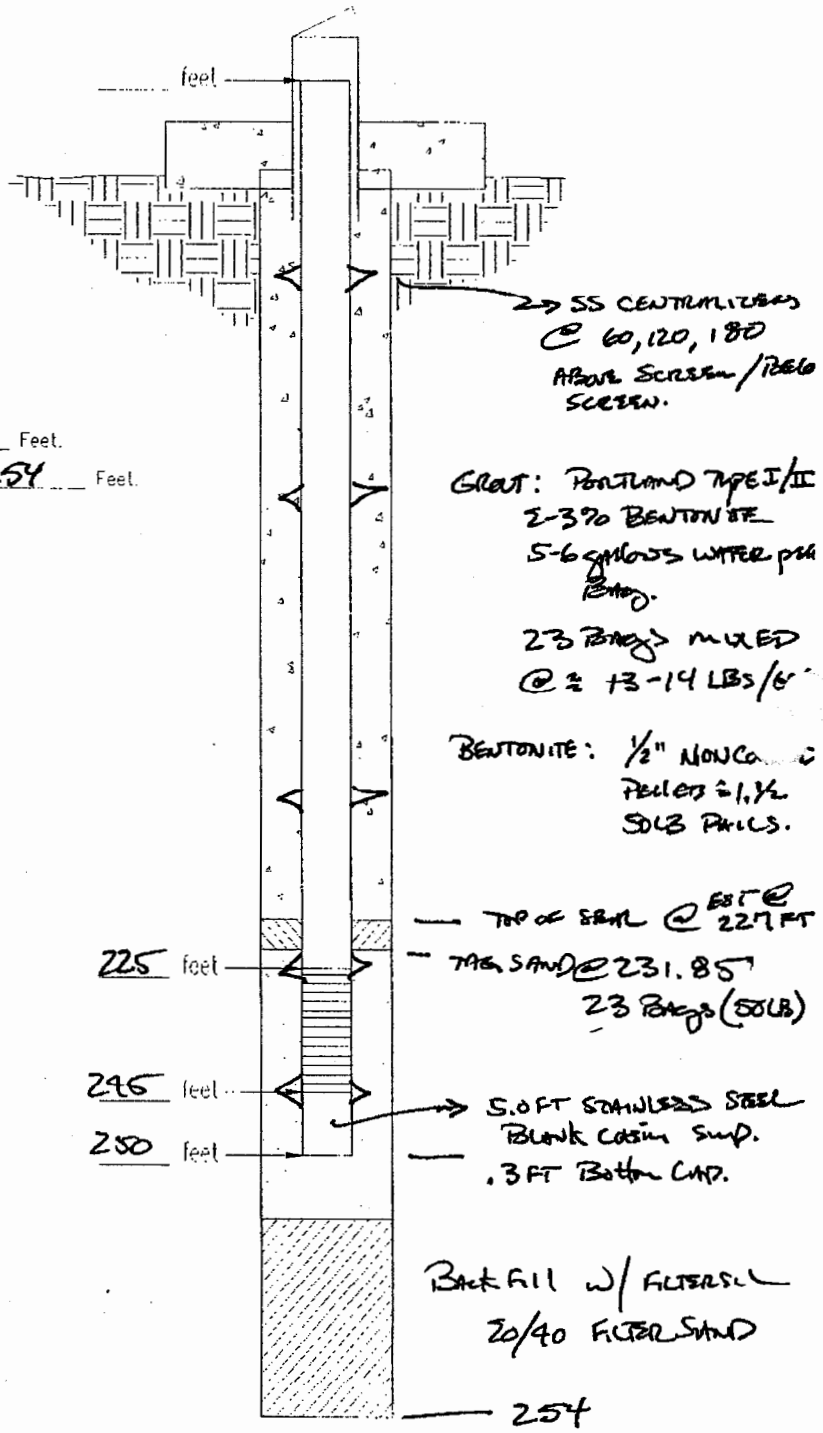
MONITORING WELL CONSTRUCTION DETAILS

WELL NUMBER: MW002

WELL NAME: _____

KEYED NOTES:

1. CONCRETE PAD W/ EMBEDDED BRASS MARKER
   ELEVATION _____ FEET (NAVD 1988).
   LAT. _____
   LONG _____
2. TOP OF WELL CASING ELEVATION _____ Feet.
3. TOTAL DEPTH (feet below top of casing) 254 Feet.
4. CASING DIAMETER 4" ID Inches.
5. SCREEN INTERVAL (feet below top of casing):
   225 Feet to 245 Feet.



GENERAL NOTES:

1. DRAWING NOT TO SCALE.

5004b045

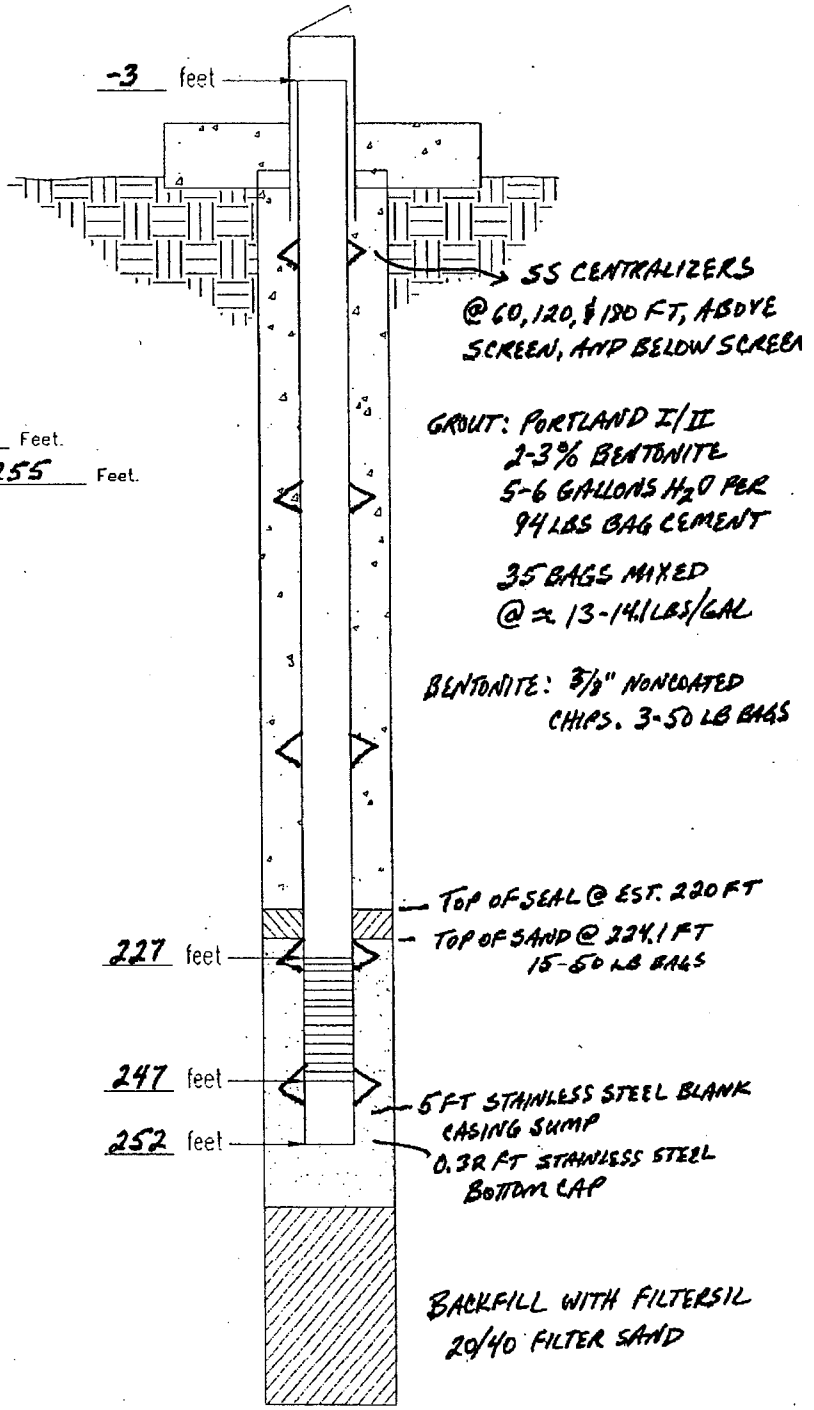
MONITORING WELL CONSTRUCTION DETAILS

WELL NUMBER: MW003

WELL NAME: _____

KEYED NOTES:

1. CONCRETE PAD W/ EMBEDDED BRASS MARKER
   ELEVATION _____ FEET (NAVD 1988).
   LAT. _____
   LONG. _____
2. TOP OF WELL CASING ELEVATION _____ Feet.
3. TOTAL DEPTH (feet below top of casing) 255 Feet.
4. CASING DIAMETER 4" ID Inches.
5. SCREEN INTERVAL (feet below top of casing):
   227 Feet to 247 Feet.



GENERAL NOTES:

1. DRAWING NOT TO SCALE.

500bb046

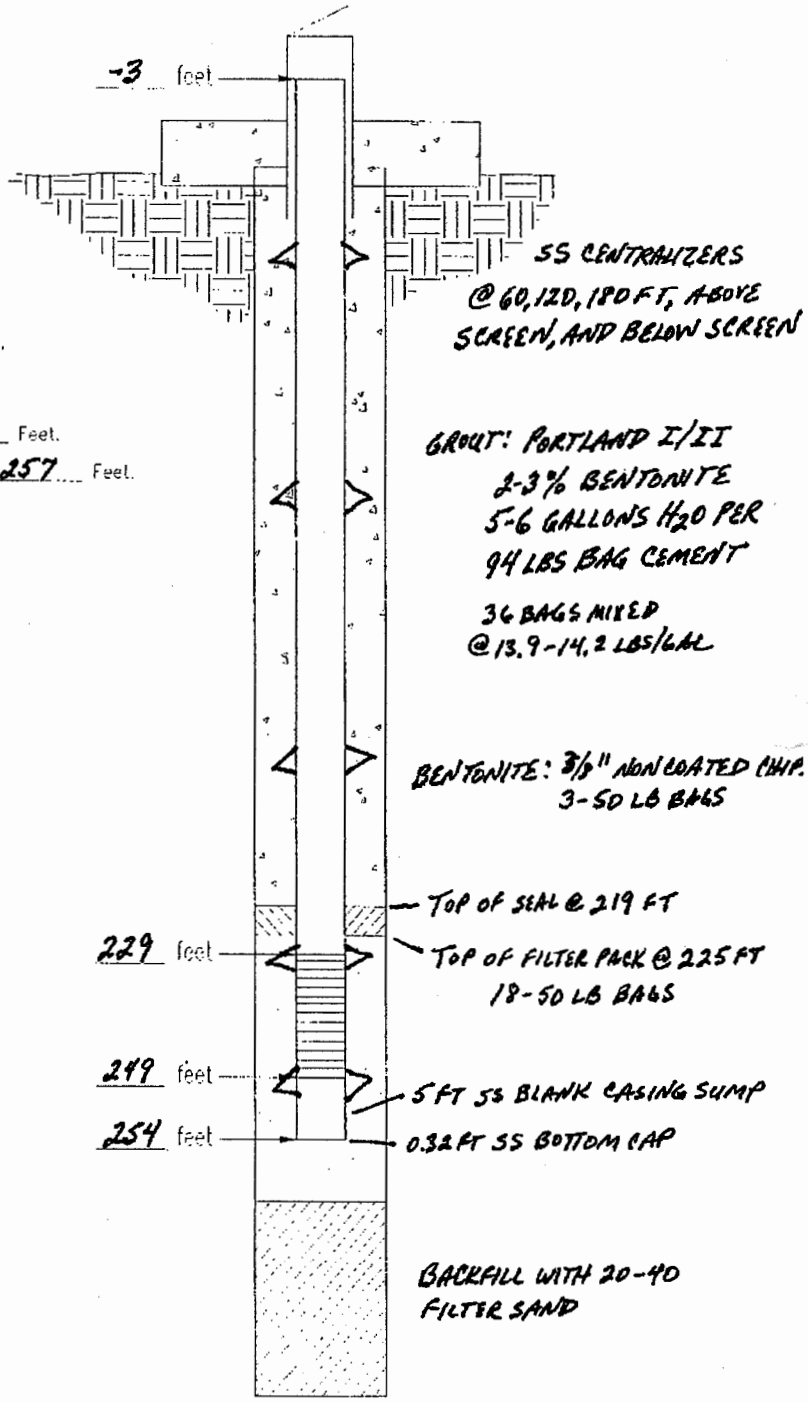
MONITORING WELL CONSTRUCTION DETAILS

WELL NUMBER: MW004

WELL NAME: _____

KEYED NOTES:

1. CONCRETE PAD W/ EMBEDDED BRASS MARKER
   ELEVATION _____ FEET (NAVD 1988).
   LAT. _____
   LONG _____
2. TOP OF WELL CASING ELEVATION _____ Feet.
3. TOTAL DEPTH (feet below top of casing) 257 Feet.
4. CASING DIAMETER 4" ID Inches.
5. SCREEN INTERVAL (feet below top of casing):
   229 Feet to 249 Feet



GENERAL NOTES:

1. DRAWING NOT TO SCALE.

5006646

LC38 DIESEL FUEL SPILL INVESTIGATION.

GROUND WATER MONITORING WELL PROPOSED CONSTRUCTION

VERTICAL: 1 INCH 30 FT
HORIZONTAL: NOT TO SCALE

19.99

+5 FT

5.19 -0- GROUND SURFACE

CASING:
SCHD 80 PVC 4"

20.00

SCREEN:
.010 INCH SLOTTED
PVC SCREEN 4"

20.00

20.01

SUMP:
SCHD 80 PVC
5.0 FT 4" Blank

19.99

FILTER PACK:

19.97

BENTONITE SEAL:

20.0

GROUT SEAL:
NEAT BENTONITE CEMENT
8 Bags H_2O / 94LB Bag
PORTLAND TYPE I/II

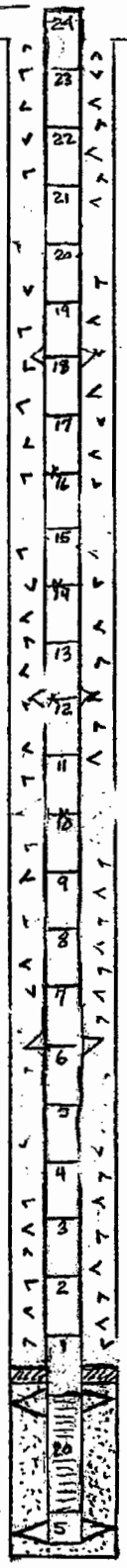
20.0

19.95

19.99

19.98

20.0



5
15
25
35
45
55
65
75
85
95
105
115
125
135
145
155
165
175
185
195
205
215
225

TOP OF BENTONITE SEAL @ 230 FT.
TOP OF SAND PACK @ 233 FT.
ANTICIPATED WL @ 240 FT

TOP OF SCREENED INTERVAL @ 235 FT

BOTTOM OF SCREENED INTERVAL @ 255 FT
BOTTOM OF BLANK CASING @ 260 FT

TD @ 261 FT

TD @ 261 FT

13 Bags
Round to 6.5

VOLUME 6.49c
7.875 x 4.5 .23 cuf

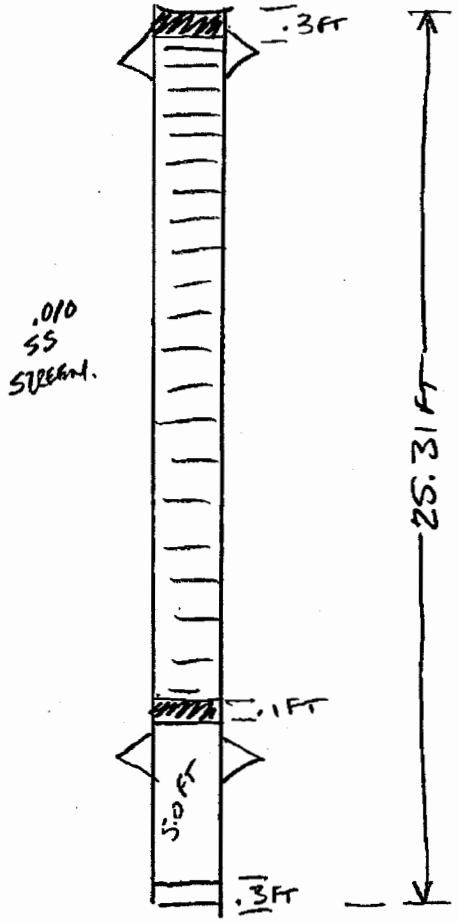
SAND 8.5" x 4.5"
30 FT x .28 cuft/ft = 8.4 cuf
≈ 9.5 100LB Bags.
ACTUAL: 18 Bags #50LB ea

GROUT
ACTUAL: 24 BAGS
230 FT x .28 cuft/ft = 64.4c
≈ 55 Bags mixed 8-9 g

BENTONITE
2 Buckets Pellets
≈ 6 FT 4.5" x 7 7/8" Hole

500 SHEETS, FILLER 5 SQUARE
50 SHEETS EYE-EASE® 5 SQUARE
100 SHEETS EYE-EASE® 5 SQUARE
42-381 100 SHEETS EYE-EASE® 5 SQUARE
42-389 200 SHEETS EYE-EASE® 5 SQUARE
13-782
42-381
42-382
42-389
National® Brand
Made in U.S.A.

SCREEN DETAIL MW001



From TOP of SCREEN
CENTRALIZERS @ 60
@ 120
@ 180

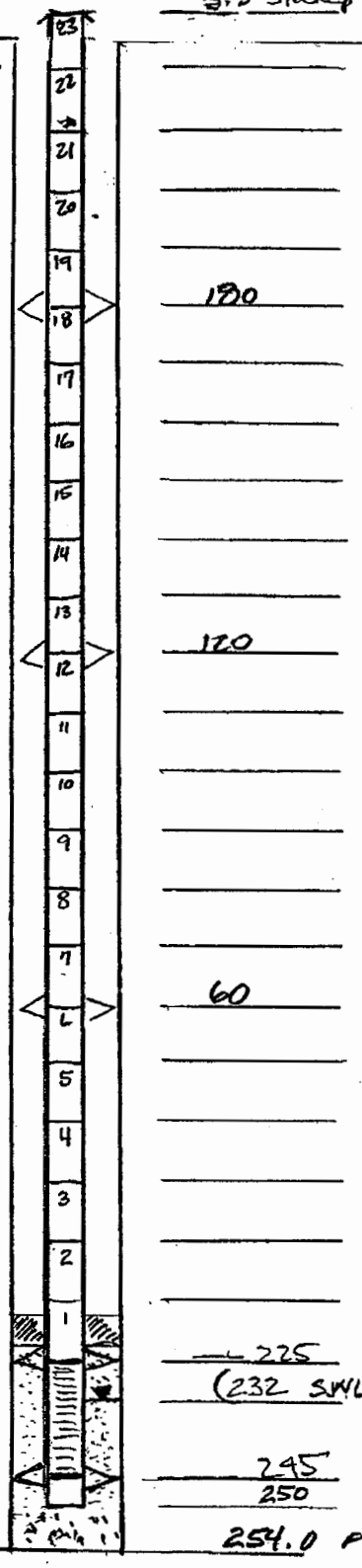
0.23 CUFT/FT.

13-782 500 SHEETS, FILLER 5 SQUARE
42-381 50 SHEETS EYE-EASE® 5 SQUARE
42-382 100 SHEETS EYE-EASE® 5 SQUARE
42-389 200 SHEETS EYE-EASE® 5 SQUARE
National® Brand
Made in U.S.A.

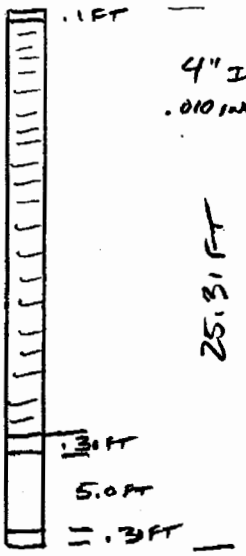
LC38 INVESTIGATION | MW002

1.76 FT HIGHER OFFSET NOT ACCOUNTED FOR IN DETAIL

VERTICAL SCALE 1" = 30 FT



ACTUAL VOLUMES:
SAND #CON 20/40
23 50LB BAGS
PELLETS: 2 50LB BUCKETS
1/2" PELLETS
NON COATED.



CASING:
4.0 INCH ID 4.5" OD PVC

BORING: 7 7/8" NOMINAL BIT SIZE
DRILLING: MUD ROTARY
TREMIE @ 231.85
TO INSTALL SAND PACK

GROUT: 94LB BAGS (23)
2-3% GEL.
H2O 5-6 GAL PER BAG

WSMR | MW003 | LC 38 INVESTIGATION

VERTICAL SCALE 1" = 30 FT

.23 (4.5 x 7 7/8)

3.0 FT STICKUP

GS.

SS CENTRALIZERS: TOP/BOT SCREEN
60' ABOVE SCREEN
120 ABOVE SCREEN
180 ABOVE SCREEN

CASING: SCHD 40 PVC
FLUSH THREAD
10 FT LENGTHS (23)

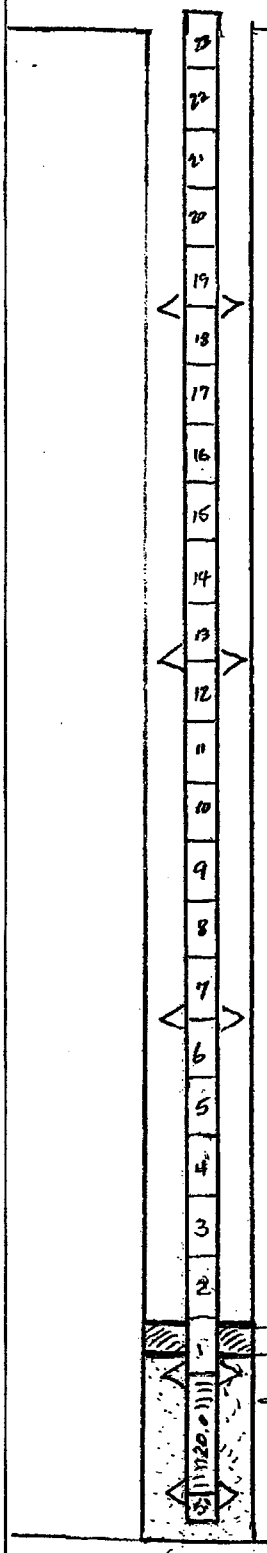
SCREEN: .010 SLOT SS
WIRE WRAPPED SCREEN
10 FT (2)

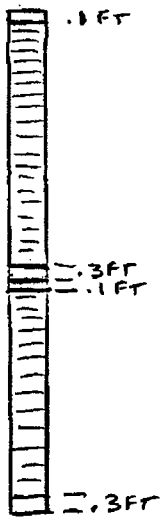
DRILLING: MUD ROTARY
NOMINAL 7 7/8 "TRICONE"
BUTTON BIT

GROUT ≈ 10 gallons mix/BH

50 cuft of 4.5/7 7/8
x 7.48 gal
374 gallons/cuft.
≈ 35 Bag mix

SAND
6.44 cuft
224 − 252 = 28 · .23
ESTIMATED QUANTITY TO INCLUDE ANY BRIDGE:
≈15 50LB Bags



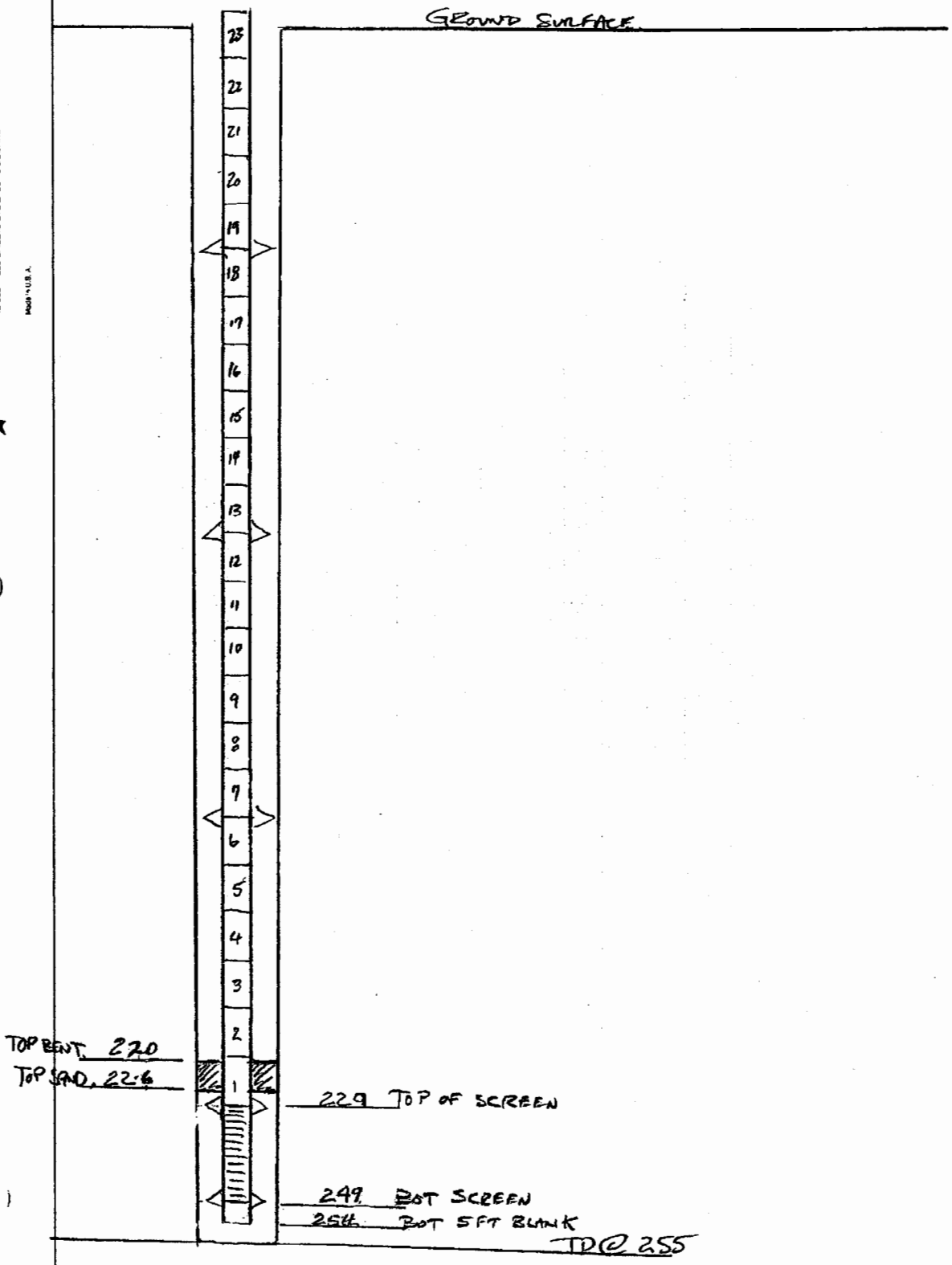


ANTICIPATED WL 232 BGS.
.010 INCH SLOT SS WIRE WRAPPED SCREEN. 4" ID

247
252 5 FT SS BLANK

TD @ 255

WSMR | MW004 | LC 38 INVESTIGATION



13-782 500 SHEETS, FILLER 6 SQUARE
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National® Brand
Made in U.S.A.

APPENDIX D

SWMU Assessment Analytical Results - Tabulated

Table D-1A. VOC Results from the November 2003 SWMU Assessment Sampling Event.

Analyte Method 8260 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-002-65.7-66.8		LC38-DSPL-SB-002-70.0-70.5		LC38-DSPL-SB-102-70.0-70.5		LC38-DSPL-SB-002-74.5-75.0		LC38-DSPL-SB-002-78.0-78.5		LC38-DSPL-SB-003-66.0-66.5		LC38-DSPL-SB-003-67.0-67.5		LC38-DSPL-SB-003-71.3-71.5		LC38-DSPL-SB-003-78.0-78.5		LC38-DSPL-SB-004-63.3-63.8		LC38-DSPL-SB-004-68.0-68.5		LC38-DSPL-SB-005-49.5-50.5		LC38-DSPL-SB-005-53.5-54.0		LC38-DSPL-SB-005-59.0-59.2		LC38-DSPL-SB-005-63.0-63.5		LC38-DSPL-SB-005-64.5-64.7		LC38-DSPL-SB-005-68-68.5		LC38-DSPL-SB-005-73.5-74.0		LC38-DSPL-SB-005-77.5-77.8		LC38-DSPL-SB-005-92.9-93.2		LC38-DSPL-SB-005-97.5-97.7		LC38-DSPL-SB-005-103-103.2		LC38-DSPL-SB-005-108-108.5		LC38-DSPL-SB-105-108-108.5	
1,1,1-Trichloroethane	5.1E+5	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
1,1,2,2-Tetrachloroethane	3.6E+3	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
1,1,2-Trichloroethane	7.9E+3	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
1,1-Dichloroethane	5.6E+5	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
1,1-Dichloroethene	8.1E+3	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
1,2-Dichloroethane	3.3E+3	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
1,2-Dichloropropane	3.5E+2*	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
2-Butanone	3.7E+6	4400	U	13	U	12	U	12	U	11	U	95	U	12	U	110	U	12	U	110	U	12	U	10	U	11	U	2200	U	4200	U	1100	U	1200	U	4200	U	11	U	12	U	10	U	10	U	11	U	11	U
2-Hexanone	NE	4400	U	13	U	12	U	12	U	11	U	95	U	12	U	110	U	12	U	110	U	12	U	10	U	11	U	2200	U	4200	U	1100	U	1200	U	4200	U	11	U	12	U	10	U	10	U	11	U	11	U
4-Methyl-2-pentanone	NE	4400	U	13	U	12	U	12	U	11	U	95	U	12	U	110	U	12	U	110	U	12	U	10	U	11	U	2200	U	4200	U	1100	U	1200	U	4200	U	11	U	12	U	10	U	10	U	11	U	11	U
Acetone	1.6E+6*	4400	U	18		11	J	5	J	6	J	95	U	12	U	24	J	5	J	110	U	3	J	10	U	12		2200	U	4200	U	1100	U	1200	U	4200	U	11	U	12	U	10	U	10	U	11	U	11	U
Benzene	6.4E+3	19000		5		2	J	4	U	3	U	9800	D	4	U	770		4	U	14000	JD	2	J	3	U	3	U	670	U	1300	U	500		360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Bromodichloromethane	9.6E+3	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Bromoform	6.2E+4	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Bromomethane	3.7E+3	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Carbon disulfide	3.6E+5*	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Carbon tetrachloride	1.6E+3	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Chlorobenzene	1.4E+5	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Chloroethane	3.0E+3**	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Chloroform	3.8E+2	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Chloromethane	1.2E+4	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
cis-1,2-Dichloroethene	4.1E+4	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
cis-1,3-Dichloropropene	NE	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Dibromochloromethane	1.0E+3*	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Dichlorodifluoromethane	9.0E+4	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Ethylbenzene	6.8E+4	76000		61		33		4	U	3	U	40000	D	4	U	9100	D	4	U	160000	D	4	U	3	U	3	U	3200		7800		5500		2000		6300		3	U	4	U	3	U	3	U	3	U	3	U
m,p-Xylene	6.3E+4^	110000		110		56		1	J	3	U	58000	D	4	U	14000	D	4	U	250000	D	1	J	3	U	3	U	4800		12000		8500		3200		9900		3	U	4	U	3	U	3	U	3	U	3	U
Methyl tert-butyl ether	6.1E+6	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Methylene chloride	8.9E+3*	440	J	4	U	4	U	4	U	3	U	28	U	25	B	32	U	4	U	33	U	4	U	11	B	12	B	670	U	1300	U	340	U	360	U	1300	U	15	B	18	B	9	B	16	B	27	B	34	B
o-Xylene	6.3E+4^	55000		61		34		4	U	3	U	28000	D	4	U	6900	D	4	U	130000	D	4	U	3	U	3	U	2400		5800		4000		1500		4800		3	U	4	U	3	U	3	U	3	U	3	U
Styrene	1.7E+6*	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Tetrachloroethene	4.9E+4	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	42		4	U	24	J	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Toluene	1.8E+5	80000	D	37		16		2	J	3	U	52000	D	4	U	7200	D	4	U	160000	D	3	J	3	U	3	U	2300		6600		5200		1500		5100		3	U	4	U	3	U	3	U	3	U	3	U
trans-1,2-Dichloroethene	6.0E+4	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
trans-1,3-Dichloropropene	NE	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Trichloroethene	1.6E+4	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Trichlorofluoromethane	3.9E+5*	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U
Vinyl chloride	2.1E+2	1300	U	4	U	4	U	4	U	3	U	28	U	4	U	32	U	4	U	33	U	4	U	3	U	3	U	670	U	1300	U	340	U	360	U	1300	U	3	U	4	U	3	U	3	U	3	U	3	U

U Not detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
D Sample was diluted.
B Analyte was also detected in the sample blank.

Table D-1B. VOC Results from the November 2003 SWMU Assessment Sampling Event.

Analyte Method 8260 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-006-99.0-99.5		LC38-DSPL-SB-007-20-20.5		LC38-DSPL-SB-007-25-25.5		LC38-DSPL-SB-007-30.0-30.5		LC38-DSPL-SB-007-35.0-35.5		LC38-DSPL-SB-007-40.0-40.5		LC38-DSPL-SB-007-45.0-45.5		LC38-DSPL-SB-007-50-50.5		LC38-DSPL-SB-007-55.0-55.5		LC38-DSPL-SB-007-59-59.5		LC38-DSPL-SB-007-61.3-62.0		LC38-DSPL-SB-007-62.0-62.5		LC38-DSPL-SB-007-69.5-70.0		LC38-DSPL-SB-007-70-70.5		LC38-DSPL-SB-007-74-74.5		LC38-DSPL-SB-007-83-83.3		LC38-DSPL-SB-007-89-89.3		LC38-DSPL-SB-007-94.0-94.3		LC38-DSPL-SB-007-97.0-97.3		LC38-DSPL-SB-007-108.5-108	
1,1,1-Trichloroethane	5.1E+5	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
1,1,2,2-Tetrachloroethane	3.6E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
1,1,2-Trichloroethane	7.9E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
1,1-Dichloroethane	5.6E+5	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
1,1-Dichloroethene	8.1E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
1,2-Dichloroethane	3.3E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
1,2-Dichloropropane	3.5E+2*	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
2-Butanone	3.7E+6	11	U	10	U	10	U	10	U	12	U	11	U	11	U	11	U	1200	U	2400	U	12000	U	1200	U	12	U	1200	U	11	U	10	U	11	U	11	U	10	U	12	U
2-Hexanone	NE	11	U	10	U	10	U	10	U	12	U	11	U	11	U	11	U	1200	U	2400	U	12000	U	1200	U	12	U	1200	U	11	U	10	U	11	U	11	U	10	U	12	U
4-Methyl-2-pentanone	NE	11	U	10	U	10	U	10	U	12	U	11	U	11	U	11	U	1200	U	2400	U	12000	U	1200	U	12	U	1200	U	11	U	10	U	11	U	11	U	10	U	12	U
Acetone	1.6E+6*	11	U	20		15		9	J	16		13		14		24		1200	U	2400	U	12000	U	1200	U	13		1200	U	9	J	10	U	11	U	11	U	10	U	12	U
Benzene	6.4E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	880		16000		360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Bromodichloromethane	9.6E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Bromoform	6.2E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Bromomethane	3.7E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Carbon disulfide	3.6E+5*	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Carbon tetrachloride	1.6E+3	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Chlorobenzene	1.4E+5	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Chloroethane	3.0E+3**	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Chloroform	3.8E+2	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Chloromethane	1.2E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
cis-1,2-Dichloroethene	4.1E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
cis-1,3-Dichloropropene	NE	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Dibromochloromethane	1.0E+3*	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Dichlorodifluoromethane	9.0E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Ethylbenzene	6.8E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	780		6600		53000		1300		20		570		3	U	3	U	3	U	3	U	3	U	4	U
m,p-Xylene	6.3E+4^	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	1200		9900		77000		1900		39		870		3	U	3	U	3	U	3	U	3	U	4	U
Methyl tert-butyl ether	6.1E+6	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Methylene chloride	8.9E+3*	16	B	12	B	12	B	11	B	23	B	17	B	16	B	16	B	380	U	710	U	3600	U	360	U	29	B	350	U	16	B	23	B	17	B	13	B	14	B	23	B
o-Xylene	6.3E+4^	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	620		4600		38000		930		22		400		3	U	3	U	3	U	3	U	3	U	4	U
Styrene	1.7E+6*	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Tetrachloroethene	4.9E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Toluene	1.8E+5	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	490		6600		76000		1000		3	J	480		3	U	3	U	3	U	3	U	3	U	4	U
trans-1,2-Dichloroethene	6.0E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
trans-1,3-Dichloropropene	NE	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Trichloroethene	1.6E+4	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Trichlorofluoromethane	3.9E+5*	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U
Vinyl chloride	2.1E+2	3	U	3	U	3	U	3	U	4	U	3	U	3	U	3	U	380	U	710	U	3600	U	360	U	4	U	350	U	3	U	3	U	3	U	3	U	3	U	4	U

U Not detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
D Sample was diluted.
B Analyte was also detected in the sample blank.

Table D-2A. SVOC Results from the November 2003 SWMU Assessment Sampling Event.

Analyte Method 8270 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-002-65.7-66.8		LC38-DSPL-SB-002-70.0-70.5		LC38-DSPL-SB-102-70.0-70.5		LC38-DSPL-SB-002-74.5-75.0		LC38-DSPL-SB-002-78.0-78.5		LC38-DSPL-SB-003-66.0-66.5		LC38-DSPL-SB-003-67.0-67.5		LC38-DSPL-SB-003-71.3-71.5		LC38-DSPL-SB-003-78.0-78.5		LC38-DSPL-SB-004-63.3-63.8		LC38-DSPL-SB-004-64.0		LC38-DSPL-SB-004-68.0-68.5		LC38-DSPL-SB-004-69.2		LC38-DSPL-SB-004-75.0		LC38-DSPL-SB-004-80.0-80.5		LC38-DSPL-SB-104-80.0-80.5		LC38-DSPL-SB-004-84.0-85.0	
1,2,4-Trichlorobenzene	5.2E+6	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
1,2-Dichlorobenzene	337E+5*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
1,2-Diphenylhydrazine	6.1E+3	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
1,3-Dichlorobenzene	1.2E+4	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
1,4-Dichlorobenzene	3.2E+4	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2,2'-oxybis(1-Chloropropane)	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2,4,5-Trichlorophenol	6.1E+6	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2,4,6-Trichlorophenol	4.4E+5	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2,4-Dichlorophenol	1.8E+5	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2,4-Dimethylphenol	1.2E+6*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2,4-Dinitrophenol	1.2E+5	29000	U	830	U	820	U	810	U	720	U	15000	U	800	U	3500	U	800	U	7300	U	820	U	830	U	750	U	780	U	810	U	800	U	720	U
2,4-Dinitrotoluene	1.2E+5	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2,6-Dinitrotoluene	6.1E+4*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2-Chloronaphthalene	3.9E+6*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2-Chlorophenol	6.4E+4*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2-Methylnaphthalene	NE	320000	D	420	U	410	U	410	U	360	U	310000	D	630		48000	D	110	J	120000	D	7700	D	420	U	370	U	390	U	410	U	400	U	360	U
2-Methylphenol	3.1E+6*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2-Nitroaniline	3.7E+3*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
2-Nitrophenol	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
3,3'-Dichlorobenzidine	1.1E+4	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
3-Nitroaniline	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4,6-Dinitro-2-methylphenol	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4-Bromophenyl-phenylether	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4-Chloro-3-methylphenol	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4-Chloroaniline	2.4E+5*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4-Chlorophenyl-phenylether	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4-Methylphenol	3.1E+5*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4-Nitroaniline	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
4-Nitrophenol	4.9E+5*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Acenaphthene	2,800,000	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Acenaphthylene	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Anthracene	1.6E+7	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Benzidine	21	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Benzo[a]anthracene	6.2E+3	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Benzo[a]pyrene	6.2E+2	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Benzo[b]fluoranthene	6.2E+3	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Benzo[g,h,i]perylene	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Benzo[k]fluoranthene	6.2E+4	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Benzoic acid	1.0E+8*	29000	U	830	U	820	U	810	U	720	U	15000	U	800	U	3500	U	800	U	7300	U	820	U	830	U	750	U	780	U	810	U	800	U	720	U
Benzyl alcohol	1.8E+7*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
bis(2-Chloroethoxy)methane	NE	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
bis(2-Chloroethyl)ether	4.4E+3	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
bis(2-Ethylhexyl)phthalate	6.0E+3	3400	BJ	500	B	320	BJ	560	B	410	B	7600	U	130	J	1800	U	5800	D	3700	U	110	J	240	J	370	U	1200		410	U	80	J	360	U
Butylbenzylphthalate	2.4E+5*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U

Analyte Method 8270 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-002-65.7-66.8		LC38-DSPL-SB-002-70.0-70.5		LC38-DSPL-SB-102-70.0-70.5		LC38-DSPL-SB-002-74.5-75.0		LC38-DSPL-SB-002-78.0-78.5		LC38-DSPL-SB-003-66.0-66.5		LC38-DSPL-SB-003-67.0-67.5		LC38-DSPL-SB-003-71.3-71.5		LC38-DSPL-SB-003-78.0-78.5		LC38-DSPL-SB-004-63.3-63.8		LC38-DSPL-SB-004-64.0		LC38-DSPL-SB-004-68.0-68.5		LC38-DSPL-SB-004-69.2		LC38-DSPL-SB-004-75.0		LC38-DSPL-SB-004-80.0-80.5		LC38-DSPL-SB-104-80.0-80.5		LC38-DSPL-SB-004-84.0-85.0	
Carbazole	2.4E+4*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Chrysene	6.1E+5	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Di-n-butylphthalate	NE	15000	U	430	B	280	BJ	720	B	420	B	7600	U	290	BJ	1800	U	910	B	3700	U	410	U	420	U	370	U	300	BJ	270	BJ	160	BJ	160	BJ
Di-n-octylphthalate	1.2E+6*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Dibenz[a,h]anthracene	6.2E+2	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Dibenzofuran	2.9E+5	55000		420	U	410	U	410	U	360	U	52000		120	J	9600		400	U	20000		1700		420	U	370	U	390	U	410	U	400	U	360	U
Diethylphthalate	4.9E+7	15000	U	420	U	410	U	410	U	100	J	7600	U	400	U	1800	U	110	J	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Dimethylphthalate	1.0E+8	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Fluoranthene	2.3E+6	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Fluorene	2.1E+6	87000		420	U	410	U	410	U	360	U	76000		190	J	13000		400	U	30000		2700		420	U	370	U	390	U	410	U	400	U	360	U
Hexachlorobenzene	3.0E+3	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Hexachlorobutadiene	1.2E+4	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Hexachlorocyclopentadiene	4.2E+5	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Hexachloroethane	6.1E+4	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Indeno[1,2,3-cd]pyrene	6.2E+3	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Isophorone	5.1E+6	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
N-Nitroso-di-n-propylamine	70*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
N-Nitrosodiphenylamine	9.9E+5	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Naphthalene	5.3E+4	69000		420	U	410	U	410	U	360	U	52000		120	J	10000		400	U	23000		1100		420	U	370	U	390	U	410	U	400	U	360	U
Nitrobenzene	1.7E+4	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Pentachlorophenol	3.0E+3*	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Phenanthrene	1.8E+6	120000		420	U	410	U	410	U	360	U	110000	D	320	J	17000		400	U	42000		3500		420	U	370	U	390	U	410	U	400	U	360	U
Phenol	3.7E+7	15000	U	420	U	410	U	410	U	360	U	7600	U	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U
Pyrene	1.8E+6	15000	U	420	U	410	U	410	U	360	U	4300	J	400	U	1800	U	400	U	3700	U	410	U	420	U	370	U	390	U	410	U	400	U	360	U

U Not detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
D Sample was diluted.
B Analyte was also detected in the sample blank.
* Not Established by New Mexico. Level given is from the EPA Region VI Human Health Specific Screening Levels.
** Not Established by New Mexico or EPA Region VI. Level given is from the EPA Region IX Preliminary Remediation Goals.
^ Level is based on Total Xylenes (m,p, and o).
NE A screening level has not been established.

Table D-2B. SVOC Results from the November 2003 SWMU Assessment Sampling Event.

Analyte Method 8270 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-004-95.0		LC38-DSPL-SB-005-49.5-50.5		LC38-DSPL-SB-005-53.5-54.0		LC38-DSPL-SB-005-59.0-59.2		LC38-DSPL-SB-005-63.0-63.5		LC38-DSPL-SB-005-64.5-64.7		LC38-DSPL-SB-005-68-68.5		LC38-DSPL-SB-005-73.5-74.0		LC38-DSPL-SB-005-77.5-77.8		LC38-DSPL-SB-005-92.9-93.2		LC38-DSPL-SB-005-97.5-97.7		LC38-DSPL-SB-005-103-103.2		LC38-DSPL-SB-005-108-108.5		LC38-DSPL-SB-105-108-108.5		LC38-DSPL-SB-006-99.0-99.5		LC38-DSPL-SB-007-20-20.5		LC38-DSPL-SB-007-25-25.5	
1,2,4-Trichlorobenzene	5.2E+6	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
1,2-Dichlorobenzene	337E+5*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
1,2-Diphenylhydrazine	6.1E+3	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
1,3-Dichlorobenzene	1.2E+4	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
1,4-Dichlorobenzene	3.2E+4	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2,2'-oxybis(1-Chloropropane)	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2,4,5-Trichlorophenol	6.1E+6	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2,4,6-Trichlorophenol	4.4E+5	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2,4-Dichlorophenol	1.8E+5	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2,4-Dimethylphenol	1.2E+6*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2,4-Dinitrophenol	1.2E+5	740	U	700	U	740	U	3800	U	3500	U	3800	U	790	U	3500	U	760	U	780	U	690	U	700	U	780	U	780	U	700	U	700	U	690	U
2,4-Dinitrotoluene	1.2E+5	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2,6-Dinitrotoluene	6.1E+4*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2-Chloronaphthalene	3.9E+6*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2-Chlorophenol	6.4E+4*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2-Methylnaphthalene	NE	370	U	350	U	76	J	45000	D	54000	D	25000	D	13000	D	39000	D	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2-Methylphenol	3.1E+6*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2-Nitroaniline	3.7E+3*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
2-Nitrophenol	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
3,3'-Dichlorobenzidine	1.1E+4	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
3-Nitroaniline	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4,6-Dinitro-2-methylphenol	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4-Bromophenyl-phenylether	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4-Chloro-3-methylphenol	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4-Chloroaniline	2.4E+5*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4-Chlorophenyl-phenylether	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4-Methylphenol	3.1E+5*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4-Nitroaniline	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
4-Nitrophenol	4.9E+5*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Acenaphthene	2,800,000	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Acenaphthylene	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Anthracene	1.6E+7	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Benzidine	21	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Benzo[a]anthracene	6.2E+3	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Benzo[a]pyrene	6.2E+2	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Benzo[b]fluoranthene	6.2E+3	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Benzo[g,h,i]perylene	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Benzo[k]fluoranthene	6.2E+4	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Benzoic acid	1.0E+8*	740	U	700	U	740	U	3800	U	3500	U	3800	U	790	U	3500	U	760	U	780	U	690	U	700	U	780	U	780	U	700	U	700	U	690	U
Benzyl alcohol	1.8E+7*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
bis(2-Chloroethoxy)methane	NE	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
bis(2-Chloroethyl)ether	4.4E+3	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U

Analyte Method 8270 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-004-95.0		LC38-DSPL-SB-005-49.5-50.5		LC38-DSPL-SB-005-53.5-54.0		LC38-DSPL-SB-005-59.0-59.2		LC38-DSPL-SB-005-63.0-63.5		LC38-DSPL-SB-005-64.5-64.7		LC38-DSPL-SB-005-68-68.5		LC38-DSPL-SB-005-73.5-74.0		LC38-DSPL-SB-005-77.5-77.8		LC38-DSPL-SB-005-92.9-93.2		LC38-DSPL-SB-005-97.5-97.7		LC38-DSPL-SB-005-103-103.2		LC38-DSPL-SB-005-108-108.5		LC38-DSPL-SB-105-108-108.5		LC38-DSPL-SB-006-99.0-99.5		LC38-DSPL-SB-007-20-20.5		LC38-DSPL-SB-007-25-25.5	
bis(2-Ethylhexyl)phthalate	6.0E+3	77	J	350	U	85	BJ	1900	U	1800	U	3400	B	180	BJ	1800	U	380	U	390	U	1600	B	2200	B	390	U	4500	B	4600	B	1300	B	76	BJ
Butylbenzylphthalate	2.4E+5*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Carbazole	2.4E+4*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Chrysene	6.1E+5	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Di-n-butylphthalate	NE	280	BJ	430	B	480	B	1900	U	540	BJ	1000	BJ	400	B	1800	U	360	BJ	570	B	490	B	520	B	350	BJ	1100	B	890	B	270	BJ	430	B
Di-n-octylphthalate	1.2E+6*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Dibenz[a,h]anthracene	6.2E+2	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Dibenzofuran	2.9E+5	370	U	350	U	370	U	5500		6300		4700		2700		5100		380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Diethylphthalate	4.9E+7	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Dimethylphthalate	1.0E+8	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Fluoranthene	2.3E+6	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Fluorene	2.1E+6	370	U	350	U	370	U	5900		8700		7900		4000		6800		380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Hexachlorobenzene	3.0E+3	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Hexachlorobutadiene	1.2E+4	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Hexachlorocyclopentadiene	4.2E+5	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Hexachloroethane	6.1E+4	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Indeno[1,2,3-cd]pyrene	6.2E+3	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Isophorone	5.1E+6	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
N-Nitroso-di-n-propylamine	70*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
N-Nitrosodiphenylamine	9.9E+5	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Naphthalene	5.3E+4	370	U	350	U	370	U	7400		9400		4600		2600		6100		380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Nitrobenzene	1.7E+4	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Pentachlorophenol	3.0E+3*	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Phenanthrene	1.8E+6	370	U	350	U	130	J	16000		19000		11000		5400	D	15000		380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	80	J
Phenol	3.7E+7	370	U	350	U	370	U	1900	U	1800	U	1900	U	400	U	1800	U	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U
Pyrene	1.8E+6	370	U	350	U	370	U	470	J	1200	J	1900	U	280	J	530	J	380	U	390	U	350	U	350	U	390	U	390	U	350	U	350	U	350	U

U Not detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
D Sample was diluted.
B Analyte was also detected in the sample blank.
* Not Established by New Mexico. Level given is from the EPA Region VI Human Health Specific Screening Levels.
** Not Established by New Mexico or EPA Region VI. Level given is from the EPA Region IX Preliminary Remediation Goals.
^ Level is based on Total Xylenes (m,p, and o).
NE A screening level has not been established.

Table D-2C. SVOC Results from the November 2003 SWMU Assessment Sampling Event.

Analyte Method 8270 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-007-30.0-30.5		LC38-DSPL-SB-007-35.0-35.5		LC38-DSPL-SB-007-40.0-40.5		LC38-DSPL-SB-007-45.0-45.5		LC38-DSPL-SB-007-50-50.5		LC38-DSPL-SB-007-55.0-55.5		LC38-DSPL-SB-007-59-59.5		LC38-DSPL-SB-007-61.3-62.0		LC38-DSPL-SB-007-62.0-62.5		LC38-DSPL-SB-007-69.5-70.0		LC38-DSPL-SB-007-70-70.5		LC38-DSPL-SB-007-74-74.5		LC38-DSPL-SB-007-83-83.3		LC38-DSPL-SB-007-89-89.3		LC38-DSPL-SB-007-94.0-94.3		LC38-DSPL-SB-007-97.0-97.3		LC38-DSPL-SB-007-108.5-108	
1,2,4-Trichlorobenzene	5.2E+6	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
1,2-Dichlorobenzene	337E+5*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
1,2-Diphenylhydrazine	6.1E+3	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
1,3-Dichlorobenzene	1.2E+4	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
1,4-Dichlorobenzene	3.2E+4	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2,2'-oxybis(1-Chloropropane)	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2,4,5-Trichlorophenol	6.1E+6	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2,4,6-Trichlorophenol	4.4E+5	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2,4-Dichlorophenol	1.8E+5	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2,4-Dimethylphenol	1.2E+6*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2,4-Dinitrophenol	1.2E+5	680	U	800	U	740	U	720	U	730	U	830	U	4000	U	30000	U	790	U	780	U	780	U	760	U	720	U	720	U	720	U	670	U	780	U
2,4-Dinitrotoluene	1.2E+5	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2,6-Dinitrotoluene	6.1E+4*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2-Chloronaphthalene	3.9E+6*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2-Chlorophenol	6.4E+4*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2-Methylnaphthalene	NE	340	U	400	U	370	U	360	U	370	U	5700		59000	D	420000	D	5000		3900		3200		380	U	360	U	360	U	360	U	340	U	390	U
2-Methylphenol	3.1E+6*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2-Nitroaniline	3.7E+3*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
2-Nitrophenol	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
3,3'-Dichlorobenzidine	1.1E+4	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
3-Nitroaniline	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4,6-Dinitro-2-methylphenol	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4-Bromophenyl-phenylether	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4-Chloro-3-methylphenol	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4-Chloroaniline	2.4E+5*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4-Chlorophenyl-phenylether	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4-Methylphenol	3.1E+5*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4-Nitroaniline	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
4-Nitrophenol	4.9E+5*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Acenaphthene	2,800,000	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Acenaphthylene	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Anthracene	1.6E+7	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Benzidine	21	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Benzo[a]anthracene	6.2E+3	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Benzo[a]pyrene	6.2E+2	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Benzo[b]fluoranthene	6.2E+3	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Benzo[g,h,i]perylene	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Benzo[k]fluoranthene	6.2E+4	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Benzoic acid	1.0E+8*	680	U	800	U	740	U	720	U	730	U	830	U	4000	U	30000	U	790	U	780	U	780	U	760	U	720	U	720	U	720	U	670	U	780	U
Benzyl alcohol	1.8E+7*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
bis(2-Chloroethoxy)methane	NE	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
bis(2-Chloroethyl)ether	4.4E+3	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
bis(2-Ethylhexyl)phthalate	6.0E+3	340	U	400	U	75	BJ	80	BJ	370	U	130	BJ	2000	U	15000	U	110	BJ	390	U	110	BJ	2500	B	4600	B	360	U	90	BJ	3300	B	390	U
Butylbenzylphthalate	2.4E+5*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U

Analyte Method 8270 µg/kg November 2003	NMED SSL	LC38-DSPL-SB-007-30.0-30.5		LC38-DSPL-SB-007-35.0-35.5		LC38-DSPL-SB-007-40.0-40.5		LC38-DSPL-SB-007-45.0-45.5		LC38-DSPL-SB-007-50-50.5		LC38-DSPL-SB-007-55.0-55.5		LC38-DSPL-SB-007-59-59.5		LC38-DSPL-SB-007-61.3-62.0		LC38-DSPL-SB-007-62.0-62.5		LC38-DSPL-SB-007-69.5-70.0		LC38-DSPL-SB-007-70-70.5		LC38-DSPL-SB-007-74-74.5		LC38-DSPL-SB-007-83-83.3		LC38-DSPL-SB-007-89-89.3		LC38-DSPL-SB-007-94.0-94.3		LC38-DSPL-SB-007-97.0-97.3		LC38-DSPL-SB-007-108.5-108	
Carbazole	2.4E+4*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Chrysene	6.1E+5	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Di-n-butylphthalate	NE	120	BJ	350	BJ	220	BJ	450	B	340	BJ	280	BJ	770	BJ	15000	U	580	B	510	B	680	B	370	BJ	610	B	720	B	100	BJ	690	B	610	B
Di-n-octylphthalate	1.2E+6*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Dibenz[a,h]anthracene	6.2E+2	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Dibenzofuran	2.9E+5	340	U	400	U	370	U	360	U	370	U	2000		12000		50000		1000		840		630		380	U	360	U	360	U	360	U	340	U	390	U
Diethylphthalate	4.9E+7	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Dimethylphthalate	1.0E+8	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Fluoranthene	2.3E+6	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Fluorene	2.1E+6	340	U	400	U	370	U	360	U	370	U	2800		17000		63000		1200		960		740		380	U	360	U	360	U	360	U	340	U	390	U
Hexachlorobenzene	3.0E+3	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Hexachlorobutadiene	1.2E+4	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Hexachlorocyclopentadiene	4.2E+5	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Hexachloroethane	6.1E+4	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Indeno[1,2,3-cd]pyrene	6.2E+3	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Isophorone	5.1E+6	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
N-Nitroso-di-n-propylamine	70*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
N-Nitrosodiphenylamine	9.9E+5	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Naphthalene	5.3E+4	340	U	400	U	370	U	360	U	370	U	850		13000		89000		510		430		520		380	U	360	U	360	U	360	U	340	U	390	U
Nitrobenzene	1.7E+4	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Pentachlorophenol	3.0E+3*	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Phenanthrene	1.8E+6	340	U	400	U	100	J	360	U	370	U	2800		23000		140000		2700		2100		1400		380	U	360	U	360	U	75	J	340	U	390	U
Phenol	3.7E+7	340	U	400	U	370	U	360	U	370	U	420	U	2000	U	15000	U	400	U	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U
Pyrene	1.8E+6	340	U	400	U	370	U	360	U	370	U	420	U	970	J	6900	J	140	J	390	U	390	U	380	U	360	U	360	U	360	U	340	U	390	U

U Not detected at the indicated laboratory reporting limit.
J Detected below the laboratory reporting limit.
D Sample was diluted.
B Analyte was also detected in the sample blank.
* Not Established by New Mexico. Level given is from the EPA Region VI Human Health Specific Screening Levels.
** Not Established by New Mexico or EPA Region VI. Level given is from the EPA Region IX Preliminary Remediation Goals.
^ Level is based on Total Xylenes (m,p, and o).
NE A screening level has not been established.

APPENDIX E

Sieve and Hydrometer Analysis for SB-001

February 2, 2004

Mevatec Corporation
PO Box 399
WSMR, NM 88002

Job No.: 4-40120

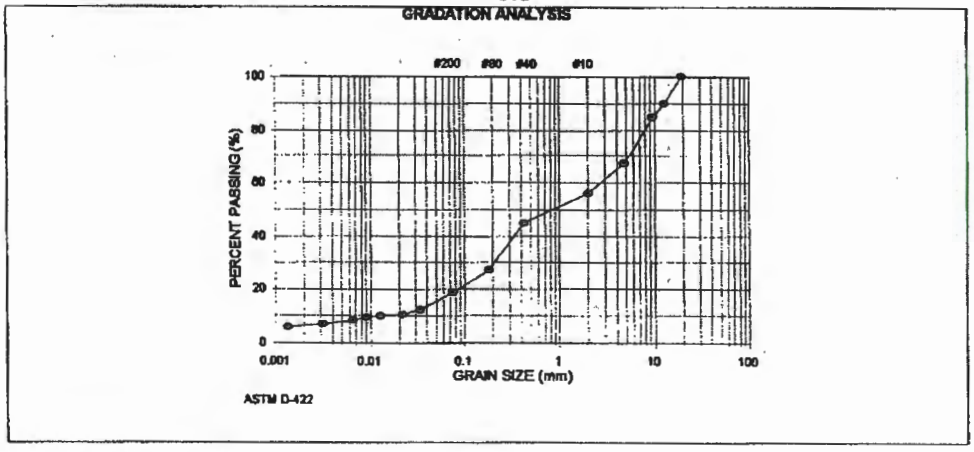
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(2.0'-3.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/4"	19.000	100
1/2"	12.500	90
3/8"	9.500	85
No. 4	4.750	67
No. 10	2.0000	56
No. 40	0.4250	45
No. 80	0.1800	27
No.200	0.0750	18.6
	0.0337	12.2
	0.0216	10.4
	0.0126	9.9
	0.0090	9.3
	0.0064	8.1
	0.0032	7.0
	0.0013	5.8



Respectfully Submitted:
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Tim Byres, SET

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(505) 526-6260
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GEO-TEST

February 2, 2004

Mevatec Corporation
PO Box 399
WSMR, NM 88002

Job No.: 4-40120

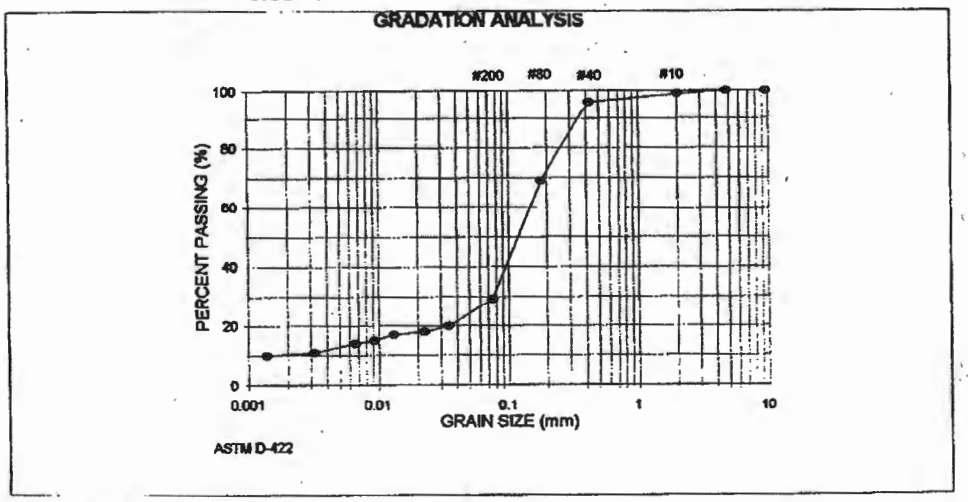
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(9.0'-10.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	99
No. 40	0.4250	96
No. 80	0.1800	69
No.200	0.0750	29.0
	0.0347	19.8
	0.0222	17.8
	0.0129	16.8
	0.0092	14.8
	0.0066	13.9
	0.0032	10.9
	0.0014	9.9



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February 2, 2004

Mevatec Corporation
PO Box 399
WSMR, NM 88002

Job No.: 4-40120

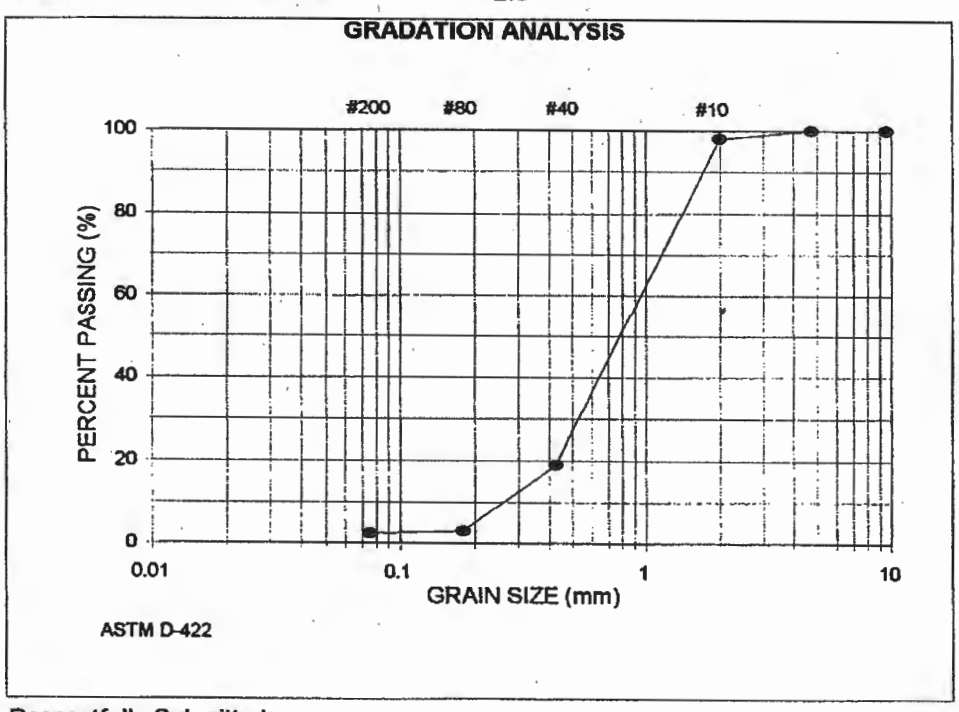
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(19.0'-19.5')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	98
No. 40	0.4250	19
No. 80	0.1800	3
No.200	0.0750	2.3



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Job No.: 4-40120

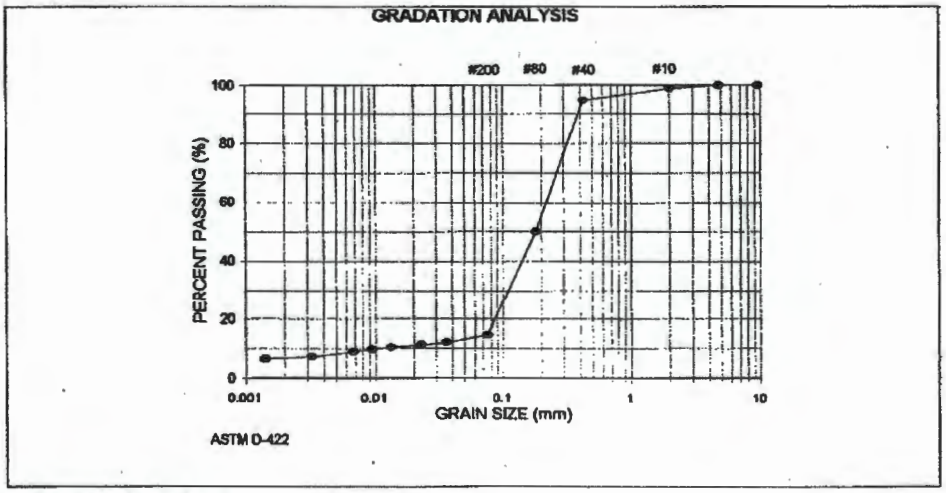
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(22.0'-23.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	99
No. 40	0.4250	95
No. 80	0.1800	50
No.200	0.0750	14.5
	0.0358	12.0
	0.0228	11.2
	0.0132	10.4
	0.0094	9.6
	0.0067	8.8
	0.0032	7.2
	0.0014	6.4



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Job No.: 4-40120

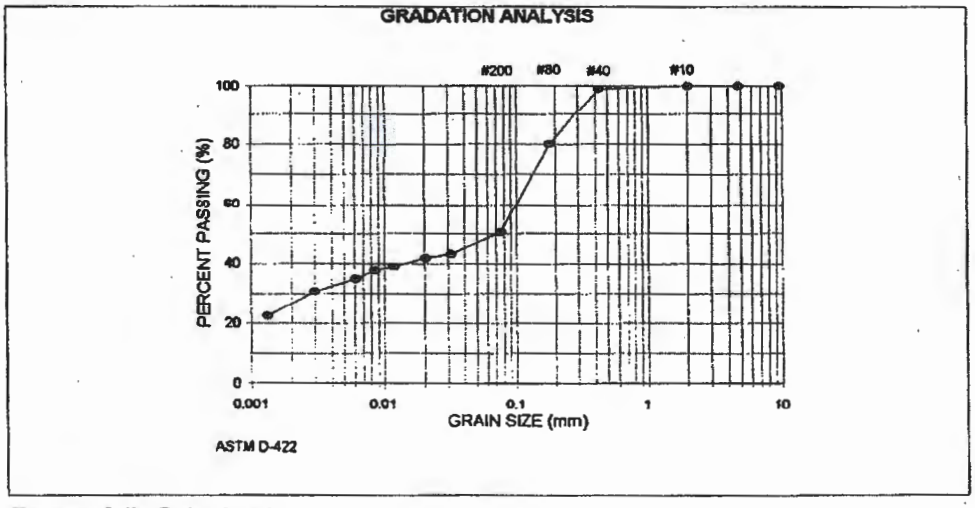
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(29.0'-30.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	100
No. 40	0.4250	99
No. 80	0.1800	80
No.200	0.0750	50.4
	0.0318	43.2
	0.0203	41.8
	0.0119	39.0
	0.0085	37.6
	0.0061	34.8
	0.0030	30.6
	0.0013	22.3



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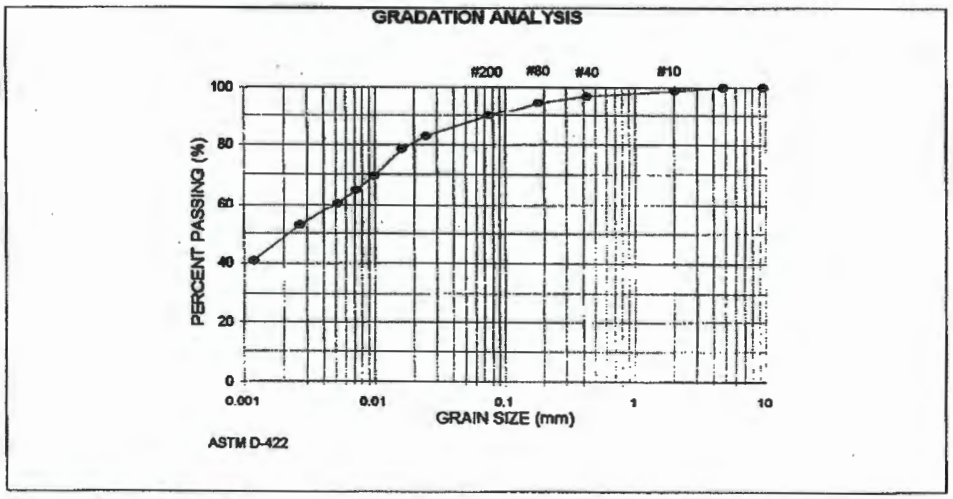
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(34.0'-35.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	99
No. 40	0.4250	97
No. 80	0.1800	95
No.200	0.0750	90.0
	0.0247	83.0
	0.0161	78.4
	0.0099	69.4
	0.0071	64.9
	0.0052	60.3
	0.0027	52.8
	0.0012	40.7



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Job No.: 4-40120

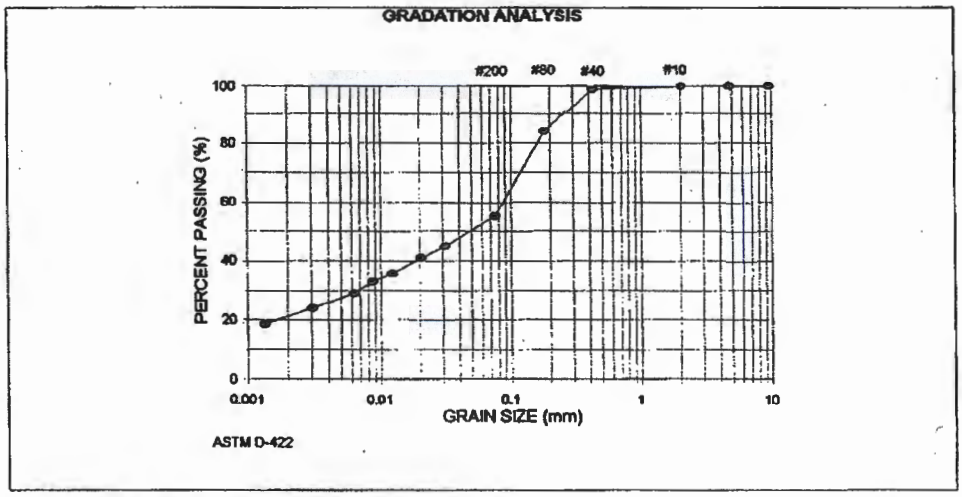
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(39.0'-40.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	100
No. 40	0.4250	99
No. 80	0.1800	84
No.200	0.0750	55.0
	0.0314	44.9
	0.0203	40.9
	0.0121	35.6
	0.0087	33.0
	0.0063	29.0
	0.0031	23.8
	0.0013	18.5



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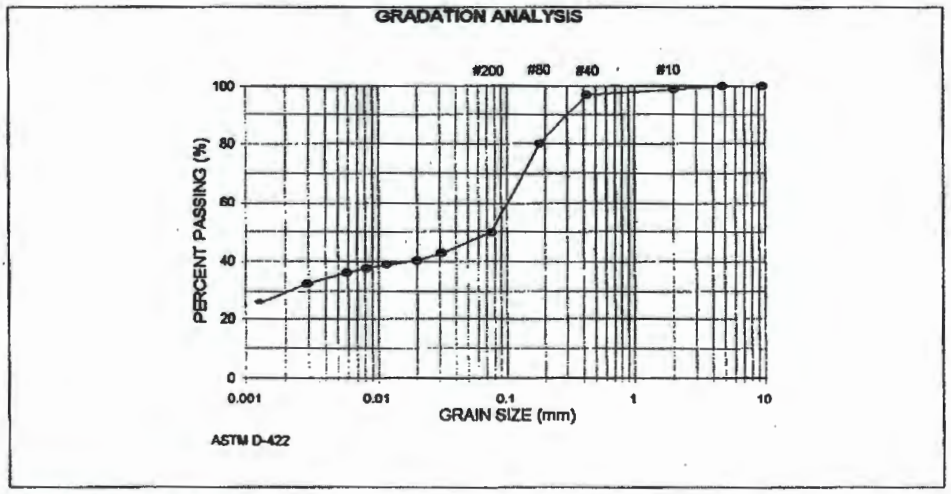
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(49.0'-50.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	99
No. 40	0.4250	97
No. 80	0.1800	80
No.200	0.0750	49.6
	0.0309	42.7
	0.0198	40.1
	0.0116	38.8
	0.0082	37.6
	0.0059	36.3
	0.0029	32.4
	0.0013	25.9



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Job No.: 4-40120

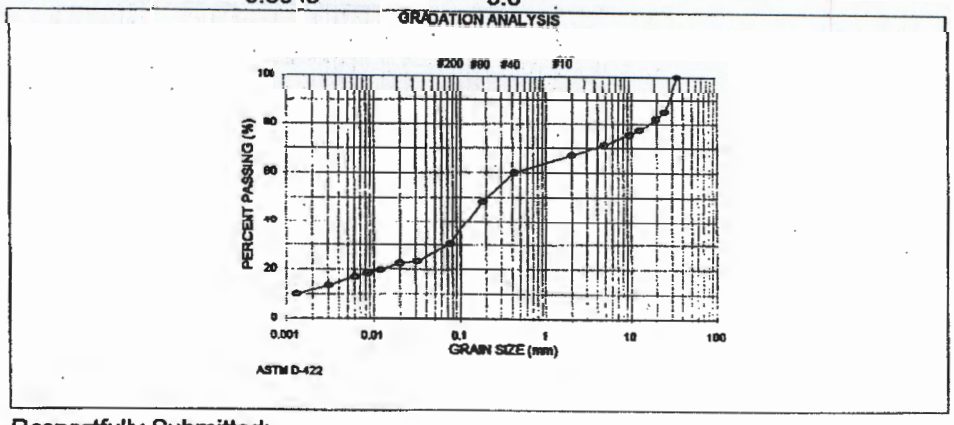
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(52.0'-53.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
1.5"	36.750	100
1"	24.500	85
3/4"	19.500	82
1/2"	12.500	77
3/8"	9.500	75
No. 4	4.750	71
No. 10	2.0000	67
No. 40	0.4250	60
No. 80	0.1800	48
No.200	0.0750	30.3
	0.0314	23.1
	0.0200	22.4
	0.0119	19.6
	0.0085	18.2
	0.0061	16.8
	0.0031	13.3
	0.0013	9.8



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Job No.: 4-40120

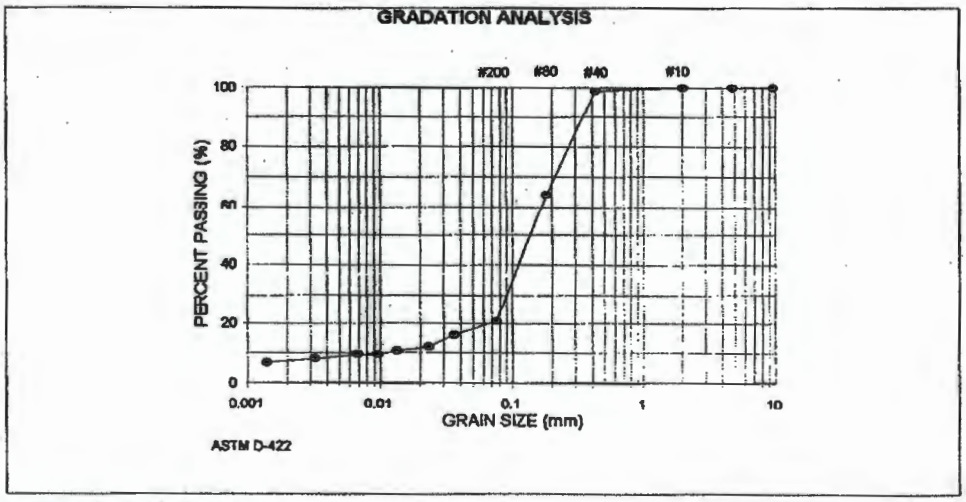
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(59.0'-60.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	100
No. 40	0.4250	99
No. 80	0.1800	64
No.200	0.0750	20.7
	0.0359	16.1
	0.0231	12.0
	0.0134	10.7
	0.0096	9.4
	0.0068	9.4
	0.0032	8.0
	0.0014	6.7



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Job No.: 4-40120

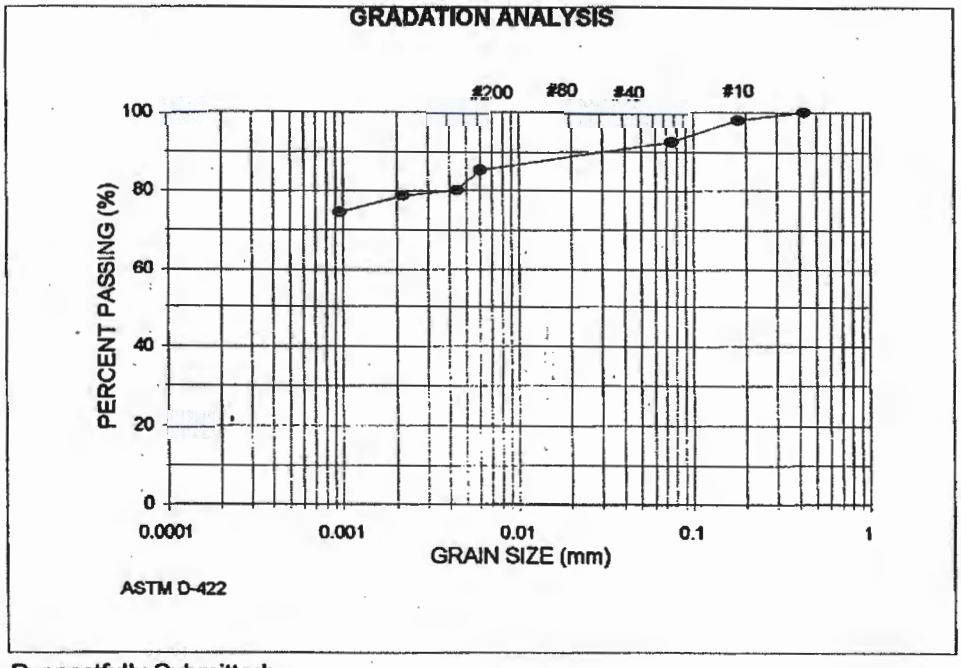
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(69.0'-70.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
No. 40	0.4250	100
No. 80	0.1800	98
No.200	0.0750	92.5
	0.0060	85.5
	0.0044	80.0
	0.0022	78.6
	0.0010	74.5



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Job No.: 4-40120

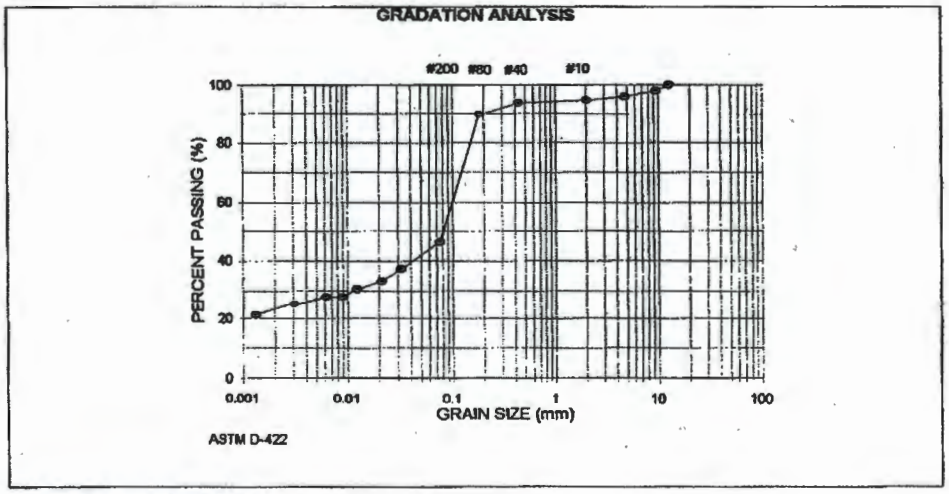
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(75.0'-77.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
1/2"	12.500	100
3/8"	9.500	98
No. 4	4.750	96
No. 10	2.0000	95
No. 40	0.4250	94
No. 80	0.1800	90
No.200	0.0750	46.2
	0.0325	37.2
	0.0210	33.2
	0.0123	30.6
	0.0088	27.9
	0.0062	27.9
	0.0031	25.3
	0.0013	21.3



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Job No.: 4-40120

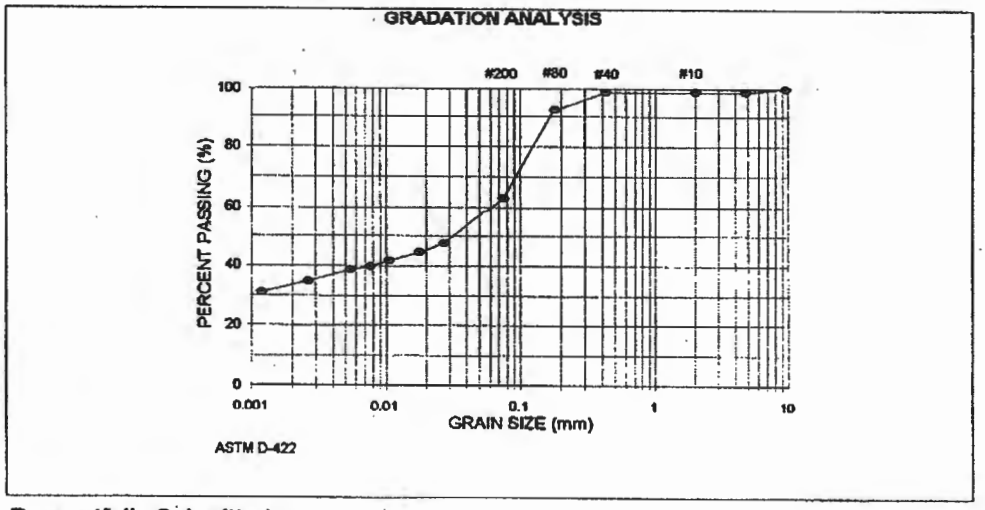
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(79.0'-80.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	99
No. 10	2.0000	99
No. 40	0.4250	99
No. 80	0.1800	93
No.200	0.0750	62.9
	0.0273	47.4
	0.0178	44.5
	0.0105	41.6
	0.0076	39.7
	0.0054	38.7
	0.0026	34.9
	0.0012	31.0



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Job No.: 4-40120

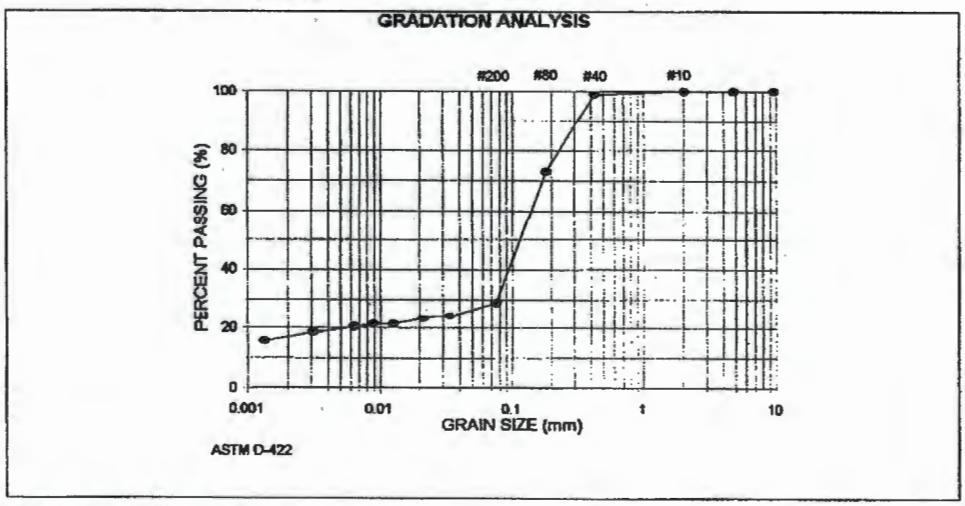
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(89.0'-90.0')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	100
No. 40	0.4250	99
No. 80	0.1800	73
No.200	0.0750	28.9
	0.0336	24.2
	0.0214	23.3
	0.0125	21.3
	0.0089	21.3
	0.0063	20.4
	0.0031	18.4
	0.0013	15.5



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Job No.: 4-40120

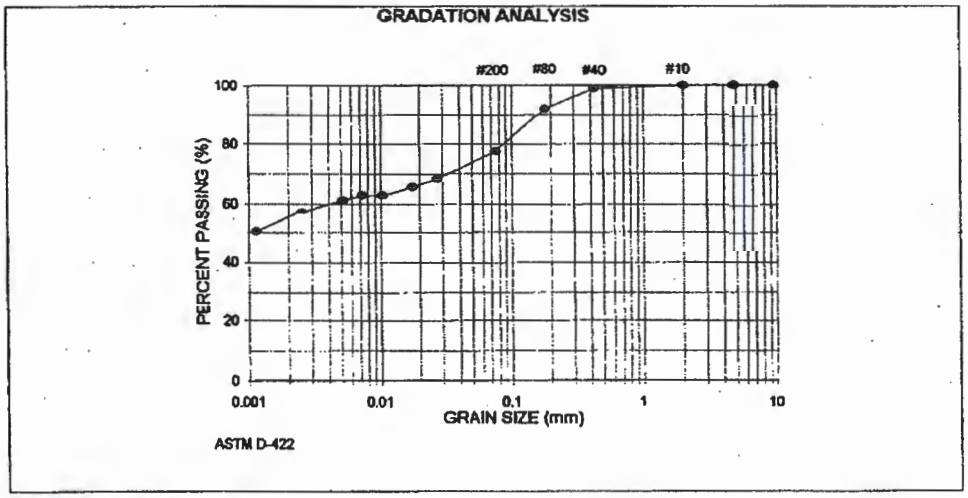
PROJECT: LC-38 Diesel Spill

SAMPLE LOCATION: LC38-DSPL-SB-001(96.5'-97.5')

SAMPLE: Soil Sample, Delivered by Client on 01/08/04

SIEVE ANALYSIS (ASTM D-422)

Sieve Size	Particle Dia. (mm)	Percent Passing
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.0000	100
No. 40	0.4250	99
No. 80	0.1800	92
No.200	0.0750	77.6
	0.0273	68.4
	0.0176	65.6
	0.0103	62.8
	0.0072	62.8
	0.0052	61.4
	0.0025	57.2
	0.0011	50.3



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APPENDIX F

Contaminant Plume Models

Figure 3

LC-38
Geochemical Fence Diagram
TPH DRO (ppm)
Northwest View

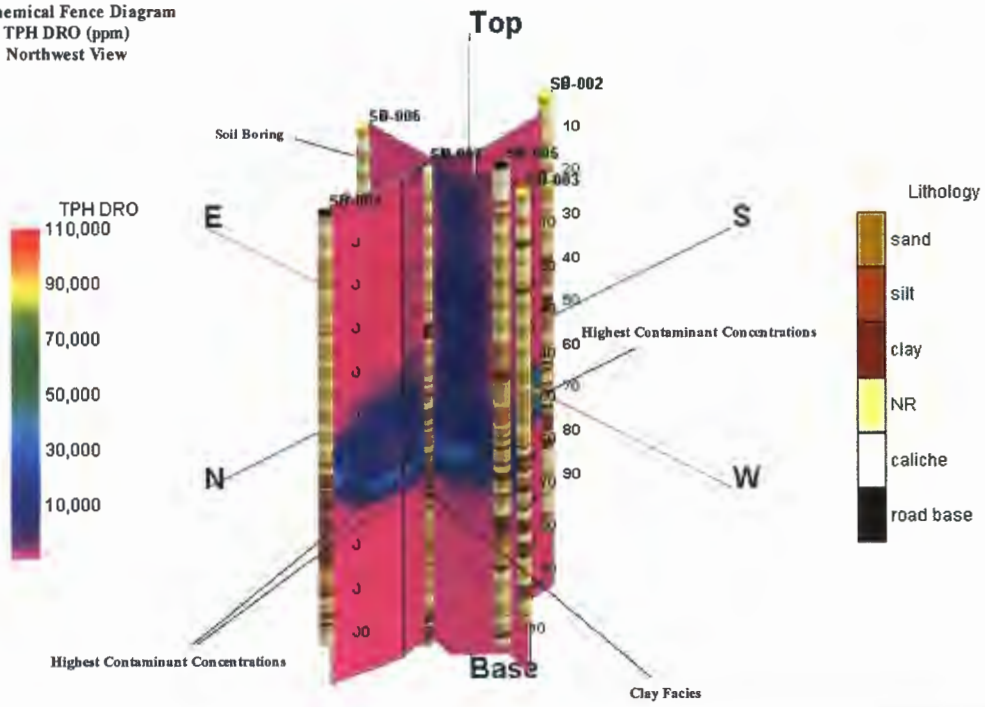

Figure 4

LC-38
Geochemical Fence Diagram
TPH DRO (ppm)
Norheast View

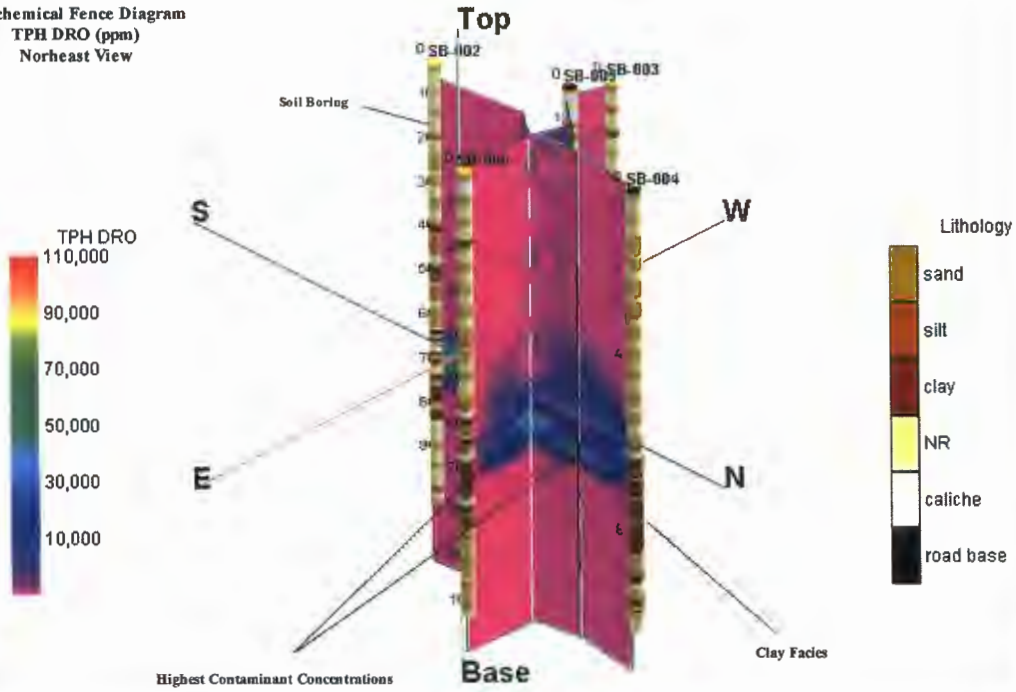

Figure 5

LC-38
Geochemical Fence Diagram
TPH DRO (ppm)
Southwest View

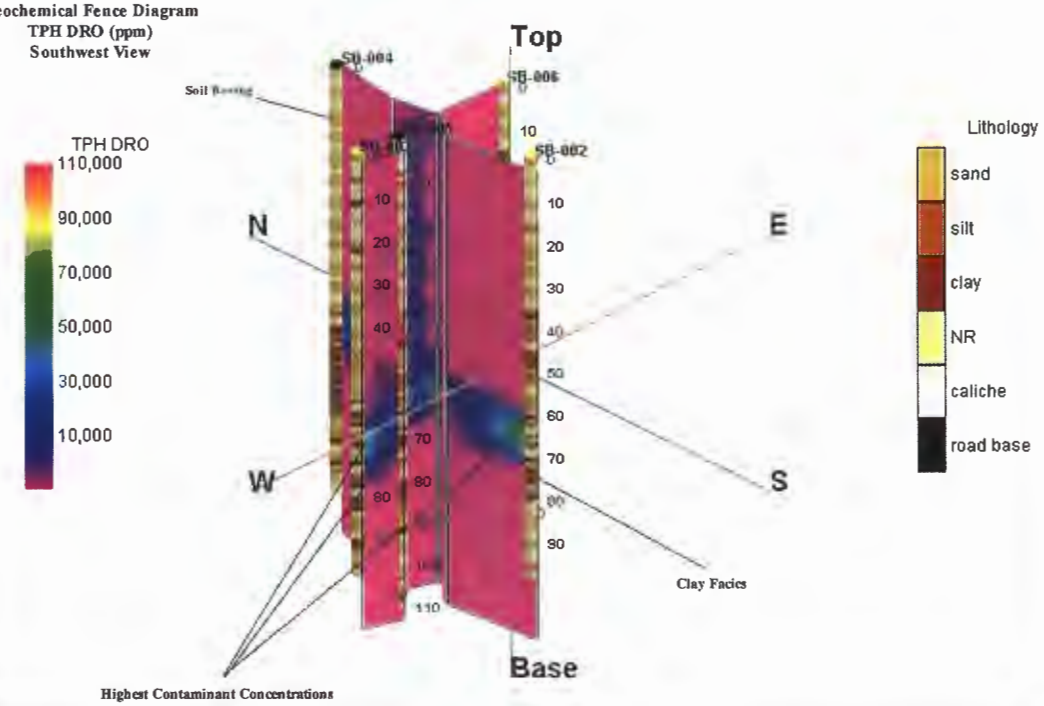

Figure 6

LC-38
Geochemical Fence Diagram
TPH DRO (ppm)
Southeast View

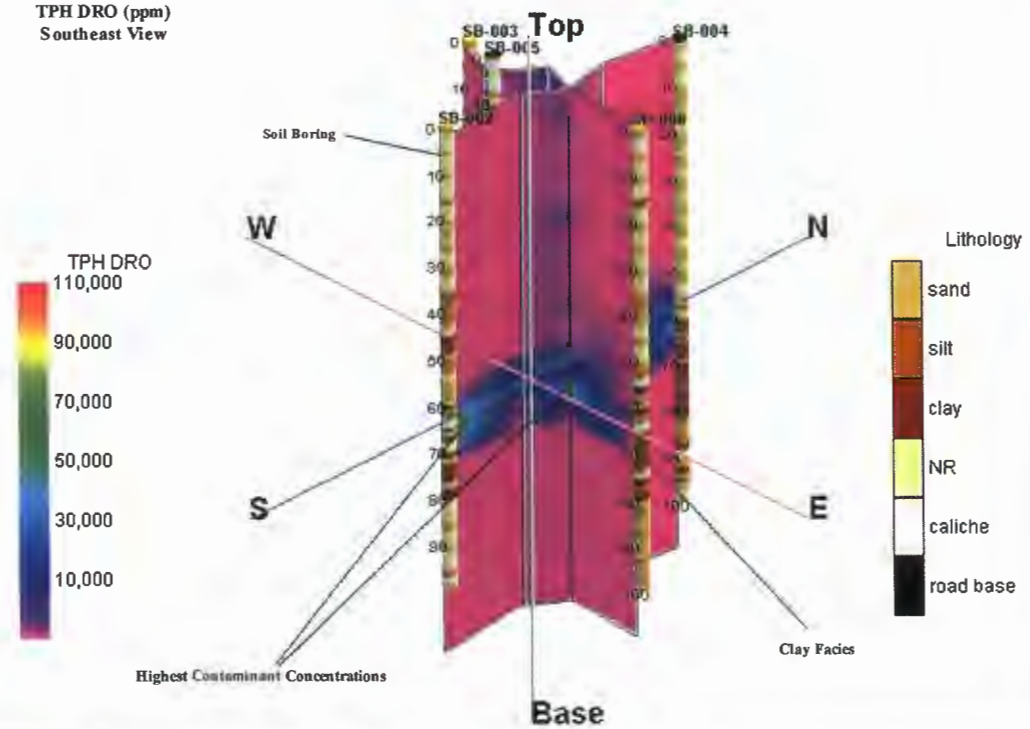

Figure 7

LC-38
Geochemical Block Diagram
TPH DRO (ppm)
> 10,000 ppm
Northeast View

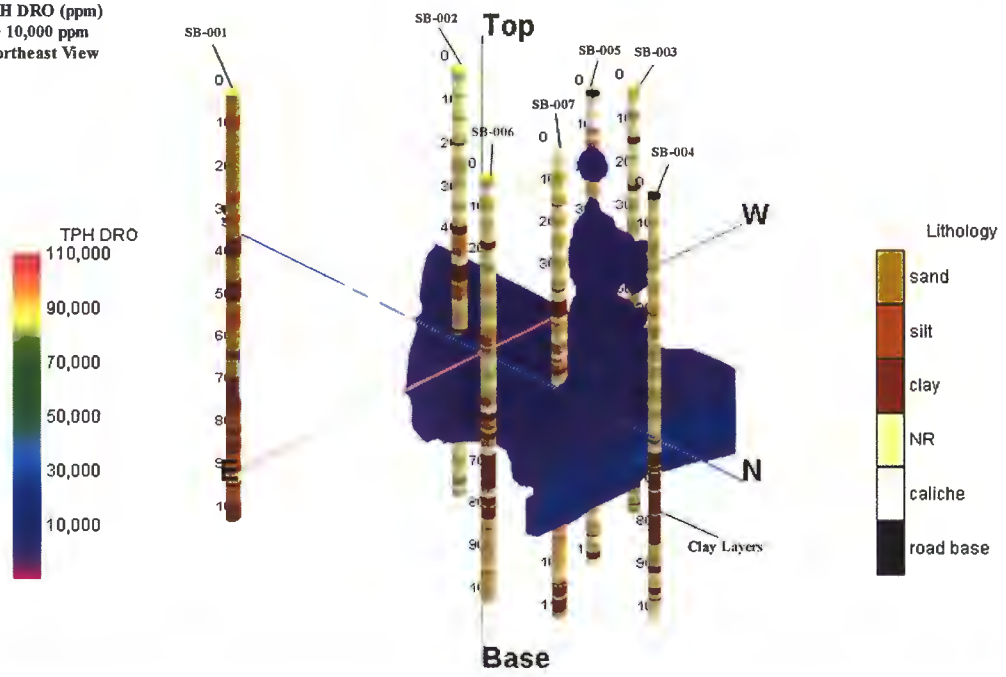

Figure 8

LC-38
Geochemical Block Diagram
TPH DRO (ppm)
> 50,000 ppm
Northeast View

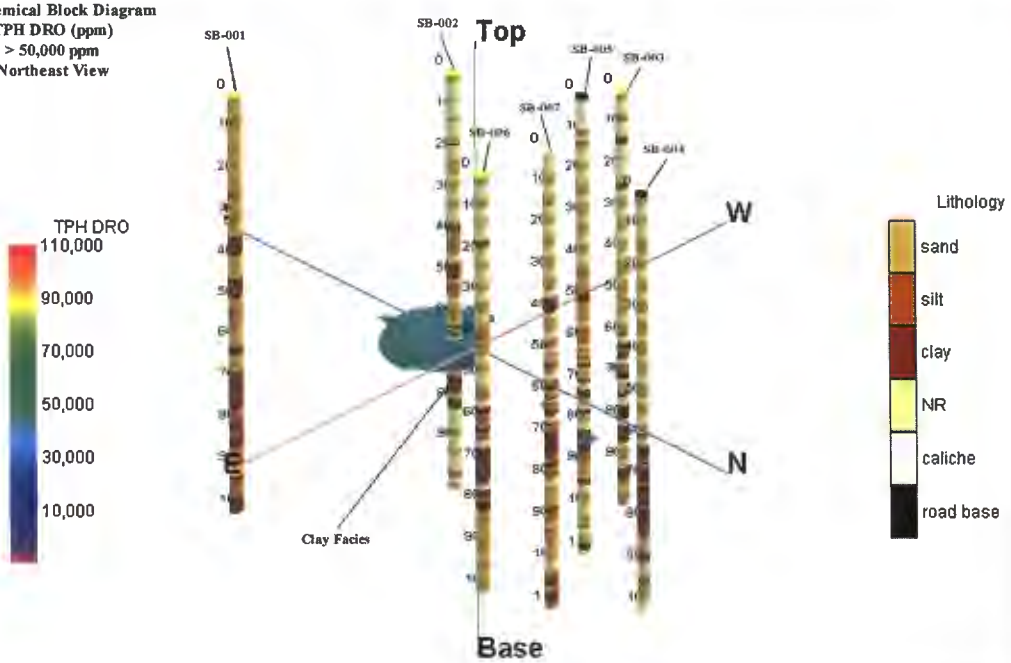

Figure 9

LC-38
Geochemical Block Diagram
TPH DRO (ppm)
> 75,000 ppm
Northeast View

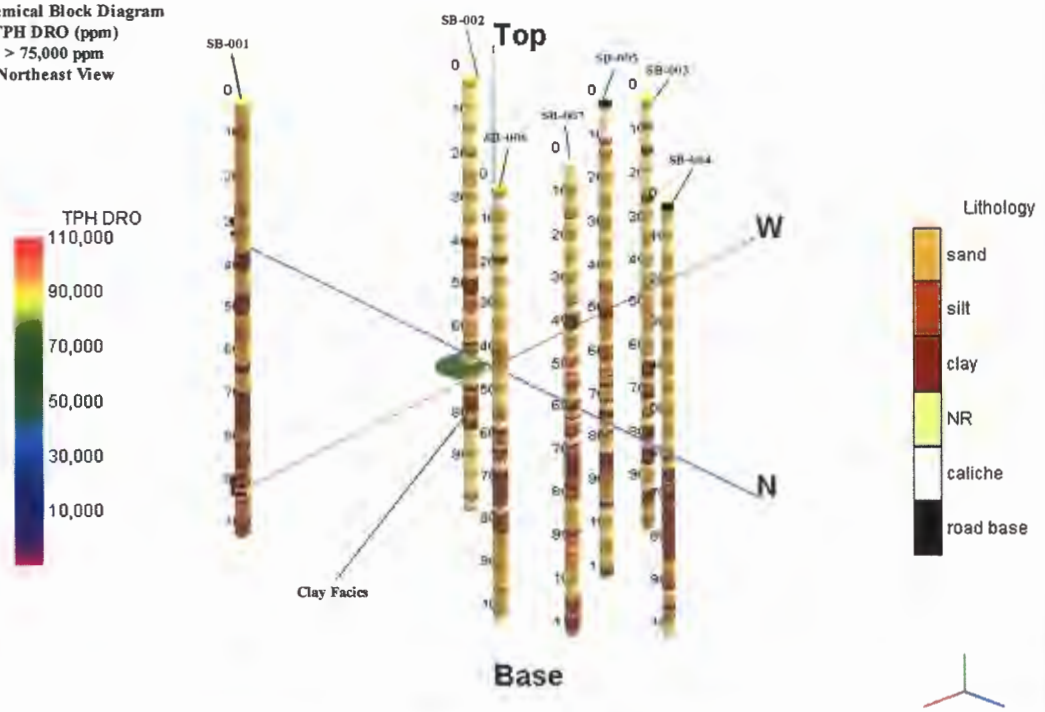

Figure 10

LC-38
Lithology Fence Diagram
TPH DRO Contamination
Northwest View (above)

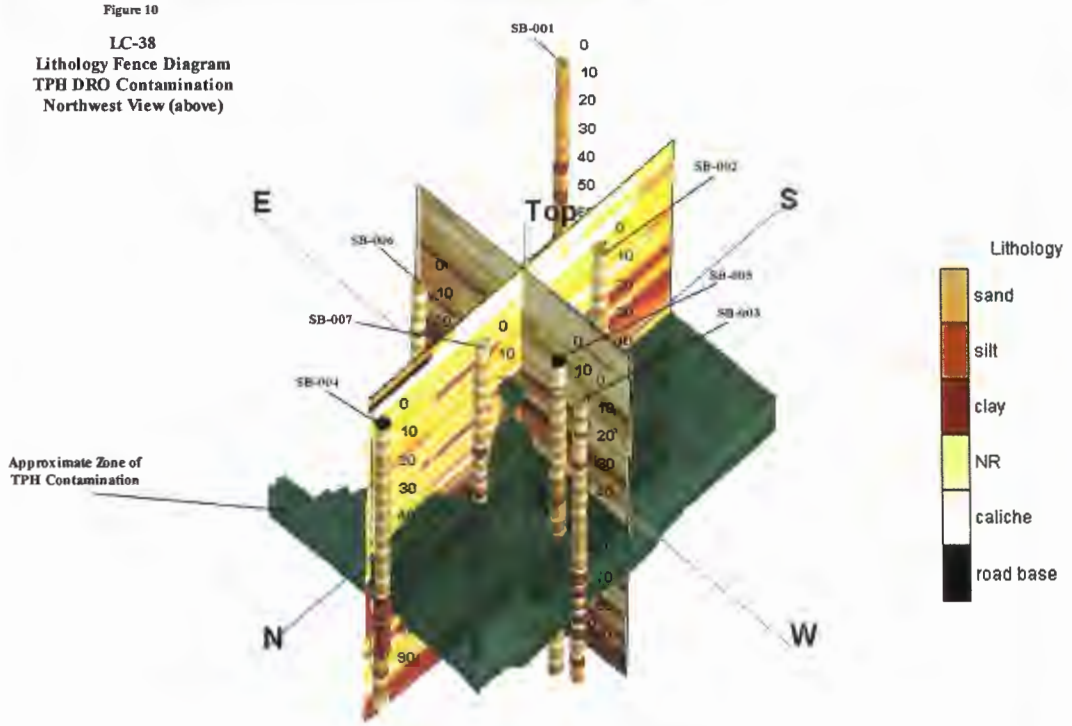

Figure 11

LC-38
Lithology Fence Diagram
TPH DRO Contamination
Northwest View (below)

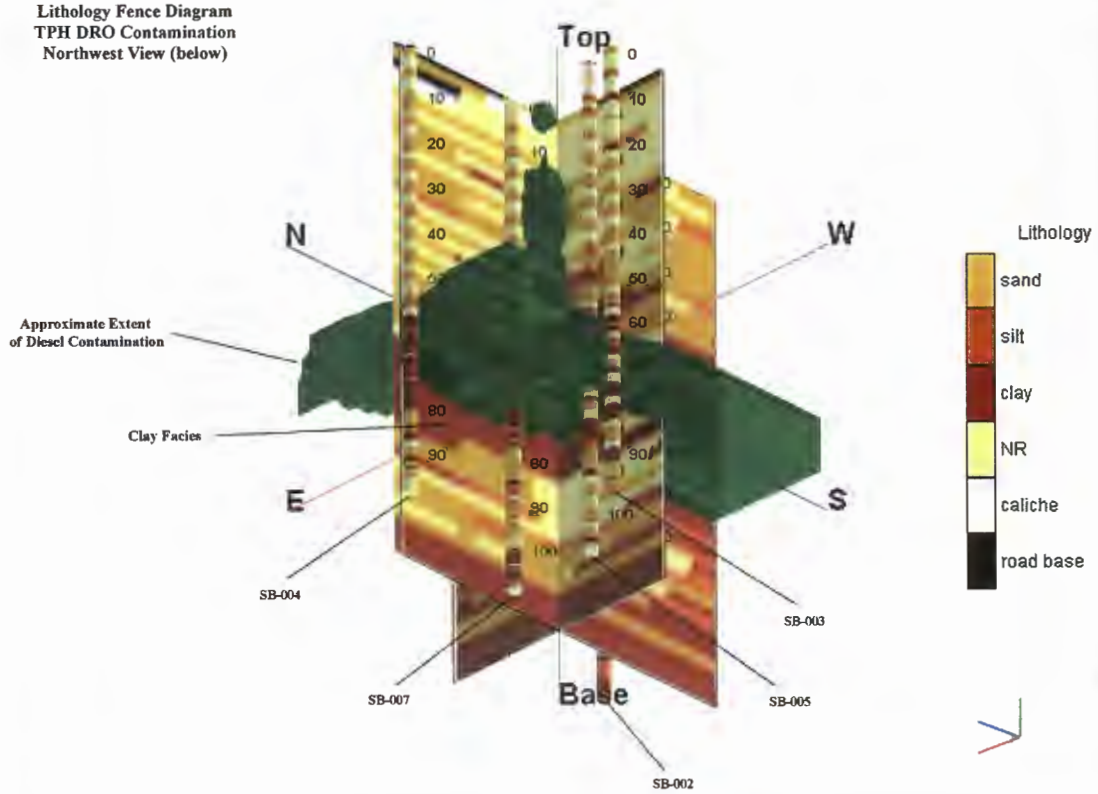

Table F-1. TPH (ppm) Detections Compared to Sample Collection Depth Interval.

Depth Interval bgs	West-East	SB-003 TPH 1,002.5 ft	SB-005 TPH 1,003.79 ft	BH-01 TPH 1,000.72 ft	SB-007 TPH 999.36 ft	SB-006 TPH 1,000.29 ft	North-South	SB-004 TPH 1,000.42 ft	BH-03 TPH 1,000.12 ft	SB-007 TPH 999.36 ft	BH-02 TPH 999.70 ft	SB-002 TPH 1,004.19 ft	SB-001 TPH 1,002.63 ft
1-2		ND											
2-3													
3-4													
4-5									1.4		16		
5-6													
6-7								59				ND	
7-8						ND							
8-9			ND										
9-10				14,000					1.8		6.1		
10-11		ND			27					27			
11-12													
12-13													
13-14													
14-15								ND	1.4		8.4		
15-16													
16-17													
17-18				11,000								ND	
18-19													
19-20				11,000					1.4		24		
20-21		ND	ND		ND	ND		ND		ND			
21-22													
22-23													
23-24													
24-25				17,000					15		14		
25-26													
26-27													
27-28												ND	
28-29													
29-30				21,000					3.6				
30-31		ND	ND		ND	ND		ND		ND			
31-32													
32-33													
33-34													
34-35				16,000					4.5		13		
35-36													
36-37													
37-38													
38-39													
39-40				14,000		ND			3.7		1.1	ND	
40-41		ND	ND		53			ND		53			
41-42													
42-43													
43-44													
44-45				21,000					5,200		0.8		
45-46													
46-47													
47-48													
48-49													
49-50			ND	10,000								ND	
50-51		ND			37	ND		ND		37			
51-52													
52-53													
53-54									30,000				
54-55				24,000					21,000		27		
55-56													
56-57													
57-58											20,000		
58-59													
59-60			10,000	11,000	20,000	ND			5,000	20,000	26,000	ND	
60-61		ND											
61-62					120,000					120,000			
62-63					1,400					1,400			
63-64			26,000					38,000					
64-65				49,000					12,000		180		
65-66													
66-67		110,000										110,000	
67-68		170							70,000		6,800		
68-69								ND					
69-70				420	1,000	ND		39	23	1,000	160		
70-71				3,000	630					630		ND	
71-72													
72-73													
73-74			8,400										
74-75								ND	56		1.4	ND	
75-76													
76-77													
77-78			100										
78-79		76										ND	
79-80				2.2	ND	ND			1.2	ND			
80-81								ND					
81-82													
82-83													
83-84													
84-85		ND	ND		ND			ND		ND			27
85-86													
86-87												140	
87-88													
88-89		ND											
89-90			ND		ND	ND		ND		ND			
90-91													
91-92												ND	
92-93			33										
93-94													
94-95		ND						ND					
95-96												ND	
96-97								ND					
97-98			ND		ND					ND			
98-99		ND											
99-100						ND						ND	ND
100-101													
101-102													
102-103													
103-104			ND		ND					ND			
104-105				1.1									
105-106													
106-107													
108-109			ND		ND					ND			

Table F-2. TPH (ppm) Concentrations Referenced to Relative Elevations Where Detected.

Elevation	West-East	SB-003 TPH 1,002.5 ft	SB-005 TPH 1,003.79 ft	BH-01 TPH 1,000.72 ft	SB-007 TPH 999.36 ft	SB-006 TPH 1,000.29 ft	North-South	SB-004 TPH 1,000.42 ft	BH-03 TPH 1,000.12 ft	SB-007 TPH 999.36 ft	BH-02 TPH 999.70 ft	SB-002 TPH 1,004.19 ft	SB-001 TPH 1,002.63 ft
1004			Gnd Sfc									Gnd Sfc	
1003													Gnd Sfc
1002		Gnd Sfc											
1001		ND		Gnd Sfc									
1000						Gnd Sfc		Gnd Sfc	Gnd Sfc		Gnd Sfc		
999					Gnd Sfc					Gnd Sfc			
998													
997			ND									ND	
996													
995									1.4		16		
994													
993								59					
992		ND				ND							
991				14,000									
990									1.8		6.1		
989													
988					27					27			
987													
986												ND	
985			ND					ND	1.4		8.4		
984													
983				11,000									
982		ND											
981				11,000									
980									1.4		24		
979						ND		ND					
978					ND					ND			
977													
976				17,000								ND	
975			ND						15		14		
974													
973													
972		ND											
971				21,000									
970									3.6				
969						ND		ND					
968					ND					ND			
967													
966				16,000									
965			ND						4.5		13		
964												ND	
963													
962		ND											
961				14,000									
960						ND			3.7		1.1		
959								ND					
958					53					53			
957													
956			ND	21,000									
955									5,200		0.8		
954												ND	
953													
952		ND											
951				10,000									
950													
949						ND		ND					
948					37					37			
947													
946			10,000	24,000					30,000				
945									21,000		27		
944												ND	
943													
942		ND	26,000								20,000		
941				11,000									
940						ND			5,000		26,000		
939					20,000					20,000			
938													
937					120,000					120,000		110,000	
936		110,000		49,000	1,400			38,000		1,400			
935		170							12,000		180		
934													
933												ND	
932			8,400						70,000		6,800		
932				420				ND					
930				3,000		ND		39	23		160		
929					1,000					1,000		ND	
928			100		630					630			
927													
926													
925								ND	56		1.4	ND	
924		76											
923													
922													
921			ND	2.2									
920						ND			1.2				
919					ND			ND		ND			
918		ND											27
917												140	
916			ND										
915								ND					
914		ND			ND					ND			
913			33										
912												ND	
911													
910						ND		ND					
909					ND					ND			
908		ND	ND									ND	
907													
906													
905								ND					
904		ND										ND	
903								ND					ND
902			ND										
901					ND					ND			
900						ND							
899													
898			ND										
897													
896				1.1									
895					ND					ND			
895													
893													
892													
891					ND					ND			

Gnd Sfc Ground Surface.
ND Not Detected.

APPENDIX G

RBDMP Tier 1 Reports Forms

RISK-BASED DECISION MAKING SOF
FOR PETROLEUM RELEASES AT UNDERGROUN
SITES IN NEW MEXICO
TIER 1 REPORT FORMS

Considerable care was exercised in developing this softwar
RAM Group, Inc. makes no warranty regarding the accurac
shall not be held liable for any damages resulting from its u

CONTINUE

Version 1.0, March 2000

Developed for:
The State of New Mexcio
Environment Department
Underground Storage Tank Bureau
by:

TITLE PAGE | NEW MEXICO ROOM | PRINT

COVER PAGE

TABLE OF CONTENTS

TIER 1 REPORT FORMS

1 EXECUTIVE SUMMARY

2 SITE CONCEPTUAL EXPOSURE SCENARIO

3 JUSTIFICATION FOR PATHWAYS SELECTED (CURRENT AND FUTURE CONDITIONS)

ON-SITE RECEPTORS	OFF-SITE RECEPTORS
RESIDENTIAL EXPOSURES	RESIDENTIAL EXPOSURES
COMMERCIAL WORKER	COMMERCIAL WORKER
CONSTRUCTION WORKER	CONSTRUCTION WORKER

4 TIER 1 COMPARISON (CURRENT AND FUTURE CONDITIONS)

ON-SITE RECEPTORS	OFF-SITE RECEPTORS
RESIDENT (CHILD AND ADULT)	RESIDENT (CHILD AND ADULT)
COMMERCIAL WORKER	COMMERCIAL WORKER
CONSTRUCTION WORKER	CONSTRUCTION WORKER

5 TIER 1 GROUNDWATER PROTECTION WITH NO WAIVER PETITION

6 TIER 1 GROUNDWATER PROTECTION WITH WAIVER PETITION

7 TIER 1 APPLICABLE TARGET LEVELS FOR VARIOUS MEDIA

8 TIER 1 RECOMMENDATIONS AND CONCLUSIONS

9 REFERENCES AND PROTOCOLS

Tier 1 Report Forms

Risk-Based Decision Making For Petroleum Releases At Underground Storage Tank Sites In New Mexico

SITE NAME:	*Launch Complex 38*
SITE LOCATION:	*Nike Avenue*
SITE ID:	*LC-38*
FACILITY ID:	*White Sands Missile Range*
SUBMITTAL DATE:	*March 31, 2004*
PREPARED BY:	*Neil V. Maimer*
REVIEWED BY:	

TABLE OF CONTENTS *(Page 1 of 3)*

☐ *Check the box against the item, if the item is included.*

Form No.	Description	TIER 1 REPORT FORMS	
1.	Executive summary.		☑
2.	Site conceptual exposure scenario.		☑
3.	Justification for pathways complete and incomplete.		
		Residential (child and adult).	☑
		Commercial worker.	☑
		Construction worker.	☑
4.	Comparison of Tier 1 RBSLs with representative site concentrations.		
	On-site receptors.		
		Resident (child and adult).	☑
		Commercial worker.	☑
		Construction worker.	☑
	Off-site receptors.		
		Resident (child and adult).	☐
		Commercial worker.	☐
		Construction worker.	☐
5.	Tier 1 groundwater protection - no petition for variance to WQCC standards required.		☑
6.	Tier 1 groundwater protection - petition for variance to WQCC standards required.		☐
7.	Tier 1 applicable target levels for various media.		☑
8.	Tier 1 conclusions and recommendations.		☑
9.	References and protocol.		☐

TABLE OF CONTENTS *(Page 2 of 3)*

All maps submitted to NMED must include a bar scale, legend, north arrow, location of all known soil borings and monitoring wells, and date of map, where appropriate.

☐ *Check the box against the item, if the item is included.*

Map No.	Description	MAPS

Maps 1-6 are part of 14 Day Report and maps 7-10 are part of Investigation Report. Update and resubmit as appropriate.

Note: Maps may be combined, as appropriate.

1. Topographic map. ☐
2. Site map with UST system location(s), including tank ID number(s). ☐
3. Site map with utility locations. ☐
4. Land use map (radius of 1,000 feet). ☐
5. Receptor survey map: with detailed land use in the vicinity of the site (at least 1,000 feet in the downgradient direction and one property deep on all other sides including across the street). ☐
6. Area map with water use well locations: within one mile radius of the site (the wells on the map must be labeled). Maps must also indicate the location of surface water drains including but not limited to streams, lakes and well head protection areas, within a 500 foot radius of the site. ☐
7. NAPL thickness contour map. ☐
8. Area geologic map. ☐
9. Groundwater gradient map: contoured map with the predominant flow direction from the most recent gauging event (add additional maps if the flow direction fluctuates). ☐
10. Soil and groundwater concentration contour maps showing boring and well locations and concentrations in each: for benzene, MTBE, total BTEX, and Total PAHs from the most recent sampling event. ☐
11. Map identifying the location of data points used to calculate representative soil concentrations protective of groundwater. ☐
12. Map Identifying POE(s) and POC(s): for both current and future conditions. ☐

ADDITIONAL MAPS:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

TABLE OF CONTENTS *(Page 3 of 3)*

☐ *Check the box against the item, if the item is included.*

Attachment No. Description

ATTACHMENTS

Aattachments 1and 2 are part of 14 Day Report and attchments 3-7 are part of Investigation Report. Update and resubmit as appropriate.

1. Most recent UST system test results. ☐
2. Vapor screening results for utilities. ☐
3. Estimation of NAPL present: Estimated thickness vs measured thickness of NAPL. Include calculation brief for estimated thickness. ☐
4. Monitoring well construction diagram. ☐
5. Representative soil boring logs: cross-section(s) showing the stratigraphy of the site and the extent of contamination. ☐
6. Historical groundwater monitoring data for all the monitoring wells. Include any data collected from temporary wells or borings. ☐
7. Contaminant concentration and depth to groundwater vs. time graphs for wells with four or more sampling events. ☐
8. Description of the logic used in the selection of data for calculation of representative site concentrations, for on site and off-site media. Provide raw data selected and representative concentrations. ☐
9. Justification for the selection of POE(s), POC(s), and groundwater standards (MCLs vs. WQCC standards). ☐

ADDITIONAL ATTACHMENTS:

Laboratory analytical report(s) not previously submitted to the department.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 1

SITE ID: LC-38	**FACILITY ID: White Sands Missile Range**
SUBMITTAL DATE: 31-Mar-04	**PREPARED BY: Neil V. Maimer**

EXECUTIVE SUMMARY

Facility name:	*White Sands Missile Range*
Facility address:	
Status of UST system:	☐ Active ☑ Inactive
Ground surface condition:	
Estimated volume and type of product(s) released:	*31,000 gallons of Diesel #2*
Has any vapor impacts been identified?	☑ No ☐ On-site ☐ Off-site
If yes (check all that apply):	☐ Utility corridor ☐ Subsurface structures ☐ Above surface structures
Is soil contaminated?	☐ No ☑ On-site ☐ Off-site
Is there any contaminant-saturated soil?	☑ No ☐ On-site ☐ Off-site
Is groundwater contaminated?	☑ No ☐ On-site ☐ Off-site
Has the source of release been identified?	☑ Yes ☐ No
Has NAPL ever been detected?	☐ Yes ☑ No
Was NAPL removed?	☐ Yes ☑ No
Was NAPL detected in the most recent sampling event?	☐ Yes ☑ No
Has surface water been contaminated by the release?	☐ Yes ☑ No ☐ Uknown ☐ Suspected
Shallowest depth to groundwater (ft bgs.):	*232.57*
Average depth to groundwater (ft bgs.):	*235.75*
Has a drinking water supply well been contaminated by this release?	☐ Yes ☑ No ☐ Unknown ☐ Suspected
If yes	☐ Drinking ☐ Irrigation ☐ Other

RECOMMENDATIONS

- ☐ No further action under tier 1
- ☐ Compliance monitoring
- ☐ Remediate to tier 1 RBSLs and WQCC standards to achieve no further action
- ☐ Perform interim remedial action and then re-evaluate
- ☐ Perform tier 2 evaluation
- ☐ Petition WQCC for approval of alternative groundwater standards

ADDITIONAL NOTES

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 2 - SCES
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

SITE CONCEPTUAL EXPOSURE SCENARIO

CONTAMINATED MEDIA	PATHWAYS/TRANSPORT MECHANISMS	EXPOSURE ROUTES	POTENTIAL RECEPTORS	CURRENT LAND USE								FUTURE LAND USE							
				ON-SITE				OFF-SITE				ON-SITE				OFF-SITE			
				Residents-Child	Residents - Adult	Commercial Workers	Construction Workers	Residents-Child	Residents - Adult	Commercial Workers	Construction Workers	Residents-Child	Residents - Adult	Commercial Workers	Construction Workers	Residents-Child	Residents - Adult	Commercial Workers	Construction Workers
Air Vapors			Inhalation (Indoors)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Inhalation (Outdoors)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Surficial Soil	Wind Erosion/Dispersion/ Volatilization/Vapor Migration		Inhalation (vapors & particulates) and Dermal Contact and Ingestion	NA	NA	NA	C	NA	NA	NA	NA	NA	NA	NA	C	NA	NA	NA	NA
Subsurface Soils	Volatilization/Vapor Migration		Inhalation (Indoors)	NA	NA	NA	NA	NA	NA	NA	NA	C	C	C	NA	NA	NA	NA	NA
			Inhalation (Outdoors)	NA	NA	NA	C	NA	NA	NA	NA	NA	NA	NA	C	NA	NA	NA	NA
			Dermal Contact and Ingestion	NA	NA	NA	C	NA	NA	NA	NA	NA	NA	NA	C	NA	NA	NA	NA
Groundwater	Volatilization/Vapor Migration		Inhalation (Indoors)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Inhalation (Outdoors)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Drinking Water		Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	YES	NO
Contaminant-saturated soil present?	☑	☐
Nonaqueous phase liquid present?	☑	☐
Utilities Threatened ?	☐	☑
Surface Waters within a 500 foot radius?	☐	☑
Ecological Receptors?	☐	☑
Leaching to groundwater?	☐	☑

C Indicates potentially completed pathways

NA Not applicable as per the NMED policy

For construction worker, no distinction is made between the surficial and subsurface soils.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 3 - RESIDENT
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

JUSTIFICATION OF PATHWAYS - ON-SITE RESIDENT (CHILD AND ADULT)

ROUTES OF EXPOSURE	CURRENT CONDITIONS		FUTURE CONDITIONS	
	C/ NC*	JUSTIFICATION	C/ NC*	JUSTIFICATION
SURFICIAL SOIL				
Ingestion, outdoor inhalation of vapors and particulate matter, and dermal contact	*NC*	*Site is an inactive fuel storage tank closed from the general public.*	*NC*	*Closed to public. Located on WSMR whose mission is support of missile development and test programs.*
SUBSURFACE SOIL				
Indoor inhalation of vapors (only when depth to contamination is less than 15 ft bgs)	*NC*	*Site is an inactive fuel storage tank closed from the general public.*	*C*	*Assuming a typical construction depth of 15 feet, possible vapor migration if directly over source area.*
GROUNDWATER				
Indoor inhalation of vapors (only when depth to groundwater is less than 15 ft bgs)	*NC*	*Site is an inactive fuel storage tank closed from the general public.*	*NC*	*Closed to public. Located on WSMR whose mission is support of missile development and test programs.*
Ingestion (only when groundwater is used, from an impacted on-site well, for drinking)	*NC*	*TDS content of more than 8,000 milligrams per liter (mg/L). No potable groundwater or agricultural supply wells located within a 10-mi radius.*	*NC*	*TDS content of more than 8,000 milligrams per liter (mg/L). No potable groundwater or agricultural supply wells located within a 10-mi radius.*

JUSTIFICATION OF PATHWAYS - OFF-SITE RESIDENT (CHILD AND ADULT)

SURFICIAL SOIL				
Ingestion, Outdoor Inhalation of Vapors and Particulate Matter, and Dermal Contact	*NC*	*Soil contamination confined to site. No residential offsite receptors within 10 mile radius.*	*NC*	*Soil contamination confined to site. No residential offsite receptors within 10 mile radius.*
SUBSURFACE SOIL				
Indoor inhalation of vapors (only when depth to contamination is less than 15 ft bgs)	*NC*	*Soil contamination confined to site. No residential offsite receptors within a 10 mile radius.*	*NC*	*Soil contamination confined to site. No residential offsite receptors within a 10 mile radius.*
GROUNDWATER				
Indoor inhalation of vapors (only when depth to groundwater is less than 15 ft bgs)	*NC*	*Depth to groundwater is over 220 feet bgs. Recent sampling indicates no diesel contamination.*	*NC*	*Conditions described under "current conditions" are expected to be maintained in the future. WSMR will maintain administrative control of the site ad infinitum.*
Ingestion (only when groundwater is used, from an impacted off site well, for drinking)	*NC*	*No off-site wells are impacted.*	*NC*	*No off-site wells are expected to be impacted. WSMR will maintain administrative control over the range, site boundaries will remain same as current.*

NOTE:

* C : Complete Pathway, NC : Not Complete

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 3 - COMMERCIAL WORKER
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Malmer	

JUSTIFICATION OF PATHWAYS - ON-SITE COMMERCIAL WORKER

ROUTES OF EXPOSURE	CURRENT CONDITIONS		FUTURE CONDITIONS	
	C/ NC*	JUSTIFICATION	C/ NC*	JUSTIFICATION
SURFICIAL SOIL				
Ingestion, outdoor inhalation of vapors and particulate matter, and dermal contact	*NC*	*Site is an inactive fuel storage tank closed from the general public.*	*NC*	*Closed to public. Located on WSMR whose mission is support of missile development and test programs.*
SUBSURFACE SOIL				
Indoor inhalation of vapors (only when depth to contamination is less than 15 ft bgs)	*NC*	*Site is an inactive fuel storage tank closed from the general public.*	*C*	*Assuming a typical construction depth of 15 feet, possible vapor migration if directly over source area.*
GROUNDWATER				
Indoor inhalation of vapors (only when depth to groundwater is less than 15 ft bgs)	*NC*	*Site is an inactive fuel storage tank closed from the general public.*	*NC*	*Closed to public. Located on WSMR whose mission is support of missile development and test programs.*
Ingestion (only when groundwater is used, from an impacted on-site well, for drinking)	*NC*	*TDS content of more than 8,000 milligrams per liter (mg/L). No potable groundwater or agricultural supply wells located within a 10-mi radius.*	*NC*	*TDS content of more than 8,000 milligrams per liter (mg/L). No potable groundwater or agricultural supply wells located within a 10-mi radius.*

JUSTIFICATION OF PATHWAYS - OFF-SITE COMMERCIAL WORKER

SURFICIAL SOIL				
Ingestion, Outdoor Inhalation of Vapors and Particulate Matter, and Dermal Contact	*NC*	*Soil contamination confined to site. No residential offsite receptors within 10 mile radius.*	*NC*	*Soil contamination confined to site. No residential offsite receptors within 10 mile radius.*
SUBSURFACE SOIL				
Indoor inhalation of vapors (only when depth to contamination is less than 15 ft bgs)	*NC*	*Soil contamination confined to site. No residential offsite receptors within 10 mile radius.*	*NC*	*Soil contamination confined to site. No residential offsite receptors within 10 mile radius.*
GROUNDWATER				
Indoor inhalation of vapors (only when depth to groundwater is less than 15 ft bgs)	*NC*	*Depth to groundwater is over 220 feet bgs. Recent sampling indicates no contamination.*	*NC*	*Conditions described under "current conditions" are expected to be maintained in the future. WSMR will maintain administrative control of the site ad infinitum.*
Ingestion (only when groundwater is used, from an impacted off-site well, for drinking)	*NC*	*No off-site wells are impacted.*	*NC*	*No off-site wells are expected to be impacted. WSMR will maintain administrative control over the range, site boundaries will remain same as current.*

NOTE:
* C : Complete Pathway, NC : Not Complete

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 3-CONSTRUCTION WORKER
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

JUSTIFICATION OF PATHWAYS: ON-SITE CONSTRUCTION WORKER

ROUTES OF EXPOSURE	CURRENT CONDITIONS		FUTURE CONDITIONS	
	C/ NC*	JUSTIFICATION	C/ NC*	JUSTIFICATION
SOIL WITHIN THE TYPICAL CONSTRUCTION DEPTH				
Ingestion, outdoor inhalation of vapors and particulate matter, and dermal contact	*C*	*Assuming typical construction depth of 15 feet, possible vapor and particulate inhalation, dermal contact.*	*C*	*Assuming typical construction depth of 15 feet, possible vapor and particulate inhalation, dermal contact.*
GROUNDWATER				
Outdoor inhalation of vapors	*NC*	*Depth to groundwater is over 220 feet bgs. Recent sampling indicates no contamination.*	*NC*	*Depth to groundwater is over 220 feet bgs. Recent sampling indicates no contamination.*

JUSTIFICATION OF PATHWAYS: OFF-SITE CONSTRUCTION WORKER

SOIL WITHIN THE TYPICAL CONSTRUCTION DEPTH				
Ingestion, Outdoor Inhalation of Vapors and Particulate Matter, and Dermal Contact	*NC*	*Source not located offsite.*	*NC*	*Source not located offsite.*
GROUNDWATER				
Outdoor inhalation of vapors	*NC*	*Source not located offsite.*	*NC*	*Source not located offsite.*

NOTE:

* C : Complete Pathway, NC : Not Complete
No distinction is made between surficial soil and subsurface soil for a construction worker within the zone of construction since subsurface soil may be brought to the surface during construction/excavation activities.

NEW MEXICO RBDM	TIER 1 REPORT	FORM 4 - RESIDENT
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Malmer	

COMPARISON OF TIER 1 RBSLs WITH REPRESENTATIVE CONCENTRATIONS - ON-SITE RESIDENT (CHILD AND ADULT)

CONTAMINANTS OF CONCERN	SURFICIAL SOIL			SUB-SURFACE SOIL			GROUNDWATER					
	Ingestion, inhalation, and dermal contact		NC	Indoor inhalation of vapors		C	Indoor inhalation of vapors		NC	Ingestion		NC
	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [µg/L]	RBSLs [µg/L]	E/Exceeds or NE/Not Exceeds	Concentration at the tap [µg/L]	MCL [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS												
Benzene				66.32	2.07E-02	E						
Toluene				153057	1.88E+00	E						
Ethylbenzene				122663	3.69E+01 >RES	E						
Xylenes (Total)				150205	2.59E+00	E						
Ethylene Dibromide (EDB)				N/A	8.21E-03							
1,2-Dichloroethane (EDC)				N/A	2.14E-02							
MTBE				N/A	1.07E+01							
POLYCYCLIC AROMATIC HYDROCARBONS												
Acenaphthene				558520	2.57E+03 >RES	E						
Anthracene				N/A	1.91E+05 >RES							
Benzo(a)anthracene				N/A	1.41E+04 >RES							
Benzo(a)pyrene				N/A	1.72E+06 >RES							
Benzo(b)fluoranthene				N/A	3.29E+03 >RES							
Benzo(k)fluoranthene				N/A	4.39E+05 >RES							
Chrysene				N/A	1.14E+05 >RES							
Dibenz(a-h)anthracene				N/A	6.40E+06 >RES							
Fluoranthene				N/A	2.31E+05 >RES							
Fluorene				225288	7.63E+03 >RES	NE						
Total Naphthalenes				430.36	3.45E+01 >RES	E						
Phenanthrene				249682	4.63E+03 >RES	NE						
Pyrene				597037	3.89E+05 >RES	NE						
METALS												
Lead												

NOTE:

Enter the representative concentration and indicate.

Representative concentration is: *Soil:* *Toluene: 153057*

Groundwater:

N/A: Not applicable

>RES: Calculated RBSLs exceeded residual soil saturation level.

>SOL: Calculated RBSLs exceeded pure component water solubility.

This comparative evaluation is performed automatically after the user has completed Report Form No 3 and entered the representative concentration on this form for complete pathways.

NEW MEXICO RBDM	TIER 1 REPORT	FORM 2 - RESIDENT
SITE ID: LC-38		FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04		PREPARED BY: Neil V. Maimer

COMPARISON OF TIER 1 RBSLs WITH REPRESENTATIVE CONCENTRATIONS FOR SITE RESIDENT (CHILD AND ADULT)

CONTAMINANTS OF CONCERN	SURFICIAL SOIL			SUB-SURFACE SOIL			GROUNDWATER					
	Ingestion, inhalation, and dermal contact		NC	Indoor inhalation of vapors		NC	Indoor inhalation of vapors		NC	Ingestion		NC
	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [µg/L]	RBSLs [µg/L]	E/Exceeds or NE/Not Exceeds	Concentration at the tap [µg/L]	MCL [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS												
Benzene												
Toluene												
Ethylbenzene												
Xylenes (Total)												
Ethylene Dibromide (EDB)												
1,2-Dichloroethane (EDC)												
MTBE												
POLYCYCLIC AROMATIC HYDROCARBONS												
Acenaphthene												
Anthracene												
Benzo(a)anthracene												
Benzo(a)pyrene												
Benzo(b)fluoranthene												
Benzo(k)fluoranthene												
Chrysene												
Dibenz(a-h)anthracene												
Fluoranthene												
Fluorene												
Total Naphthalenes												
Phenanthrene												
Pyrene												
METALS												
Lead												

NOTE:

Enter the representative concentration and indicate.

Representative concentration is: *Soil:* _____ *Groundwater:* _____

N/A: Not applicable

>RES: Calculated RBSLs exceeded residual soil saturation level.

>SOL: Calculated RBSLs exceeded pure component water solubility.

This comparative evaluation is performed automatically after the user has completed Report Form No.3 and entered the representative concentration on this form for complete pathways.

NEW MEXICO RBDM	TIER 1 REPORT	FORM 4 - COMMERCIAL WORKER
SITE ID: LC-38		FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04		PREPARED BY: Neil V. Maimer

COMPARISON OF TIER 1 RESULTS WITH REPRESENTATIVE CONCENTRATIONS - ONSITE COMMERCIAL WORKER

CONTAMINANTS OF CONCERN	SURFICIAL SOIL			SUB-SURFACE SOIL			GROUNDWATER					
	Ingestion, Inhalation, and Dermal Contact		NC	Indoor inhalation of vapors		C	Indoor inhalation of vapors		NC	Ingestion		NC
	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [µg/L]	RBSLs [µg/L]	E/Exceeds or NE/Not Exceeds	Concentration at the tap [µg/L]	MCL [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS												
Benzene				66.32	1.28E-01	E						
Toluene				1530.57	2.05E+01	E						
Ethylbenzene				1226.63	4.02E+02 >RES	E						
Xylenes (Total)				1502.05	2.82E+01	E						
Ethylene Dibromide (EDB)				N/A	3.49E-02							
1,2-Dichloroethane (EDC)				N/A	9.12E-02							
MTBE				N/A	1.17E+02							
POLYCYCLIC AROMATIC HYDROCARBONS												
Acenaphthene				5585.20	2.81E+04 >RES	NE						
Anthracene				N/A	2.08E+06 >RES							
Benzo(a)anthracene				N/A	6.00E+04 >RES							
Benzo(a)pyrene				N/A	7.33E+06 >RES							
Benzo(b)fluoranthene				N/A	1.40E+04 >RES							
Benzo(k)fluoranthene				N/A	1.87E+06 >RES							
Chrysene				N/A	4.84E+05 >RES							
Dibenzo(a,h)anthracene				N/A	2.72E+07 >RES							
Fluoranthene				N/A	2.51E+06 >RES							
Fluorene				2252.88	8.31E+04 >RES	NE						
Total Naphthalenes				430.06	3.76E+02 >RES	E						
Phenanthrene				2496.82	5.04E+04 >RES	NE						
Pyrene				5970.37	4.24E+06 >RES	NE						
METALS												
Lead												

NOTE:

Enter the representative concentration and indicate.

Representative concentration is: *Soil:* *Toluene: 1530.57*

Groundwater:

N/A: Not applicable

>RES: Calculated RBSLs exceeded residual soil saturation level.

>SOL: Calculated RBSLs exceeded pure component water solubility.

This comparative evaluation is performed automatically after the user has completed Report Form No.1 and entered the representative concentration on this form for complete pathways.

NEW MEXICO RBDM	TIER 1 REPORT	FORM 4 - COMMERCIAL WORKER
SITE ID: LC-38		FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04		PREPARED BY: Neil V. Maimer

COMPARISON OF TIER 1 RBSLs WITH REPRESENTATIVE CONCENTRATIONS: OFF-SITE COMMERCIAL WORKER

CONTAMINANTS OF CONCERN	SURFICIAL SOIL			SUB-SURFACE SOIL			GROUNDWATER					
	Ingestion, inhalation, and dermal contact		NC	Indoor inhalation of vapors		NC	Indoor inhalation of vapors		NC	Ingestion		NC
	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [µg/L]	RBSLs [µg/L]	E/Exceeds or NE/Not Exceeds	Concentration at the tap [µg/L]	MCL [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS												
Benzene												
Toluene												
Ethylbenzene												
Xylenes (Total)												
Ethylene Dibromide (EDB)												
1,2-Dichloroethane (EDC)												
MTBE												
POLYCYCLIC AROMATIC HYDROCARBONS												
Acenaphthene												
Anthracene												
Benzo(a)anthracene												
Benzo(a)pyrene												
Benzo(b)fluoranthene												
Benzo(k)fluoranthene												
Chrysene												
Dibenz(a-h)anthracene												
Fluoranthene												
Fluorene												
Total Naphthalenes												
Phenanthrene												
Pyrene												
METALS												
Lead												

NOTE:

Enter the representative concentration and indicate. Representative concentration is. *Soil:* *Groundwater:*

N/A: Not applicable

>RES: Calculated RBSLs exceeded residual soil saturation level.

>SOL: Calculated RBSLs exceeded pure component water solubility.

This comparative evaluation is performed automatically after the user has completed Report Form No.3 and entered the representative concentration on this form for complete pathways.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 4 - CONSTRUCTION WORKER
SITE ID: LC-38		FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04		PREPARED BY: Neil V. Maimer

COMPARISON OF TIER 1 RBSLs AND REPRESENTATIVE CONCENTRATIONS - ON-SITE CONSTRUCTION WORKER

CONTAMINANTS OF CONCERN	SOIL WITHIN THE TYPICAL CONSTRUCTION ZONE				GROUNDWATER		
	Ingestion, inhalation, and dermal contact			C	Outdoor inhalation of vapors		NC
	Representative concentration [mg/kg]	RBSLs [mg/kg]		E/Exceeds or NE/Not Exceeds	Representative concentration [µg/L]	RBSLs [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS							
Benzene	66.32	1.67E+02		NE			
Toluene	1530.57	6.31E+03	>RES	NE			
Ethylbenzene	1226.63	5.91E+03	>RES	NE			
Xylenes (Total)	1502.05	8.00E+03	>RES	NE			
Ethylene Dibromide (EDB)	N/A	6.19E-01					
1,2-Dichloroethane (EDC)	N/A	1.36E+02					
MTBE	N/A	3.77E+02					
POLYCYCLIC AROMATIC HYDROCARBONS							
Acenaphthene	5585.20	1.14E+04	>RES	NE			
Anthracene	N/A	9.96E+04	>RES				
Benzo(a)anthracene	N/A	4.19E+02	>RES				
Benzo(a)pyrene	N/A	4.28E+01	>RES				
Benzo(b)fluoranthene	N/A	4.16E+02	>RES				
Benzo(k)fluoranthene	N/A	4.27E+02	>RES				
Chrysene	N/A	3.95E+04	>RES				
Dibenz(a-h)anthracene	N/A	4.32E+01	>RES				
Fluoranthene	N/A	1.60E+04	>RES				
Fluorene	2252.88	1.10E+04	>RES	NE			
Total Naphthalenes	430.06	3.22E+03	>RES	NE			
Phenanthrene	2496.82	7.90E+03	>RES	NE			
Pyrene	5970.37	1.24E+04	>RES	NE			
METALS							
Lead							

NOTE:

Enter the representative concentration and indicate.

Representative concentration is:

Soil:

Groundwater:

N/A: Not applicable

>RES: Calculated RBSLs exceeded residual soil saturation level.

>SOL: Calculated RBSLs exceeded pure component water solubility.

This comparative evaluation is performed automatically after the user has completed Report Form No.3 and entered the representative concentration on this form for complete pathways.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 4 - CONSTRUCTION WORKER
SITE ID: LC-38		FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04		PREPARED BY: Neil V. Mainer

COMPARISON OF TIER 1 RBSLs WITH REPRESENTATIVE CONCENTRATIONS - OFF-SITE CONSTRUCTION WORKER

CONTAMINANTS OF CONCERN	SOIL WITHIN THE TYPICAL CONSTRUCTION ZONE			GROUNDWATER		
	Ingestion, inhalation, and dermal contact		NC	Outdoor inhalation of vapors		NC
	Representative concentration [mg/kg]	RBSLs [mg/kg]	E/Exceeds or NE/Not Exceeds	Representative concentration [µg/L]	RBSLs [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS						
Benzene						
Toluene						
Ethylbenzene						
Xylenes (Total)						
Ethylene Dibromide (EDB)						
1,2-Dichloroethane (EDC)						
MTBE						
POLYCYCLIC AROMATIC HYDROCARBONS						
Acenaphthene						
Anthracene						
Benzo(a)anthracene						
Benzo(a)pyrene						
Benzo(b)fluoranthene						
Benzo(k)fluoranthene						
Chrysene						
Dibenz(a-h)anthracene						
Fluoranthene						
Fluorene						
Total Naphthalenes						
Phenanthrene						
Pyrene						
METALS						
Lead						

NOTE:

Enter the representative concentration and indicate.

N/A: Not applicable

>RES: Calculated RBSLs exceeded residual soil saturation level.

>SOL: Calculated RBSLs exceeded pure component water solubility.

This comparative evaluation is performed automatically after the user has completed Report Form No.3 and entered the representative concentration on this form for complete pathways.

Representative concentration is:

Soil:

Groundwater:

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 5
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

TIER 1 GROUNDWATER PROTECTION - NO PETITION FOR VARIANCE TO WQCC STANDARDS REQUIRED

	COMPARISON FOR SOURCE SOIL			COMPARISON FOR GROUNDWATER											
				MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10		
CONTAMINANTS OF CONCERN	Source rep. conc.* [mg/kg]	RBSLs** [mg/kg]	E/Exceeds or NE/Not Exceeds	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	WQCC std. or RBSL [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS															
Benzene	66.32	-	NE												
Toluene	1530.57	-	NE												
Ethylbenzene	1226.63	-	NE												
Xylenes (Total)	1502.05	-	NE												
Ethylene Dibromide (EDB)	N/A														
1,2-Dichloroethane (EDC)	N/A														
MTBE	N/A														
POLYCYCLIC AROMATIC HYDROCARBONS															
Acenaphthene	5585.2	-	NE												
Anthracene	N/A														
Benzo(a)anthracene	N/A														
Benzo(a)pyrene	N/A														
Benzo(b)fluoranthene	N/A														
Benzo(k)fluoranthene	N/A														
Chrysene	N/A														
Dibenz(a-h)anthracene	N/A														
Fluoranthene	N/A														
Fluorene	2252.88	-	NE												
Total Naphthalenes	430.06	-	NE												
Phenanthrene	2496.82	-	NE												
Pyrene	5970.37	-	NE												
METALS															
Lead															

NOTE:

* Source representative concentration is: _____

** Back-calculated from WQCC groundwater standards for distance to POE=0 (from Table 4-15 of the Guidance Document)

The representative concentrations in each monitoring well should be the maximum for the most recent 8 consecutive quarters, unless otherwise approved.

N/A: Not applicable

This comparative evaluation is performed automatically after the user has input representative concentrations and target levels for soil and representative concentrations for groundwater.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 5
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

TIER 1 GROUNDWATER PROTECTION - NO PETITION FOR VARIANCE TO WQCC STANDARDS REQUIRED

	COMPARISON FOR GROUNDWATER														
	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23		
CONTAMINANTS OF CONCERN	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	Recent# 8 qrtr max. [µg/L]	WQCC std. or RBSL [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS															
Benzene															
Toluene															
Ethylbenzene															
Xylenes (Total)															
Ethylene Dibromide (EDB)															
1,2-Dichloroethane (EDC)															
MTBE															
POLYCYCLIC AROMATIC HYDROCARBONS															
Acenaphthene															
Anthracene															
Benzo(a)anthracene															
Benzo(a)pyrene															
Benzo(b)fluoranthene															
Benzo(k)fluoranthene															
Chrysene															
Dibenz(a-h)anthracene															
Fluorarthene															
Fluorene															
Total Naphthalenes															
Phenanthrene															
Pyrene															
METALS															
Lead															

NOTE:

N/A: Not applicable

The representative concentrations in each monitoring well should be the maximum for the most recent 8 consecutive quarters, unless otherwise approved.

This comparative evaluation is performed automatically after the user has input the representative concentrations.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 6
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

TIER 1 GROUNDWATER PROTECTION - PETITION FOR VARIANCE TO WOCC STANDARDS REQUIRED

				Distance from source to Point of Exposure (POE) =								
	COMPARISON FOR SOURCE SOIL			COMPARISON FOR COMPLIANCE WELLS								
COMPLIANCE WELL NUMBER	N/A											
DISTANCE FROM SOURCE	N/A											
RECENT TREND	N/A											
CONTAMINANTS OF CONCERN	Source rep. conc.* [mg/kg]	RBSLs** [mg/kg]	E/Exceeds or NE/Not Exceeds	Recent# 8 qrtr max. [µg/L]	RBSLs** [µg/L]	E/Exceeds or NE/Not Exceeds	Recent# 8 qrtr max. [µg/L]	RBSLs** [µg/L]	E/Exceeds or NE/Not Exceeds	Recent# 8 qrtr max. [µg/L]	RBSLs** [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS												
Benzene												
Toluene												
Ethylbenzene												
Xylenes (Total)												
Ethylene Dibromide (EDB)												
1,2-Dichloroethane (EDC)												
MTBE												
POLYCYCLIC AROMATIC HYDROCARBONS												
Acenaphthene												
Anthracene												
Benzo(a)anthracene												
Benzo(a)pyrene												
Benzo(b)fluoranthene												
Benzo(k)fluoranthene												
Chrysene												
Dibenz(a-h)anthracene												
Fluoranthene												
Fluorene												
Total Naphthalenes												
Phenanthrene												
Pyrene												
METALS												
Lead												

NOTE:

* Source representative concentration is: _____ ** Back-calculated from WOCC standards using tier 1 default parameters.

The representative concentrations in each compliance well should be the maximum for the most recent 8 consecutive quarters, unless otherwise approved.

N/A: Not applicable

This comparative evaluation is performed automatically after the user has input the representative concentrations and the target levels.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 6
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

TIER 1 GROUNDWATER PROTECTION PETITION FOR VARIANCE TO WQCC STANDARDS REQUIRED

	Distance to Point of Exposure (POE) =											
	COMPARISON FOR COMPLIANCE WELLS											
COMPLIANCE WELL NUMBER												
DISTANCE FROM SOURCE												
RECENT TREND												
CONTAMINANTS OF CONCERN	Recent# 8 qrtr max. [µg/L]	RBSLs** [µg/L]	E/Exceeds or NE/Not Exceeds	Recent# 8 qrtr max. µg/L]	RBSLs** [µg/L]	E/Exceeds or NE/Not Exceeds	Recent# 8 qrtr max. [µg/L]	RBSLs** [µg/L]	E/Exceeds or NE/Not Exceeds	Recent# 8 qrtr max. [µg/L]	RBSLs** [µg/L]	E/Exceeds or NE/Not Exceeds
ORGANICS												
Benzene												
Toluene												
Ethylbenzene												
Xylenes (Total)												
Ethylene Dibromide (EDB)												
1,2-Dichloroethane (EDC)												
MTBE												
POLYCYCLIC AROMATIC HYDROCARBONS												
Acenaphthene												
Anthracene												
Benzo(a)anthracene												
Benzo(a)pyrene												
Benzo(b)fluoranthene												
Benzo(k)fluoranthene												
Chrysene												
Dibenz(a-h)anthracene												
Fluoranthene												
Fluorene												
Total Naphthalenes												
Phenanthrene												
Pyrene												
METALS												
Lead												

NOTE:

** Back-calculated from WQCC standards using tier 1 default parameters.

The representative concentrations in each compliance well should be the maximum for the most recent 8 consecutive quarters, unless otherwise approved.

N/A: Not applicable

This comparative evaluation is performed automatically after the user has input the representative concentrations and the target levels.

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 7
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Malmer	

TIER 1 APPLICABLE TARGET LEVELS FOR VARIOUS MEDIA

NOTE: The RBSLs listed in this table, for each route of exposure, are the lowest of the RBSLs for all the receptors for that particular route of exposure.
The applicable target levels for each medium would be the lowest of the RBSLs listed in this table.

CONTAMINANTS OF CONCERN	SURFICIAL SOIL		SUBSURFACE SOIL		GROUNDWATER						GROUNDWATER PROTECTION	
	Ingestion, inhalation, and dermal contact		Indoor inhalation		Indoor inhalation		Outdoor inhalation		Ingestion	Resource protection	Soil concentrations protective of groundwater - no petition required	Soil concentrations protective of groundwater - petition required
	[mg/kg]		[mg/kg]		[µg/L]		[µg/L]		[µg/L]	[µg/L]	[mg/kg]	[mg/kg]
	ON-SITE	OFF-SITE	ON-SITE	OFF-SITE	ON-SITE	OFF-SITE	ON-SITE	OFF-SITE				
ORGANICS												
Benzene	1.67E+02		2.07E-02								-	
Toluene	6.31E+03		1.88E+00								-	
Ethylbenzene	5.98E+03		3.69E+01								-	
Xylenes (Total)	8.00E+03		2.59E+00								-	
Ethylene Dibromide (EDB)	6.19E-01		8.21E-03									
1,2-Dichloroethane (EDC)	1.30E+02		2.14E-02									
MTBE	3.77E+02		1.07E+01									
POLYCYCLIC AROMATIC HYDROCARBONS												
Acenaphthene	1.16E+04		2.57E+03								-	
Anthracene	9.96E+04		9.96E+04									
Benzo(a)anthracene	4.19E+02		4.19E+02									
Benzo(a)pyrene	4.28E+01		4.28E+01									
Benzo(b)fluoranthene	4.10E+02		4.10E+02									
Benzo(k)fluoranthene	4.27E+02		4.27E+02									
Chrysene	3.99E+04		3.99E+04									
Dibenz(a-h)anthracene	4.32E+01		4.32E+01									
Fluoranthene	1.60E+04		1.60E+04									
Fluorene	1.10E+04		7.63E+03								-	
Total Naphthalenes	3.23E+03		3.45E+01								-	
Phenanthrene	7.90E+03		4.63E+03								-	
Pyrene	1.24E+04		1.24E+04								-	
METALS												
Lead												

N/A: Not applicable

NEW MEXICO RBDM	TIER 1 REPORT
SITE ID: LC-38	FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Malmer

ADDITIONAL NOTES

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 8
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Malmer	

TIER 1 CONCLUSIONS AND RECOMMENDATIONS

1.	*Has the site been adequately investigated and characterized?*
	Yes, see report
2.	*Has NAPL been removed?*
	NAPL has not been found at this site.
3.	*Is the groundwater plume stable or shrinking, based on the concentration trend plots?*
	No contaminents have been found in the groundwater at this site.
4.	*Are on-site soil and groundwater concentrations protective of current and reasonable future on-site receptors?*
	Yes, unless a contracoter facility were build directly over the source area, or there is a land use change in the future which would allow construction of residences directly above the source area.
5.	*Are off-site soil and groundwater concentrations protective of current and reasonable future off-site receptors?*
	Yes, all contamination is confined to the site.
6.	*Are soil concentrations protective of groundwater?*
	Yes, the unsaturated soil configuration is 55 which would not allow contamination to reach groundwater in 40 years or longer.
7.	*Are groundwater concentrations below the applicable standards?*
	Yes, groundwater contamination was not found at this site..

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 8
SITE ID: LC-38	FACILITY ID: White Sands Missile Range	
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer	

TIER 1 CONCLUSIONS AND RECOMMENDATIONS

8.	*Is a waiver petition for alternative groundwater protection standards recommended?*
	No.
9.	*Is compliance monitoring of groundwater recommended?*
	No.
10.	*Is an interim remediation and tier 1 re-evaluation recommended?*
	Yes, if it is reasonable to assume that the missile range would build a facility directly over the source area or there will be a land use change that would allow construction of a residence directly above the source area. Remediation of localized exceedences would be the least complicated and least costly alternative. This would involve excavation of contaminated soils immediately below the source area to a depth of 15 feet below surrounding ground level to eliminate possible vapor migration.
11.	*Is remediation to tier 1 target levels recommended?*
	No.
12.	*Is site recommended for NFA status?*
	Yes, see report.
13.	*Is a Tier 2 evaluation recommended? If yes, list the receptors, routes of exposure, and the COCs to be evaluated.*
	No.
14.	*Other relevant information*

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 9

SITE ID: LC-38	FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer

REFERENCES AND PROTOCOLS

NEW MEXICO RBDM	TIER 1 REPORT	FORM NO. 9

SITE ID: LC-38	FACILITY ID: White Sands Missile Range
SUBMITTAL DATE: 31-Mar-04	PREPARED BY: Neil V. Maimer

REFERENCES AND PROTOCOLS

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- [x] COVER PAGE
- [x] TABLE OF CONTENTS
- [x] 1 EXECUTIVE SUMMARY
- [x] 2 SITE CONCEPTUAL EXPOSURE SCENARIO

3 JUSTIFICATION FOR COMPLETE PATHWAYS (CURRENT AND FUTURE CONDITIONS)

ON-SITE RECEPTORS		OFF-SITE RECEPTORS	
[x]	RESIDENTIAL EXPOSURES	[ ]	RESIDENTIAL EXPOSURES
[x]	COMMERCIAL WORKER	[ ]	COMMERCIAL WORKER
[x]	CONSTRUCTION WORKER	[ ]	CONSTRUCTION WORKER

4 TIER 1 COMPARISON (CURRENT AND FUTURE CONDITIONS)

CONTAMINATED SOIL		OFF-SITE RECEPTORS	
[x]	RESIDENT (CHILD AND ADULT)	[ ]	RESIDENT (CHILD AND ADULT)
[x]	COMMERCIAL WORKER	[ ]	COMMERCIAL WORKER
[x]	CONSTRUCTION WORKER	[ ]	CONSTRUCTION WORKER

- [x] 6 TIER 1 GROUNDWATER PROTECTION WITH NO WAIVER PETITION
- [ ] 4 TIER 1 GROUNDWATER PROTECTION WITH WAIVER PETITION
- [x] 7 APPLICABLE TARGET LEVELS
- [x] 8 TIER 1 RECOMMENDATIONS AND CONCLUSIONS
- [ ] 9 REFERENCES AND PROTOCOLS

TRUE
TRUE
TRUE
FALSE
TRUE
FALSE
TRUE
FALSE
TRUE
FALSE
TRUE
FALSE
TRUE
FALSE
TRUE
FALSE
TRUE
TRUE
FALSE
TRUE
TRUE

Table G-1. CONTAMINANTS OF CONCERN - REPRESENTATIVE CONCENTRATIONS (SOIL)

ORGANICS

Benzene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 83.5 mg/kg	83.5	83.5	83.5		19	83.5	83.5	83.5		83.5	
	83.5	83.5	83.5		0.005	83.5	83.5	83.5		0.88	
	83.5					0.77		0.5		16	
	83.5							83.5		83.5	Representative
	83.5							83.5		83.5	Concentraiton
										83.5	[mg/kg]:
Totals:	417.5	167	167		19.005	167.77	167	334.5		350.88	**66.32**

Toluene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 3155 mg/kg	47	3155	3155		3155	3155	3155	2.3		0.49	
	3155	67	91		0.037	3155	3155	6.6		6.6	
	3155					3155		5.2		76	
	3155							1.5		1	Representative
	3155							5.1		3155	Concentraiton
										0.48	[mg/kg]:
Totals:	12667	3222	3246		3155	9465	6310	21		3239.57	**1530.57**

Ethylbenzene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 2990 mg/kg	2990	2990	2990		76	2990	2990	3.2		0.78	
	2990	13	9		0.061	2990	2990	7.8		6.6	
	2990					2990		5.5		53	
	44							2		1.3	Representative
	2990							6.3		0.020	Concentraiton
										0.57	[mg/kg]:
Totals:	12004	3003	2999		76	8970	5980	25		62	**1226.63**

Table G-1. CONTAMINANTS OF CONCERN - REPRESENTATIVE CONCENTRATIONS (SOIL)

ORGANICS

Xylenes (Total)	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 4000 mg/kg	24	4000	4000		165	4000	4000	7.2		1.82	
	4000	89	55		0.171	4000	4000	17.8		14.5	
	4000					4000		12.5		115	
	30							4.7		2.73	Representative
	4000							14.7		0.061	Concentraiton
										1.27	[mg/kg]:
Totals:	12054	4089	4055		165	12000	8000	57		135	**1502.05**

POLYCYCLIC AROMATIC HYDROCARBONS

Acenaphthene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 5800 mg/kg	5800	5800	5800		5800	5800	5800	5800		5800	
	5800	5800	5800		5800	5800	5800	5800		5800	
	5800					5800		5800		5800	
	5800							5800		5800	Representative
	0.44							5800		5800	Concentraiton
										5800	[mg/kg]:
Totals:	23200.44	11600	11600		11600	17400	11600	29000		34800	**5585.20**

Anthracene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 49800 mg/kg											
		No Detections									
											Representative Concentraiton [mg/kg]:
Totals:	0	0	0		0	0	0	0		0	**0.00**

Table G-1. CONTAMINANTS OF CONCERN - REPRESENTATIVE CONCENTRATIONS (SOIL)

POLYCYCLIC AROMATIC HYDROCARBONS

Benzo(a)anthracene 0.5 RBSL = 209.50 mg/kg	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	Representative Concentraiton [mg/kg]:
	No Detections										
Totals:	0	0	0.0		0.0	0	0	0.0		0.0	**0.00**

Benzo(a)pyrene 0.5 RBSL = 21.40 mg/kg	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	Representative Concentraiton [mg/kg]:
	No Detections										
Totals:	0.0	0.0	0.0		0	0.0	0	0.0		0.0	**0.00**

Benzo(b)fluoranthene 0.5 RBSL = 205 mg/kg	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	Representative Concentraiton [mg/kg]:
	No Detections										
Totals:	0	0	0		0	0	0	0		0	**0.00**

Table G-1. CONTAMINANTS OF CONCERN - REPRESENTATIVE CONCENTRATIONS (SOIL)

POLYCYCLIC AROMATIC HYDROCARBONS

Benzo(k)fluoranthene 0.5 RBSL = 213.5 mg/kg	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	Representative Concentraiton [mg/kg]:
	No Detections										
Totals:	0	0	0.0		0.0	0	0	0.0		0.0	**0.00**

Chrysene 0.5 RBSL = 19950 mg/kg	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	Representative Concentraiton [mg/kg]:
	No Detections										
Totals:	0	0	0		0	0	0	0		0	**0.00**

Dibenz(a-h)anthracene 0.5 RBSL = 21.6 mg/kg	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	Representative Concentraiton [mg/kg]:
	No Detections										
Totals:	0.0	0.0	0.0		0	0.0	0	0.0		0.0	**0.00**

Table G-1. CONTAMINANTS OF CONCERN - REPRESENTATIVE CONCENTRATIONS (SOIL)

POLYCYCLIC AROMATIC HYDROCARBONS

Fluoranthene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 8000 mg/kg											
		No Detections									
											Representative Concentraiton [mg/kg]:
Totals:	0	0	0		0	0	0	0		0	**0.00**

Fluorene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 5500 mg/kg	5500	5500	5500		87	76	30	5.9		2.8	
	5500	5500	5500		5500	5500	2.7	8.7		17	
	5500					13		7.9		63	
	5500							4		1.2	Representative
	5500							6.8		0.96	Concentraiton
										0.74	[mg/kg]:
Totals:	27500	11000	11000		5587	5589	32.7	33.3		85.70	**2252.88**

Total Naphthalenes	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 1615 mg/kg	1615	0.93	9.6		69	52	23	7.4		0.85	
	1615	1615	6.1		1615	1615	1.1	9.4		13	
	1615					10		4.6		89	
	1615							2.6		0.51	Representative
	0.58							6.1		0.43	Concentraiton
										0.52	[mg/kg]:
Totals:	6460.58	1615.93	15.70		1684	1677	24.1	30.1		104.31	**430.06**

Table G-1. CONTAMINANTS OF CONCERN - REPRESENTATIVE CONCENTRATIONS (SOIL)

POLYCYCLIC AROMATIC HYDROCARBONS

Phenanthrene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 3950 mg/kg	3950	1.6	3950		120	3950	42	16		3950	
	19	3950	3950		3950	3950	3.5	19		3950	
	3950					17		11		3950	
	3950							3950		3950	Representative
	3950							15		3950	Concentraiton
										3950	[mg/kg]:
Totals:	15819	3951.6	7900		4070	7917	45.5	4011		23700	**2496.82**

Pyrene	BH-01	BH-02	BH-03	SB-01	SB-02	SB-03	SB-04	SB-05	SB-06	SB-07	
0.5 RBSL = 6200 mg/kg	6200	6200	6200		6200	6200	6200	6200		6200	
	6200	6200	6200		6200	6200	6200	6200		6200	
	6200					6200		6200		6200	
	6200							6200		6200	Representative
	0.049							6200		6200	Concentraiton
										6200	[mg/kg]:
Totals:	24800.049	12400	12400	0	12400	18600	12400	31000		37200	**5970.37**

APPENDIX H

NMED Screening Level Ecological Risk Assessment

ATTACHMENT A

SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT
SCOPING ASSESSMENT
SITE ASSESSMENT CHECKLIST

INTRODUCTION

This checklist has been developed as a tool for gathering information about the facility property and surrounding areas, as part of the scoping assessment. Specifically, the checklist assists in the compilation of information on the physical and biological aspects of the site including the site environmental setting, usage of the site, releases at the site, contaminant fate and transport mechanisms, and the area's habitats, receptors, and exposure pathways. The completed checklist can then be used to construct the preliminary conceptual site exposure model (PCSEM) for the site. In addition, the checklist and PCSEM will serve as the basis for the scoping assessment report. Section III of this document provides further information on using the completed checklist to develop the PCSEM.

In general, the checklist is designed for applicability to all sites, however, there may be unusual circumstances which require professional judgment in order to determine the need for further ecological evaluation (*e.g.,* cave-dwelling receptors). In addition, some of the questions in the checklist may not be relevant to all sites. Some facilities may have large amounts of data available regarding contaminant concentrations and hydrogeologic conditions at the site, while other may have only limited data. In either case, the questions on the checklist should be addressed as completely as possible with the information available.

Habitats and receptors, which may be present at the site, can be identified by direct or indirect[1] observations and by contacting local and regional natural resource agencies. Habitat types may be determined by reviewing land use and land cover maps (LULC), which are available via the Internet at http://www.nationalatlas.gov/mapit.html. With regard to receptors, it should be noted that receptors are often present at a site even when they are not observed. Therefore, for the purposes of this checklist, it should be assumed that receptors are present if viable habitat is present. The presence of receptors should be confirmed by contacting one or several of the organizations listed below.

Sources of general information available for the identification of ecological receptors and habitats include:

- U.S. Fish and Wildlife Service (http://www.fws.gov)
- Biota Information System of New Mexico (BISON-M) maintained by the New Mexico Department of Game and Fish (NMGF) (http://151.199.74.229/states/nm.htm)
- U.S. Forest Service (USFS) (http://www.fs.fed.us/)
- New Mexico Forestry Division (NMFD) of the Energy, Minerals and Natural Resources Department (http://www.emnrd.state.nm.us/forestry/index.htm)

1 Examples of indirect observations that indicate the presence of receptors include: tracks, feathers, burrows, scat

- U.S. Bureau of Land Management (USBLM) (http://www.blm.gov/nhp/index.htm) or (http://www.nm.blm.gov/www/new_home_2.html)
- United States Geological Service (USGS) (http://www.usgs.gov)
- National Wetland Inventory Maps (http://wetlands.fws.gov)
- National Audubon Society (http://www.audobon.com)
- National Biological Information Infrastructure (http://biology.usgs.gov)
- Sierra Club (http://www.sierraclub.org)
- National Geographic Society (http://www.nationalgeographic.com)
- New Mexico Natural Heritage Program (http://nmnhp.unm.edu/)
- State and National Parks System
- Local universities
- Tribal organizations

INSTRUCTIONS FOR COMPLETING THE CHECKLIST

The checklist consists of four sections: Site Location, Site Characterization, Habitat Evaluation, and Exposure Pathway Evaluation. Answers to the checklist should reflect existing conditions and should not consider future remedial actions at the site. Completion of the checklist should provide sufficient information for the preparation of a PCSEM and scoping report and allow for the identification of any data gaps.

Section I - Site Location, provides general site information, which identifies the facility being evaluated, and gives specific location information. Site maps and diagrams, which should be attached to the completed checklist, are an important part of this section. The following elements should be clearly illustrated: 1) the location and boundaries of the site relative to the surrounding area, 2) any buildings, structures or important features of the facility or site, and 3) all ecological areas or habitats identified during completion of the checklist. It is possible that several maps will be needed to clearly and adequately illustrate the required elements. Although topographical information should be illustrated on at least one map, it is not required for every map. Simplified diagrams (preferably to scale) of the site and surrounding areas will usually suffice.

Section II - Site Characterization, is intended to provide additional temporal and contextual information about the site, which may have an impact on determining whether a certain area should be characterized as ecologically viable habitat or contains receptors. Answers to the questions in Section II will help the reviewer develop a broader and more complete evaluation of the ecological aspects of a site.

Section III - Habitat Evaluation, provides information regarding the physical and biological characteristics of the different habitat types present at or in the locality of the site. Aquatic features such as lakes, ponds, streams, arroyos and ephemeral waters can be identified by reviewing aerial photographs, LULC and topographic maps and during site reconnaissance visits. In New Mexico, there are several well-defined terrestrial communities, which occur naturally. Typical communities include wetlands, forest (e.g., mixed conifer,

ponderosa pine and pinyon juniper), scrub/shrub, grassland, and desert. Specific types of vegetation characterize each of these communities and can be used to identify them. Field guides are often useful for identifying vegetation types. A number of sites may be in areas that have been disturbed by human activities and may no longer match any of the naturally occurring communities typical of the southwest. Particularly at heavily used areas at facilities, the two most common of these areas are usually described as "weed fields" and "lawn grass". Vegetation at "weed fields" should be examined to determine whether the weeds consist primarily of species native to the southwest or introduced species such as Kochia. Fields of native weeds and lawn grass are best evaluated using the short grass prairie habitat guides.

The applicable portions of Section III of the checklist should be completed for each individual habitat identified. For example, the questions in Section III.A of the checklist should be answered for each wetland area identified at or in the locality of the site and the individual areas must be identified on a map or maps.

Section IV- Exposure Pathway Evaluation, is used to determine if contaminants at the site have the potential to impact habitat identified in Section III. An exposure pathway is the course a chemical or physical agent takes from a source to an exposed organism. Each exposure pathway includes a source (or release from a source), an environmental transport mechanism, an exposure point, and an exposure route. A complete exposure pathway is one in which each of these components, as well as a receptor to be exposed, is present. Essentially, this section addresses the fate and transport of contaminants that are known or suspected to have been released at the site. In most cases, without a complete exposure pathway between contaminants and receptors, additional ecological evaluation is not warranted.

Potential transport pathways addressed in this checklist include migration of contaminants via air dispersion, leaching into groundwater, soil erosion/runoff, groundwater discharge to surface water, and irradiation. Due to New Mexico's semi-arid climate, vegetation is generally sparse. The sparse vegetation, combined with the intense nature of summer storms in New Mexico, results in soil erosion that occurs sporadically over a very brief time frame. Soil erosion may be of particular concern for sites located in steeply sloped areas. Several questions within Section IV of this checklist have been developed to aid in the identification of those sites where soil erosion/runoff would be an important transport mechanism.

USING THE CHECKLIST TO DEVELOP THE PRELIMINARY CONCEPTUAL SITE EXPOSURE MODEL

The completed Site Assessment Checklist can be used to construct the PCSEM. An example PCSEM diagram is presented in Figure 1. The CSM illustrates actual and potential contaminant migration and exposure pathways to associated receptors. The components of a complete exposure pathway are simplified and grouped into three main categories: sources, release mechanisms, and potential receptors. As a contaminant migrates and/or is transformed in the environment, sources and release mechanisms may expand into primary, secondary, and tertiary levels. For example, Figure 1 illustrates releases from inactive

lagoons (primary sources) through spills (primary release mechanism), which migrate to surface and subsurface soils (secondary sources), which are then leached (secondary release mechanism) to groundwater (tertiary source). Similarly, exposures of various trophic levels to the contaminant(s) and consequent exposures via the food chain may lead to multiple groups of receptors. For example, Figure 1 illustrates groups of both aquatic and terrestrial receptors which may be exposed and subsequently serve as tertiary release mechanisms to receptors which prey on them.

Although completing the checklist will not provide the user with a readymade PCSEM, a majority of the components of the PCSEM can be found in the answers to the checklist. It is then up to the user to put the pieces together into a comprehensive whole. The answers from Section II of the checklist, Site Characterization, can be used to identify sources of releases. The answers to Section IV, Exposure Pathway Evaluation, will assist users in tracing the migration pathways of releases in the environment, thus helping to identify release mechanisms and sources. The results of Section III, Habitat Evaluation, can be used to both identify secondary and tertiary sources and to identify the types of receptors which may be exposed. Appendix B of the NMED's *Guidance for Assessing Ecological Risks Posed by Chemicals: Screening-Level Ecological Assessment* also contains sample food webs which may be used to develop the PCSEM.

Once all of the components have been identified, one can begin tracing the steps between the primary releases and the potential receptors. For each potential receptor, the user should consider all possible exposure points (e.g., prey items, direct contact with contaminated soil or water, etc.) then begin eliminating pathways, which are not expected to result in exposure to the contaminant at the site. Gradually, the links between the releases and receptors can be filled in, resulting in potential complete exposure pathways.

For further guidance on constructing a PCSEM, consult the NMED's *Guidance for Assessing Ecological Risks Posed by Chemicals: Screening-Level Ecological Assessment* (2000), and EPA's Office of Solid Waste and Emergency *Response's Soil Screening Guidance: User's Guide* (1996).

~~**Figure 1. Example Preliminary Conceptual Site Exposure Model Diagram**~~

NEW MEXICO ENVIRONMENT DEPARTMENT
SITE ASSESSMENT CHECKLIST

I. SITE LOCATION

1. Site Name: Launch Complex 38 Diesel Spill Site on White Sands Missile Range
US EPA I.D.
Number: NM2750211235
Location: Tularosa Basin within White Sands Missile Range
County: Otero
City: N/A State: NM

2. Latitude: 32.4070
Longitude: 106.2582

3. Attach site maps, including a topographical map, a diagram which illustrates the layout of the facility (e.g., site boundaries, structures, etc.), and maps showing all habitat areas identified in Section III of the checklist. Also, include maps which illustrate known release areas, sampling locations, and any other important features, if available. Site maps are included in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range* of which this site assessment checklist is appended.

II. SITE CHARACTERIZATION

1. Indicate the approximate area of the site (i.e., acres or sq. ft) The surface area of this site is approximately -40,000 square feet.
2. Provide an approximate breakdown of the land uses on the site:

____% Heavy Industrial	~~____%~~ 100 % Light Industrial	____% Urban
____% Residential	____% Rural	____% Agricultural[b]
____% Recreational[a]	____% Undisturbed	____% Other[c]

[a]For recreational areas, please describe the usage of the area (e.g., park, playing field, etc.):
N/A

[b]For agricultural areas, please list the crops and/or livestock which are present:
N/A

'For areas designated as "other", please describe the usage of the area:

The LC-38 Diesel Spill is within the White Sands Missile Range and is designated for military testing. The site itself has light industrial components related to mission specific tasks on WSMR. The diesel spill is within a launch complex on WSMR designated for testing of military weapons and weapon systems.

3. Provide an approximate breakdown of the land uses in the area surrounding the site. Indicate the radius (in miles) of the area described: one mile

____% Heavy Industrial	10 % Light Industrial	____% Urban
____% Residential	____% Rural	____% Agricultural[b]
____% Recreational[a]	~~____%~~ 90 % Undisturbed	____% Other [c]

[a]For recreational areas, please describe the usage of the area (e.g., park, playing field, golf course, etc.):
N/A

[b]For agricultural areas, please list the crops and/or livestock which are present:
N/A

[c]For areas designated as "other", please describe the usage of the area:
The diesel spill is within a launch complex on WSMR designated for testing of military weapons and weapon systems.

4. Describe reasonable and likely future land and/or water use(s) at the site.
This site is likely to remain a launch complex on White Sands Missile for the foreseeable future and will continue to be used for testing weapons and weapon systems. No use of ground water is anticipated at this site due to its high TDS (>7,000 ppm).

5. Describe the historical uses of the site. Include information on chemical releases that may have occurred as a result of previous land uses. For each chemical release, provide information on the form of the chemical released (i.e., solid, liquid, vapor) and the known or suspected causes or mechanism of the release (i.e., spills, leaks, material disposal, dumping, explosion, etc.).

A strategic reserve of diesel fuel was stored in a 150,000-gallon above-ground storage tank (AST) at Launch Complex 38 (LC-38) on White Sands Missile Range (WSMR). Prior to retiring the facility in the summer of 2000, White Sands personnel could not account for missing fuel estimated in the amount of 31,000 gallons. The tank was dedicated exclusively to diesel fuel storage throughout its service life at WSMR. No other chemical releases are reported or expected to have occurred at this site.

~~6.~~If any movement of soil has taken place at the site, describe the degree of the disturbance. Indicate the likely source of any disturbances (e.g., erosion, agricultural, mining, industrial activities, removals, etc.) and estimate when these events occurred.

Soil was displaced at this site during construction of the AST. The soil was bermed around the AST for spill prevention measures. No other soil disturbances have occurred at this site.

~~7.~~6. Describe the current uses of the site. Include information on recent (previous 5 years) disturbances or chemical releases that have occurred. For each chemical release, provide information on the form of the chemical released and the causes or mechanism of the release.

The only known release to have occurred at this site was discovered in the summer of 2000. Details of this leak are included in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range* of which this site assessment checklist is appended.

~~8.~~7. Identify the location or suspected location of chemical releases at the site. Provide an estimate of the distance between these locations and the areas identified in Section III.

As described in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*, the leak source was from an underground pipe from the AST to a pump terminal. This leak is located within the locations and areas identified in Section III pertinent to this site.

~~9.~~8. Identify the suspected contaminants of concern (COCs) at the site. If known, include the maximum contaminant levels. Please indicate the source of data cited (e.g., RFI, confirmatory sampling, etc.).

The COC at this site is Total Petroleum Hydrocarbons Diesel Range Organics as described in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*. TPH DRO was detected above levels outlined in the TPH Screening Guidelines developed by NMED. NMED TPH Screening Guidelines published June 24, 2003.

~~10.~~9. Identify the media (e.g., soil (surface or subsurface), surface water, air, groundwater) which are known or suspected to contain COCs.— Subsurface soil is the only media with known COCs as described in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*. Ground water has been shown to not have been affected.

~~11.~~10. Indicate the approximate depth to groundwater (in feet below ground surface [(bgs)]. A——s described in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*, the depth to groundwater at the site is over 230 feet below ground surface.

~~12.~~11. Indicate the direction of groundwater flow (e.g., north, southeast, etc.). As described in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*, the groundwater flow direction at the site is to the southeast.

III. HABITAT EVALUATION

III.A Wetland Habitats

Are any wetland[2] areas such as marshes or swamps on or adjacent to the site?

☐ Yes ☒ No

If yes, indicate the wetland area on the attached site map and answer the following questions regarding the wetland area. If more than one wetland area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual wetland area. Distinguish between wetland areas by using names or other designations (such as location), and clearly identify each area on the site map. Also, obtain and attach a National Wetlands Inventory Map (or maps) to illustrate each wetland area.

Identify the sources of the observations and information (e.g., National Wetland Inventory, Federal or State Agency, USGS topographic maps) used to make the determination that wetland areas are or are not present. USGS Topographic maps and interviews with local resource experts confirmed that no wetland habitats are adjacent to the site.

If no wetland areas are present, proceed to Section III.B.

2Wetlands are defined in 40 CFR §232.2 as " Areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Examples of typical wetlands plants include: cattails, cordgrass, willows and cypress trees. National wetland inventory maps may be available at http:\\nwi.fws.gov. Additional information on wetland delineation criteria is also available from the Army Corps of Engineers.

~~Wetland Area Questions~~

~~☐ Onsite ☐ Offsite~~

~~Name or Designation:~~ _____

~~1.Indicate the approximate area of the wetland (acres or ft^2)~~ _____

~~2.Identify the type(s) of vegetation present in the wetland.~~

- ~~☐Submergent (i.e., underwater) vegetation~~
- ~~☐Emergent (i.e., rooted in the water, but rising above it) vegetation~~
- ~~☐Floating vegetation~~
- ~~☐Scrub/shrub~~
- ~~☐Wooded~~
- ~~☐Other (Please describe):~~ _____

~~3.Estimate the vegetation density of the wetland area.~~

- ~~☐Dense (i.e., greater than 75% vegetation)~~
- ~~☐Moderate (i.e., 25% to 75% vegetation)~~
- ~~☐Sparse (i.e., less than 25% vegetation)~~

~~4.Is standing water present? ☐ Yes ☐ No~~

~~If yes, is the water primarily: ☐ Fresh or ☐ Brackish~~

~~Indicate the approximate area of the standing water (ft^2):~~ _____

~~Indicate the approximate depth of the standing water, if known (ft. or in.)~~ _____

~~5. If known, indicate the source of the water in the wetland.~~

- ~~☐Stream/River/Creek/Lake/Pond~~
- ~~☐Flooding~~
- ~~☐Groundwater~~
- ~~☐Surface runoff~~

~~6. Is there a discharge from the facility to the wetland? ☐ Yes ☐ No~~

~~If yes, please describe:~~ _____

~~Wetland Area Questions (Continued)~~

~~7.Is there a discharge from the wetland? ☐ Yes ☐ No~~

~~If yes, indicate the type of aquatic feature the wetland discharges into:~~

- ~~☐Surface stream/River (Name: _____)~~
- ~~☐Lake/Pond (Name: _____)~~
- ~~☐Groundwater~~
- ~~☐Not sure~~

~~8.Does the area show evidence of flooding? ☐ Yes ☐ No~~

~~If yes, indicate which of the following are present (mark all that apply):~~

- ~~☐Standing water~~
- ~~☐Water-saturated soils~~
- ~~☐Water marks~~
- ~~☐Buttressing~~
- ~~☐Debris lines~~
- ~~☐Mud cracks~~
- ~~☐Other (Please describe): _____~~

~~9.Animals observed in the wetland area or suspected to be present based on indirect evidence or file material:~~

- ~~☐Birds~~
- ~~☐Fish~~
- ~~☐Mammals~~
- ~~☐Reptiles (e.g., snakes, turtles)~~
- ~~☐Amphibians (e.g., frogs, salamanders)~~
- ~~☐Sediment-dwelling invertebrates (e.g., mussels, crayfish, insect nymphs)~~

~~Specify species, if known:~~

_____

_____

_____

_____

_____

III.B Aquatic Habitats
III.B.1 Non-Flowing Aquatic Features

Are any non-flowing aquatic features (such as ponds or lakes) located at or adjacent to the site?

☐ Yes ~~☐~~ X No

If yes, indicate the aquatic feature on the attached site map and answer the following questions regarding the non-flowing aquatic features. If more than one non-flowing aquatic feature is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual aquatic feature. Distinguish between aquatic features by using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.B.2.

~~**Non-Flowing Aquatic Feature Questions**~~

~~☐ Onsite ☐ Offsite~~

~~Name or Designation:~~ _____

~~1.Indicate the type of aquatic feature present:~~

~~☐Natural (e.g., pond or lake)~~
~~☐Man-made (e.g., impoundment, lagoon, canal, etc.)~~

~~2.Estimate the approximate size of the water body (in acres or sq. ft.)~~ _____

~~3.If known, indicate the depth of the water body (in ft. or in.).~~ _____

~~Non-Flowing Aquatic Feature Questions (Continued)~~

~~4.Indicate the general composition of the bottom substrate. Mark all sources that apply from the following list.~~

~~5.Indicate the source(s) of the water in the aquatic feature. Mark all sources that apply from the following list.~~

- ☐ ~~River/Stream/Creek~~
- ☐ ~~Groundwater~~
- ☐ ~~Industrial Discharge~~
- ☐ ~~Surface Runoff~~
- ☐ ~~Other (please specify):~~ _____

~~6.Is there a discharge from the facility to the aquatic feature?~~ ☐ ~~Yes~~ ☐ ~~No~~

~~If yes, describe the origin of each discharge and its migration path:~~

_____

_____

_____

_____

~~7.Does the aquatic feature discharge to the surrounding environment?~~ ☐ ~~Yes~~ ☐ ~~No~~

~~If yes, indicate the features from the following list into which the aquatic feature discharges, and indicate whether the discharge occurs onsite or offsite:~~

- ☐ ~~River/Stream/Creek~~ ☐ ~~onsite~~ ☐ ~~offsite~~
- ☐ ~~Groundwater~~ ☐ ~~onsite~~ ☐ ~~offsite~~
- ☐ ~~Wetland~~ ☐ ~~onsite~~ ☐ ~~offsite~~
- ☐ ~~Impoundment~~ ☐ ~~onsite~~ ☐ ~~offsite~~
- ☐ ~~Other (please describe)~~ _____

~~Non-Flowing Aquatic Feature Questions (Continued)~~

~~8.Animals observed in the vicinity of the aquatic feature or suspected to be present based on indirect evidence or file material:~~

- ☐ ~~Birds~~
- ☐ ~~Fish~~
- ☐ ~~Mammals~~
- ☐ ~~Reptiles (e.g., snakes, turtles)~~
- ☐ ~~Amphibians (e.g., frogs, salamanders)~~
- ☐ ~~Sediment-dwelling invertebrates (e.g., mussels, crayfish, insect nymphs)~~

~~Specify species, if known:~~

_____

_____

_____

_____

_____

III.B.2 Flowing Aquatic Features

Are any flowing aquatic features (such as streams or rivers) located at or adjacent to the site?

☐ Yes ☒ No

If yes, indicate the aquatic feature on the attached site map and answer the following questions regarding the flowing aquatic features. If more than one flowing aquatic feature is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual aquatic feature. Distinguish between aquatic features by using names or other designations, and clearly identify each area on the site map

If no, proceed to Section III.C.

~~**Flowing Aquatic Feature Questions**~~

~~☐ Onsite ☐ Offsite~~

~~Name or Designation:~~ _____

~~1.Indicate the type of flowing aquatic feature present.~~

- ~~☐River~~
- ~~☐Stream~~
- ~~☐Creek~~
- ~~☐Brook~~
- ~~☐Dry wash~~
- ~~☐Arroyo~~
- ~~☐Intermittent stream~~
- ~~☐Artificially created (ditch, etc.)~~
- ~~☐Other (specify)~~
- ~~☐~~

~~2.Indicate the general composition of the bottom substrate.~~
~~3.Describe the condition of the bank (e.g., height, slope, extent of vegetative cover) of the aquatic feature.~~

_____

_____

~~3.Is there a discharge from the facility to the aquatic feature?~~ ~~☐ Yes ☐ No~~

~~If yes, describe the origin of each discharge and its migration path:~~

_____

_____

_____

_____

_____

~~4.Indicate the discharge point of the water body. Specify name, if known.~~

_____

_____

_____

_____

~~Flowing Aquatic Feature Questions (Continued)~~

~~6.If the flowing aquatic feature is a dry wash or arroyo, answer the following questions.~~

~~☐Check here if feature is not a dry wash or arroyo~~

~~If known, specify the average number of days in a year in which flowing water is present in the feature: _____~~

~~Is standing water or mud present? Check all that apply.~~

~~☐Standing water~~

~~☐Mud~~

~~☐Neither standing water or mud~~

~~Does the area show evidence of recent flow (e.g., flood debris clinging to vegetation)?~~

~~☐Yes~~

~~☐No~~

~~☐Not sure~~

~~7.Animals observed in the vicinity of the aquatic feature or suspected to be present based on indirect evidence or file material:~~

~~☐Birds~~

~~☐Fish~~

~~☐Mammals~~

~~☐Reptiles (e.g., snakes, turtles)~~

~~☐Amphibians (e.g., frogs, salamanders)~~

~~☐Sediment-dwelling invertebrates (e.g., mussels, crayfish, insect nymphs)~~

~~Specify species, if known:~~

_____

_____

_____

_____

_____

III.C Terrestrial Habitats
III.C.1 Wooded

Are any wooded areas on or adjacent to the site? ☐ Yes ☒ No

If yes, indicate the wooded area on the attached site map and answer the following questions. If more than one wooded area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual wooded area. Distinguish between wooded areas by using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.C.2.

~~Wooded Area Questions~~

~~☐ On-site ☐ Off-site~~

~~Name or Designation:~~ _____

~~1.Estimate the approximate size of the wooded area (in acres or sq. ft.)~~ _____

~~2.Indicate the dominant type of vegetation in the wooded area.~~

~~☐Evergreen~~
~~☐Deciduous~~
~~☐Mixed~~

~~Dominant plant species, if known:~~ _____

~~3.Estimate the vegetation density of the wooded area.~~

~~☐Dense (i.e., greater than 75% vegetation)~~
~~☐Moderate (i.e., 25% to 75% vegetation)~~
~~☐Sparse (i.e., less than 25% vegetation)~~

~~4.Indicate the predominant size of the trees at the site. Use diameter at chest height.~~

~~☐0-6 inches~~
~~☐6-12 inches~~
~~☐>12 inches~~
~~☐No single size range is predominant~~

~~5.Animals observed in the wooded area or suspected to be present based on indirect evidence or file material:~~

~~☐Birds~~
~~☐Mammals~~
~~☐Reptiles (e.g., snakes, lizards)~~
~~☐Amphibians (e.g., toads, salamanders)~~

~~Specify species, if known:~~

_____
_____
_____
_____
_____

III.C.2 Shrub/Scrub

Are any shrub/scrub areas on or adjacent to the site? ~~☐~~ X Yes ☐ No

If yes, indicate the shrub/scrub area on the attached site map and answer the following questions. If more than one shrub/scrub area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual shrub/scrub area. Distinguish between shrub/scrub areas, using names or other designations, and clearly identify each area on the site map.

~~If no, proceed to Section III.C.3.~~

The shrub/scrub areas in the southern part of WSMR are shown on the map titled "WSMR Vegetative Cover" appended to this SLERA.

Shrub/Scrub Area Questions

☒-X Onsite ☐ Offsite

Name or Designation: Mesquite coppice dune land

1. Estimate the approximate size of the shrub/scrub area (in acres or sq. ft.). Surrounding the Site there are tens of thousands of acres of Chihuahuan desert scrub. The nearest non-shrub/scrub area is 20 miles to the east in the Sacramento Mountains.

2. Indicate the dominant type of shrub/scrub vegetation present, if known.

Dominant vegetation at and surrounding the site includes honey mesquite (*Prosopis glandulosa*) fourwing saltbush (*Atriplex canescens*) snakeweed (*Guterrezia sarothrae*) with sparse dropseed grasses (*Sporobolus* species). A complete list of species detected at the Site is presented in the ***Site Visit Report*** completed as part of this Environmental Site Assessment.

3. Estimate the vegetation density of the shrub/scrub area.

- ☐ Dense (i.e., greater than 75% vegetation)
- ☒ X Moderate (i.e., 25% to 75% vegetation)
- ☐ Sparse (i.e., less than 25% vegetation)

4. Indicate the approximate average height of the scrub/shrub vegetation.

- ☐ 0-2 feet
- ☒ X 2-5 feet
- ☐ >5 feet

5. Animals observed in the shrub/scrub area or suspected to be present based on indirect evidence or file material:

- ☒ X Birds
- ☒ X Mammals
- ☒ X Reptiles (e.g., snakes, lizards)
- ☐ Amphibians (e.g., toads, salamanders)

Specify species, if known:

Some of the most common species at the Site that were detected during the Site Visit included *Canis latrans*-Coyote; *Oryx gazella* - Oryx ; and *Sylvilagus audubonii*-Desert Cottontail. Other animals detected included; *Zonitrichia leucophrys* –white-crowned

sparrow; and *Lepus californicus* - Black-tailed Jackrabbit. A complete list of species detected at the Site is presented in the ***Site Visit Report*** completed as part of this Environmental Site Assessment.

III.C.3 Grassland

Are any grassland areas on or adjacent to the site? ☐ Yes ~~☐~~ X No

If yes, indicate the grassland area on the attached site map and answer the following questions. If more than one grassland area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual grassland area. Distinguish between grassland areas by using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.C.4.

~~**Grassland Area Questions**~~

~~☐ Onsite ☐ Offsite~~

~~Name or Designation:~~ _____

~~1.Estimate the approximate size of the grassland area (in acres or sq. ft.).~~ _____

~~2. Indicate the dominant plant type, if known.~~

_____

_____

_____

_____

~~3. Estimate the vegetation density of the grassland area.~~

~~☐Dense (i.e., greater than 75% vegetation)~~
~~☐Moderate (i.e., 25% to 75% vegetation)~~
~~☐Sparse (i.e., less than 25% vegetation)~~

~~4.Indicate the approximate average height of the dominant plant type (in ft. or in.)~~ _

~~5.Animals observed in the grassland area or suspected to be present based on indirect evidence or file material:~~

~~☐Birds~~
~~☐Mammals~~
~~☐Reptiles (e.g., snakes, lizards)~~
~~☐Amphibians (e.g., toads, salamanders)~~

~~Specify species, if known:~~

III.C.4 Desert

Are any desert areas on or adjacent to the site? ~~☐~~ X Yes ☐ No

If yes, indicate the desert area on the attached site map and answer the following questions. If more than one desert area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual desert area. Distinguish between desert areas by using names or other designations, and clearly identify each area on the site map.

~~If no, proceed to Section III.C.5.~~

The map titled "WSMR in Relation to the Chihuahuan Desert" is appended to this SLERA.

Desert Area Questions

~~☐~~ X Onsite ☐ Offsite

Name or Designation The Site is located in the Chihuahuan Desert

1. Estimate the approximate size of the desert area (in acres or sq. ft The Site is surrounded by tens of thousands of acres of Chihuahuan Desert.~~).~~

2. Describe the desert area (e.g., presence or absence of vegetation, vegetation types, presence/size of rocks, sand, etc.)

   Detailed descriptions about the biotic communities within WSMR can be found in the WSMR Integrated Natural Resource Management Plan. Habitats directly associated with this Site include typical desert scrub communities. In this area, honey mesquite stems act to trap blowing sand to form coppice dunes. Other vegetation is sparse with the exception of broom snakeweed, fourwing saltbush, and mesa dropseed.

3. Animals observed in the desert area or suspected to be present based on indirect evidence or file material:

   ~~☐~~ X Birds
   ~~☐~~ X Mammals
   ~~☐~~ X Reptiles (e.g., snakes, lizards)

☐ X Amphibians (e.g., toads, salamanders)

Specify species, if known:

Species lists compiled and developed by resource experts on WSMR indicate that there are over 1,000 species of vegetation, nearly 300 species of birds, 55 species of reptiles and amphibians, and 70 species of mammals confirmed within WSMR (Pers. comm. David Anderson and Doug Burkett). The WSMR Integrated Natural Resource Management Plan (November 2001) cites a more detailed species list that can be encountered in differing areas on WSMR, however, the following list of species was identified during a site visit:

Vegetation

Apodanthera undulate-coyote gourd

Atriplex canescens-fourwing saltbush

Prosopis glandulosa-honey mesquite

Gutierrezia sarothrae-broom snakeweed

Sphaeralcea coccinea-common globemallow

Sporobolus airoides- alkali sacaton

Sporobolus cryptandrus-sand dropseed

Avians

Corvus cryptoleucus – Chihuahuan raven

Invertebrates

Mycetophilidae-gnats

Cerambycidae-longhorn Beetle

Formicidae -harvester Ants

Lycosidae-wolf spider

Mammals

Lepus californicus - black-tailed jackrabbit

Oryx gazella - oryx

Sylvilagus audubonii-desert cottontail

Reptiles

Uta stansburiana-side-blotched lizard

III.C.5 Other

1. Are there any other terrestrial communities or habitats on or adjacent to the site which were not previously described?

   ☐ Yes ~~☐~~ X No

   If yes, indicate the "other" area(s) on the attached site map and describe the area(s) below. Distinguish between onsite and offsite areas. If no, proceed to Section III.D.

III.D Sensitive Environments and Receptors

1. Do any other potentially sensitive environmental areas[3] exist adjacent to or within 0.5 miles of the site? If yes, list these areas and provide the source(s) of information used to identify sensitive areas. *Do not answer "no" without confirmation from the U.S. Fish and Wildlife Service and appropriate State of New Mexico division.*

No. Consultation with the latest information available through WSMR Resource Managers and the latest literature available through the US Fish and Wildlife Service and the NM Dept of Game and Fish indicates that no sensitive

~~3 Areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding, hatching, rearing of young and overwintering. Refer to **Table 1** at the end of this document for examples of sensitive environments.~~

environments exist within at least a five mile radius of the site.

2. Are any areas on or near (i.e., within 0.5 miles) the site which are owned or used by local tribes? If yes, describe. *Contact the Tribal Liason in the Office of the Secretary (505)827-2855 to obtain this information.* No

3 Areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding, hatching, rearing of young and overwintering. Refer to **Table 1** at the end of this document for examples of sensitive environments.

NO. Consultation with the latest information available through WSMR Resource Managers and the latest literature available through the USFWS and NMDGF indicate that no sensitive environmental areas exist within at least 10 miles of the Site

4. Does the site serve or potentially serve as a habitat, foraging area, or refuge by rare, threatened, endangered, candidate and/or proposed species (plants or animals), or any otherwise protected species? If yes, identify species. *This information should be obtained from the U.S. Fish and Wildlife Service and appropriate State of New Mexico division.* No. The latest lists of State and Federal species of concern, candidate, threatened, and endangered species were consulted. Resource experts familiar with the sites confirmed that none of these species utilize the habitats at or adjacent to the Site.

~~5.~~Is the site potentially used as a breeding, roosting or feeding area by migratory bird species? If yes, identify which species. Yes. There are hundreds of species of migrating birds that may potentially roost or feed at or near the Site. Several species of birds may nest near the Site including Say's phoebe and cactus wren.

~~6.~~5. Is the site used by any ecologically[4], recreationally, or commercially important. Yes. Gemsbok *(Oryx gazella)* frequent all portions of the Missile Range and do occasionally visit the Site. Gemsbok are harvested by recreational hunters in many portions of the Range including near this Site~~species? If yes, explain.~~.

4 ~~Ecologically important species include populations of species which provide a critical (i.e., not replaceable) food resource for higher organisms and whose function as such would not be replaced by more tolerant species; or perform a critical ecological function (such as organic matter decomposition) and whose functions will not be replaced by other species. Ecologically important species include pest and opportunistic species that populate an area if they serve as a food source for other species, but do not include domesticated animals (e.g., pets and livestock) or plants/animals whose existence is maintained by continuous human interventions (e.g., fish hatcheries, agricultural crops, etc.,)~~

IV. EXPOSURE PATHWAY EVALUATION

1. Do existing data provide sufficient information on the nature, rate, and extent of contamination at the site?

   ☒ X Yes
   ☐ No
   ☐ Uncertain

   Please provide an explanation for your answer: The nature and extent of contamination is described fully in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*, to which this SLERA is attached.

2. Do existing data provide sufficient information on the nature, rate, and extent of contamination in offsite affected areas?

   ☐ Yes
   ☐ No
   ☐ Uncertain
   ☒ X No offsite contamination

   Please provide an explanation for your answer: The nature and extent of contamination is described fully in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*, to which this SLERA is attached.

3. Do existing data address potential migration pathways of contaminants at the site?

   ☒ X Yes
   ☐ No
   ☐ Uncertain

   Please provide an explanation for your answer:

Potential migration pathways were addressed in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*, to which this SLERA is attached.

4. Do existing data address potential migration pathways of contaminants in offsite affected areas?

- ❑ Yes
- ❑ No
- ❑ Uncertain
- ☒ X No offsite contamination

Please provide an explanation for your answer: Potential migration pathways were addressed in the *SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range*, to which this SLERA is attached.

5. Are there visible indications of stressed habitats or receptors on or near (i.e., within 0.5 miles) the site that may be the result of a chemical release? If yes, explain. Attach photographs if available.

No.

6. Is the location of the contamination such that receptors might be reasonably expected to come into contact with it? For soil, this means contamination in the soil 0 to 5 feet below ground surface (bgs). If yes, explain.

No. The source of contamination was a leaking underground pipe. Evidence of contamination is > 5 feet below ground surface.

7. Are receptors located in or using habitats where chemicals exist in air, soil, sediment or surface water? If yes, explain.

No.

8. Could chemicals reach receptors via groundwater? Can chemicals leach or dissolve to groundwater? Are chemicals mobile in groundwater? Does groundwater discharge into receptor habitats? If yes, explain.

No.

9. Could chemicals reach receptors through runoff or erosion? Answer the following questions: No.

What is the approximate distance from the contaminated area to the nearest watercourse or arroyo?

- ❑ 0 feet (i.e., contamination has reached a watercourse or arroyo)
- ❑ 1-10 feet
- ❑ 11-20 feet
- ❑ 21-50 feet
- ❑ 51-100 feet
- ❑ 101-200 feet
- ❑ > 200 feet
- ❑ > 500 feet
- ☒ X > 1000 feet

What is the slope of the ground in the contaminated area?

- ☒ X 0-10%
- ❑ 10-30%
- ❑ > 30%

What is the approximate amount of ground and canopy vegetative cover in the contaminated area?

- ☒ ___ < 25%
- ☒ X 25-75%
- ❑ > 75%

Is there visible evidence of erosion (e.g., a rill or gully) in or near the contaminated area?

- ❑ Yes
- ☒ X No
- ❑ Do not know

Do any structures, pavement, or natural drainage features direct run-on flow (i.e., surface flows originating upstream or uphill from the area of concern) into the contaminated area?

☐ X Yes, this site is bermed.
☐ ___ No
☐ Do not know

10. Could chemicals reach receptors through the dispersion of contaminants in air (e.g., volatilization, vapors, fugitive dust)? If yes, explain.

No.

11. Could chemicals reach receptors through migration of non-aqueous phase liquids (NAPLs)? Is a NAPL present at the site that might be migrating towards receptors or habitats? Could NAPL discharge contact receptors or their habitat?

NAPLs (Diesel Fuel) are associated with this site but are confined from ecological receptors.

12. Could receptors be impacted by external irradiation at the site? Are gamma emitting radionuclides present at the site? Is the radionuclide contamination buried or at the surface?

No radionuclide contamination is associated with this site.

PHOTOGRAPHIC DOCUMENTATION

During the site visit(s), photographs should be taken to document the current conditions at the site and to support the information entered in the checklist. For example, photographs may be used to document the following:

- The nature, quality, and distribution of vegetation at the site
- Receptors or evidence of receptors
- Potentially important ecological features, such as ponds and drainage ditches
- Potential exposure pathways
- Any evidence of contamination or impact

The following space may be used to record photo subjects.

Photographic documentation of the site are attached to the end of this checklist.

SUMMARY OF OBSERVATIONS AND SITE SETTING

Include information on significant source areas and migration pathways that are likely to constitute complete exposure pathways.

———The Site exists in a typical and widespread desert scrub community in the Tularosa Basin within White Sands Missile Range. Habitat present is not considered rare or sensitive by any of the regulating or management agencies including the USFWS, NMDGF, and WSMR Directorate of Environment and Safety. The habitat present does not harbor listed or sensitive species. No plants at or near the Site showed any external signs of stress due to contact with the contaminant. Potential plants that could be exposed include those in the complete species list for this Site visit. All are common and widespread throughout the Chihuahuan Desert.

Checklist Completed by Bradley Davis

Affiliation

BA

E Systems

Author Assisted by

Doug Burkett and David Black

Date

4-22-04

TABLE 1
EXAMPLES OF SENSITIVE ENVIRONMENTS

National Parks and National Monuments

Designated or Administratively Proposed Federal Wilderness Areas

National Preserves

National or State Wildlife Refuges

National Lakeshore Recreational Areas

Federal land designated for protection of natural ecosystems

State land designated for wildlife or game management

State designated Natural Areas

Federal or state designated Scenic or Wild River

All areas that provide or could potentially provide critical habitat[1] for state and federally listed Threatened or Endangered Species, those species that are currently petitioned for listing, and species designated by other agencies as sensitive or species of concern

All areas that provide or could potentially provide habitat for state protected species as defined in the Wildlife Code, Chapter 17 of the New Mexico Statutes

All areas that provide or could potentially provide habitat for migratory birds as protected by the Migratory Bird Treaty Act (16 U.S.C. §§ 703-712)

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1 Critical habitats are defined by the Endangered Species Act (50 CFR §424.02(d)) as:

1) Specific areas within the geographical area currently occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (ii) that may require special management considerations or protection, and 2) Specific areas outside the geographical area occupied by a species at the time it is listed upon a determination by the Secretary [of Interior] that such areas are essential for the conservation of the species.

All areas that provide or could potentially provide habitat for bald eagles and golden eagles as protected by the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)

All areas that provide or could potentially provide habitat for song birds as protected by the State of New Mexico statute (New Mexico Statute, 1978, Chapter 17, Game and Fish, 17-2-13)

All areas that provide or could potentially provide habitat for hawks, vultures and owls as protected by the State of New Mexico statute (New Mexico Statute, 1978, Chapter 17, Game and Fish, 17-2-14)

All areas that provide or could potentially provide habitat for horned toads and Bullfrogs as protected by the State of New Mexico statute (New Mexico Statute, 1978, Chapter 17, Game and Fish, 17-2-15 and 16, resp.)

All perennial waters (e.g., rivers, lakes, playas, sloughs, ponds, etc)

All ephemeral drainage (e.g., arroyos, puddles/pools, intermittent streams, etc) that provide significant wildlife habitat or that could potentially transport contaminants off site to areas that provide wildlife habitat

All riparian habitats

All perennial and ephemeral wetlands (not limited to jurisdictional wetlands)

All areas that are potentially important breeding, staging, and overwintering habitats as well as other habitats important for the survival of animals during critical periods of their life cycle.

ATTACHMENT B

ECOLOGICAL SITE EXCLUSION CRITERIA CHECKLIST AND DECISION TREE

1. NEW MEXICO ECOLOGICAL EXCLUSION CRITERIA CHECKLIST

The following questions are designed to be used in conjunction with the Ecological Exclusion Criteria Decision Tree (Figure 1). After answering each question, refer to the Decision Tree to determine the appropriate next step. In some cases, questions will be omitted as the user is directed to another section as indicated by the flow diagram in the Decision Tree. For example, if the user answers "yes" to Question 1 of Section I, he or she is directed to proceed to Section II.

I. Habitat

In the following questions, "affected property" refers to all property on which a release has occurred or is believed to have occurred, including off-site areas where contamination may have occurred or migrated.

1. Are any of the below-listed sensitive environments at, adjacent to, or in the locality[1] of the affected property? NO.

- National Park or National Monument
- Designated or administratively proposed Federal Wilderness Area
- National Preserve
- National or State Wildlife Refuge
- Federal or State land designated for wildlife or game management
- State designated Natural Areas
- All areas that are owned or used by local tribes
- All areas that are potentially important breeding, staging, and overwintering habitats as well as other habitats important for the survival of animals during critical periods of their life cycle
- All areas that provide or could potentially provide habitat for state and federally listed Threatened or Endangered Species, those species that are currently petitioned for listing, and species designated by other agencies as sensitive or species of concern
- All areas that provide or could potentially provide habitat for state protected species as defined in the Wildlife Code, Chapter 17 of the New Mexico Statutes
- All areas that provide or could potentially provide habitat for migratory birds as protected by the Migratory Bird Treaty Act (16 U.S.C. §§ 703-712)

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1 *Locality* of the site refers to any area where an ecological receptor is likely to contact site-related chemicals. The locality of the site considers the likelihood of contamination migrating over time and places the site in the context of its general surrounding. Therefore, the locality is typically larger than the site and the areas adjacent to the site.

- All areas that provide or could potentially provide habitat for bald eagles and golden eagles as protected by the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)
- All areas that provide or could potentially provide habitat for song birds as protected by the state of New Mexico statute (New Mexico Statute, 1978, Chapter 17, Game and Fish, 17-2-13)
- All areas that provide or could potentially provide habitat for hawks, vultures and owls as protected by the state of New Mexico statute (New Mexico Statute, 1978, Chapter 17, Game and Fish, 17-2-14)
- All areas that provide or could potentially provide habitat for horned toads and bullfrogs as protected by the state of New Mexico statute (New Mexico Statute, 1978, Chapter 17, Game and Fish, 17-2-15 and 16, respectively)

2. Does the affected property contain land areas which were not listed in Question 1, but could be considered viable ecological habitat? The following are examples (but not a complete listing) of viable ecological habitats: YES.

- Wooded areas
- Shrub/scrub vegetated areas
- Open fields (prairie)
- Other grassy areas
- Desert areas
- Any other areas which support wildlife and/or vegetation, excluding areas which support only opportunistic species (such as house mice, Norway rats, pigeons, etc.) that do not serve as prey to species in adjacent habitats.

The following features are not considered ecologically viable:

- Pavement
- Buildings
- Paved areas of roadways
- Paved/concrete equipment storage pads
- Paved manufacturing or process areas
- Other non-natural surface cover or structure

3. Does the affected property contain any perennial or ephemeral aquatic features which were not listed in Question 1? NO.

II. Receptors

1. Is any part of the affected property used for habitat, foraging area, or refuge by any rare, threatened, or endangered species (plant *or* animal), or otherwise protected species (e.g., raptors, migratory birds)? NO.

2. Is any part of the affected property used for habitat, foraging area, or refuge by any species used as a recreational (e.g., game animals) and/or commercial resource? YES.

3. Is any part of the affected property used for habitat, foraging area, or refuge by any plant or animal species? This includes plants considered "weeds" and opportunistic insect and animal species (such as cockroaches and rats) if they are used as a food source for other species in the area. YES.

III. Exposure Pathways

1. Could receptors be impacted by contaminants via direct contact?

   Is a receptor located in or using an area where it could contact contaminated air, soil3, or surface water? NO.

For Questions 2 and 3, note that one must answer "yes" to all three bullets in order to be directed to the "exclusion denied" box of the decision tree. This is because answering "no" to one of the questions in the bullet list indicates that a complete exposure pathway is not present. For example, in Question 2, if the chemical cannot leach or dissolve to groundwater (bullet 1), there is no chance of ecological receptors being exposed to the chemical through contact with contaminated groundwater. Similarly, the responses to the questions in Question 4 determine whether a complete pathway exists for exposure to NAPL.

2. Could receptors contact contaminants via groundwater?
   - Can the chemical leach or dissolve to groundwater4? NO. Contamination is blocked from further migration downward by a thick clay unit (> 10 ft thick). Additionally, GW is approximately 150 ft below deepest contamination at the site.
   - Can groundwater mobilize the chemical?

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3 For soil, this means contamination less than 5 feet below ground surface (bgs).

4 Information on the environmental fate of specific chemicals can be found on the Internet at *http://www.epa.gov/opptintr/chemfact/* or at a local library in published copies of the *Hazardous Substances Data Bank.*

- Could (does) contaminated groundwater discharge into known or potential receptor habitats? There is no known discharge of this ground water.

3. Could receptors contact contaminants via runoff (i.e., surface water and/or suspended sediment) or erosion by water or wind?
   - Are chemicals present in surface soils? NO. There is no surface contamination at the site.
   - Can the chemical be leached from or eroded with surface soils? NO.
   - Is there a receptor habitat located downgradient of the leached/eroded surface soil? NO.

4. Could receptors contact contaminants via migration of non-aqueous phase liquids (NAPL)?
   - Is NAPL present at the site? YES.
   - Is NAPL migrating toward potential receptors or habitats? NO. The diesel contamination is prevented from further migration downward by a thick (> 10 ft thick) clay layer.
   - Could NAPL discharge impact receptors or habitats? NO.

Based on results of this checklist, an exclusion would be granted from further ecological risk assessment.

Figure 1 -Ecological Exclusion Criteria Decision Tree

(Refer to corresponding checklist for the full text of each question)

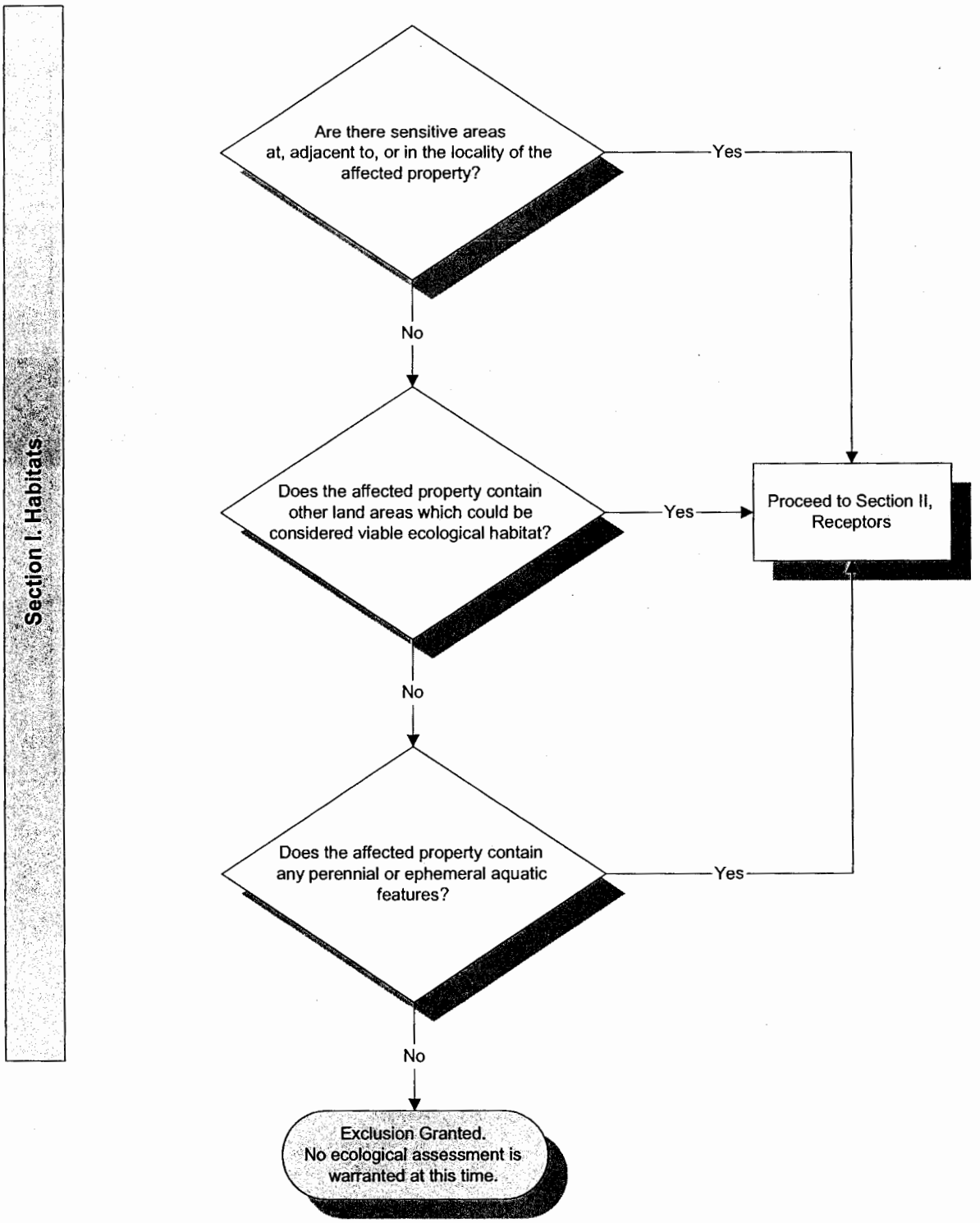


Figure 1 - Exclusion Criteria Decision Tree (continued)

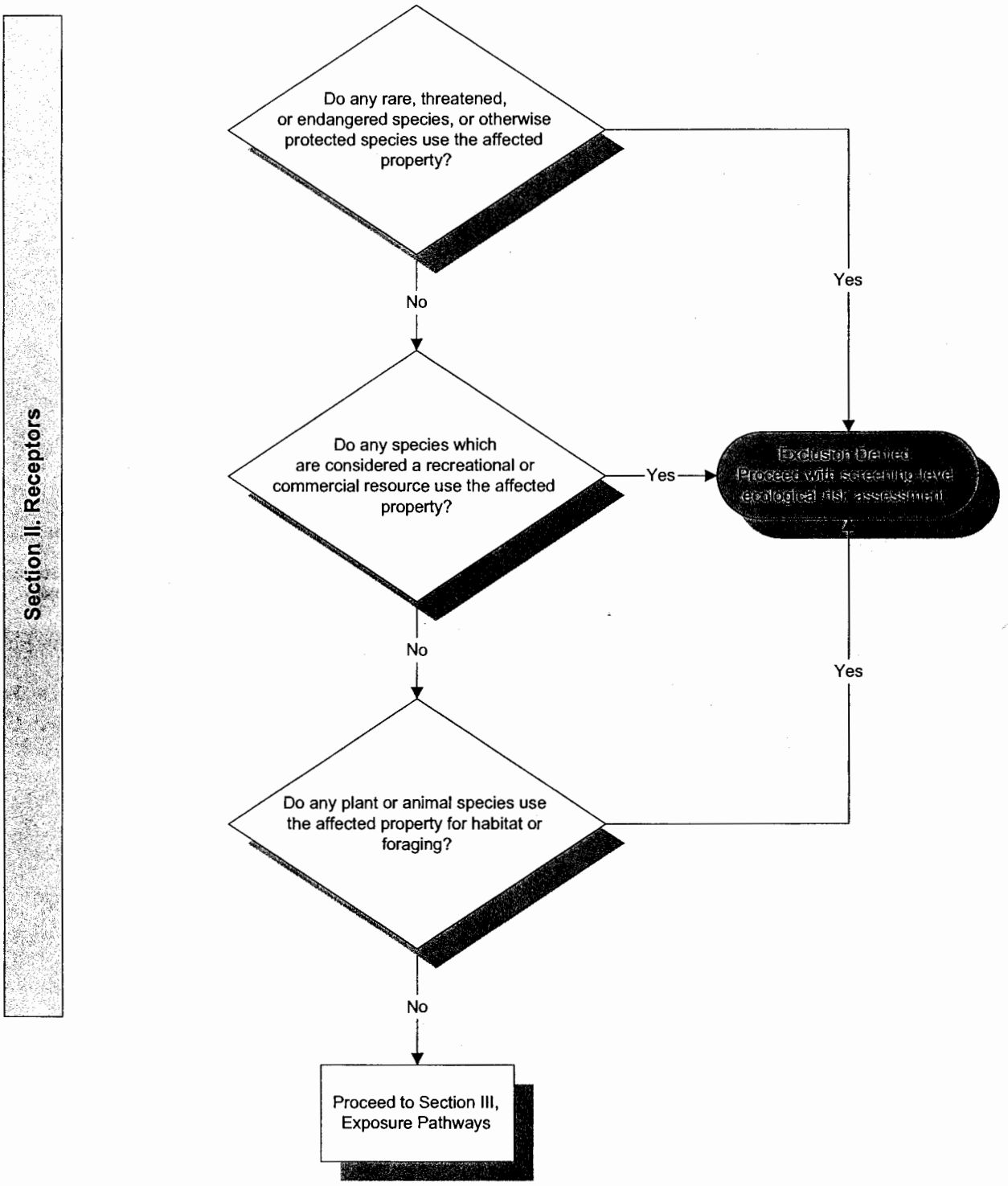
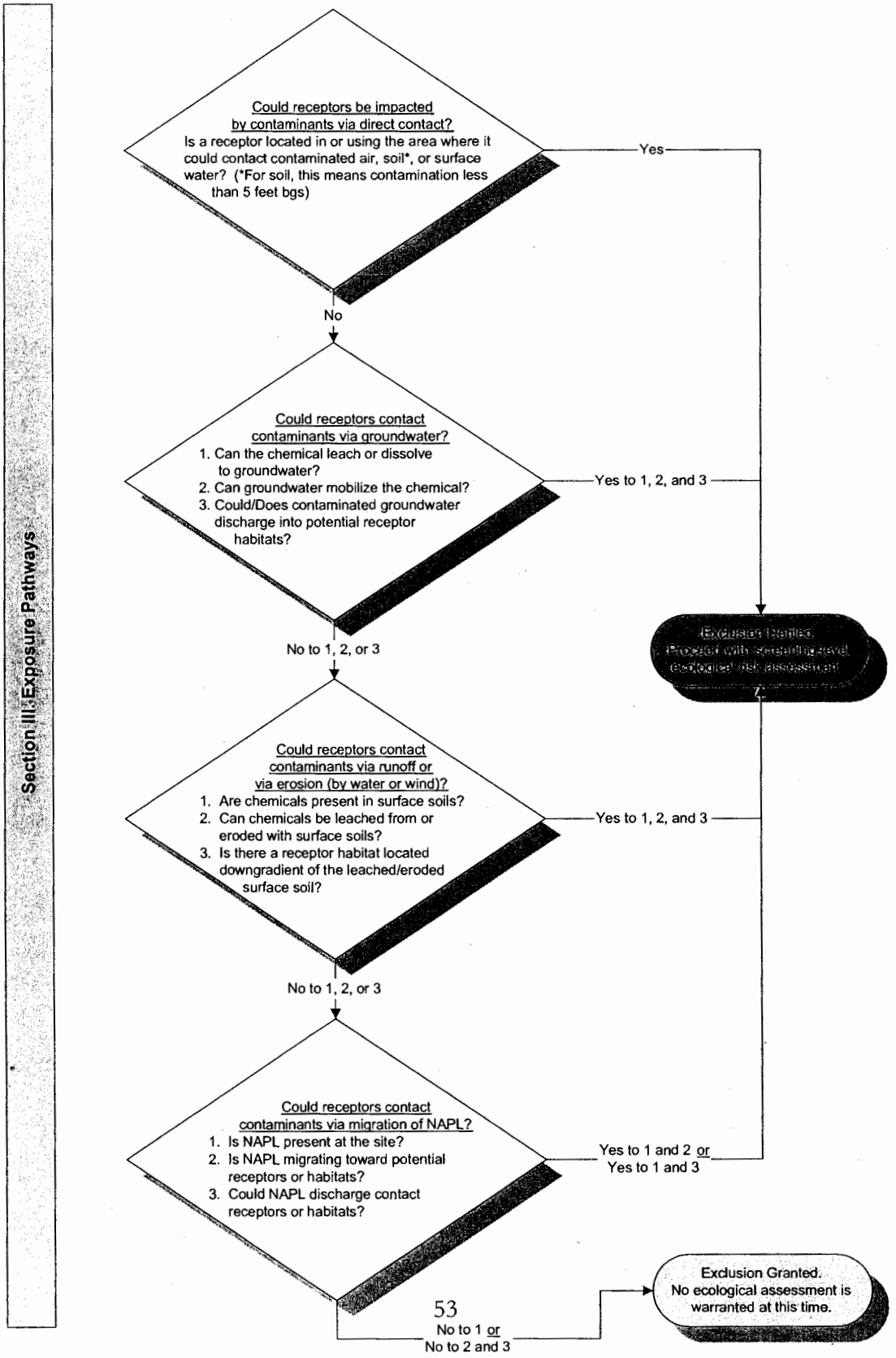


Figure 1 - Exclusion Criteria Decision Tree (continued)



Biological Investigation of the LC-38 Diesel Spill Site, White Sands Missile Range New Mexico

September 2003

Prepared by
BAE SYSTEMS

1.0 Introduction

A site visit was conducted at LC-38 Diesel Spill Site to ascertain viable ecological habitat and biological entities that could potentially be affected by drilling four wells at the proposed sampling locations.

2.0 Methods

An observer conducted a pedestrian survey at the LC-38 site on 16 September 2003. The observer recorded all detectable vegetation and fauna out to a 200-meter perimeter around the site. A list of vegetation and animals detected is presented in appendix A.

The latest lists of State and Federally listed species of special status (sensitive, of concern, threatened, or endangered) were consulted and none of the species were found to be likely to inhabit the site.

3.0 Results

After literature review and expert interview no threatened or endangered species or sensitive habitats were anticipated to exist at or near the site. Subsequent on-site reconnaissance detected no sensitive species or their habitats. Habitats associated with the site are not considered ecologically sensitive or unique to this portion of the Chihuahuan desert. The Site exists in a typical and widespread desert scrub community in the Tularosa Basin within White Sands Missile Range. Large, well defined, mesquite coppice dunes dominate this area around LC-38. Habitat present is not considered rare or sensitive by any of the regulating or management agencies including the USFWS, NMDGF, and WSMR Directorate of Environment and Safety.

The site itself has been disturbed through mechanical manipulation primarily from past military use of the site including leveling and construction of buildings.

4.0 Conclusions

Based on information gathered during this investigation, it appears that there is no reasonable potential for detrimental impact to potential ecological receptors. The lack of any sensitive habitats or species of concern limits the potential for this spill site to have any measurable detrimental affects to the environment or environmental receptors.

APPENDIX A

Species List for LC-38 Diesel Spill Site

Vegetation

Apodanthera undulate-coyote gourd

Atriplex canescens-fourwing saltbush

Prosopis glandulosa-honey mesquite

Gutierrezia sarothrae-broom snakeweed

Sphaeralcea coccinea-common globemallow

Sporobolus airoides- alkali sacaton

Sporobolus cryptandrus-sand dropseed

Avians

Corvus cryptoleucus – Chihuahuan raven

Invertebrates

Mycetophilidae-gnats

Cerambycidae-longhorn Beetle

Formicidae -harvester Ants

Lycosidae-wolf spider

Mammals

Lepus californicus - black-tailed jackrabbit

Oryx gazella - oryx

Sylvilagus audubonii-desert cottontail

Reptiles

Uta stansburiana-side-blotched lizard

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WSMR in Relation to the Chihuahuan Desert

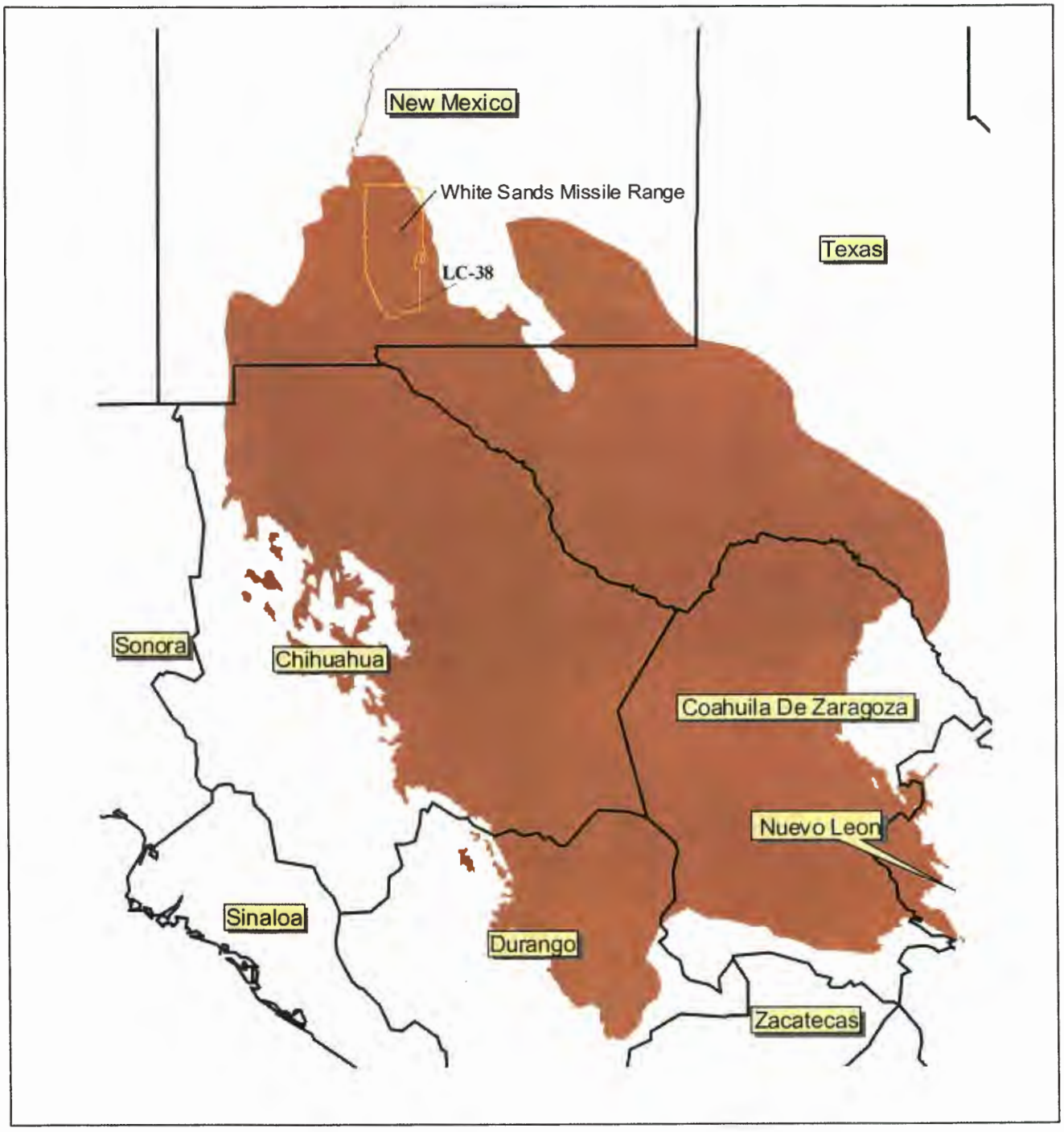
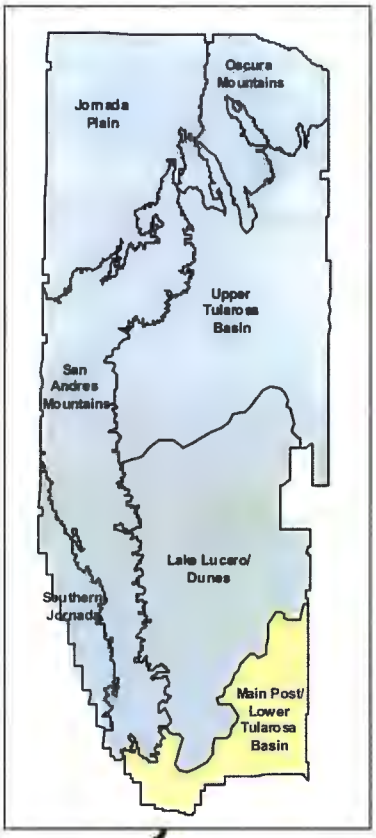


Figure taken from the WSMR Integrated Natural Resource Management Plan November 2001

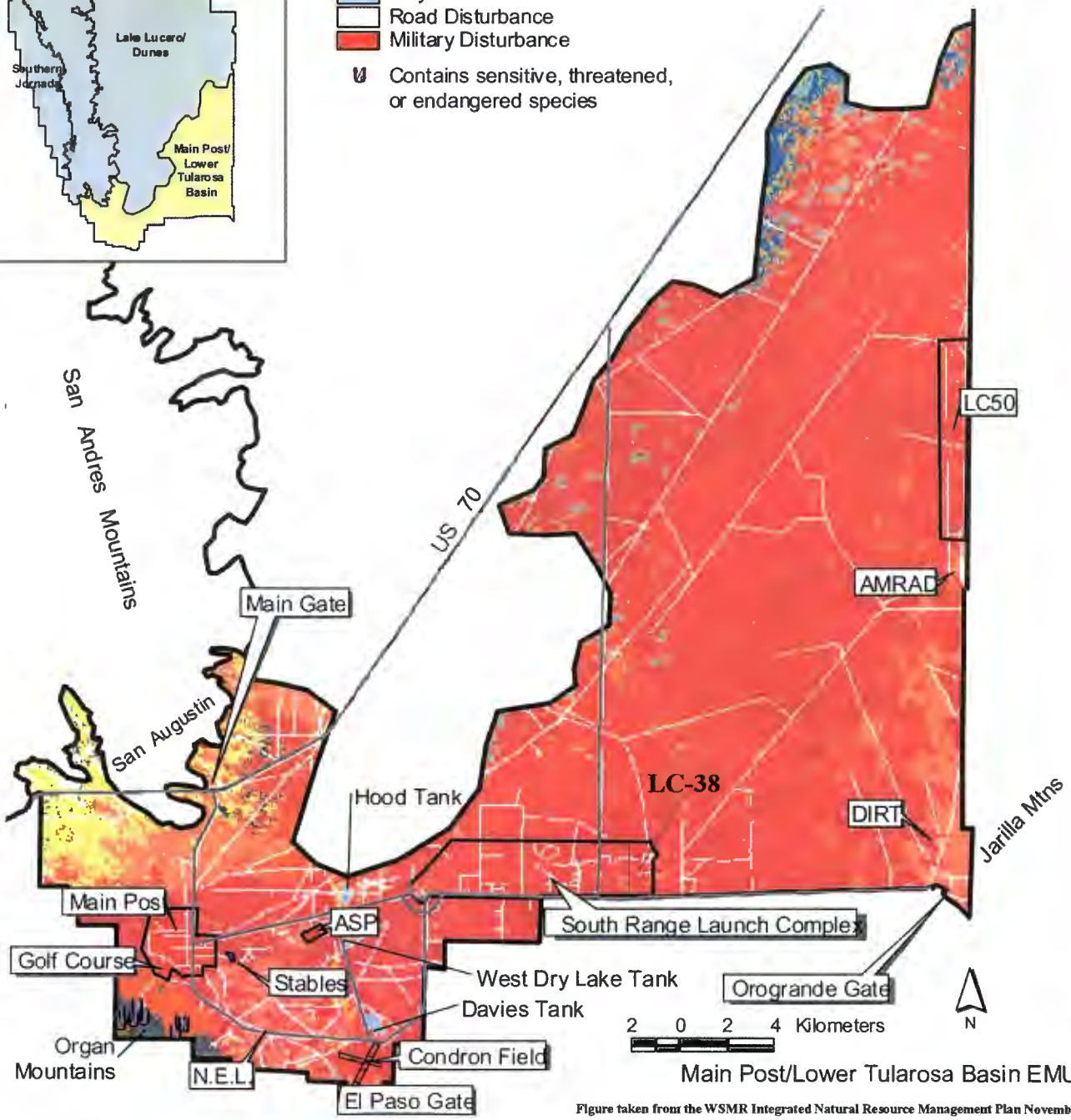
WSMR Vegetative Cover



Vegetation Map Units

- Pinyon Pine Woodland
- Juniper Woodland
- Montane Scrub
- Interior Chaparral
- Fourwing Saltbush Shrubland
- Creosotebush Shrubland
- Acacia Shrubland
- Mesquite Shrubland
- Mixed Foothill-Piedmont Desert Grasslands
- Mixed Lowland Desert Scrub
- Foothill-Montane Temperate Grasslands
- Piedmont Desert Grasslands
- Piedmont Temperate Grasslands
- Lowland Basin Grasslands
- Vegetated Gypsum Outcrop
- Mimosa Shrubland
- Playa
- Road Disturbance
- Military Disturbance

Contains sensitive, threatened, or endangered species



Main Post/Lower Tularosa Basin EMU

Figure taken from the WSMR Integrated Natural Resource Management Plan November 2001