DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON WHITE SANDS
100 Headquarters Avenue
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5000

ENTERED

REPLY TO
ATTENTION OF

FEB 14 2012

Directorate of Public Works

FEB 2012

Mr. John Kieling, Acting Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

SUBJECT: RCRA Facility Investigation Work Plan SWMU 86 & 87, Main Post Sanitary Landfill and Construction Landfill Documents for NMED Administrative Record

Dear Mr. Kieling,

Enclosed for your records are the documents titled:

MEVATEC Corporation, Demonstration for Groundwater Monitoring Suspension Request Main Post Landfill White Sands Missile Range, 22 December 1995.

MEVATEC Corporation, Installation of Monitoring Wells at the Main Post Landfill White Sands Missile Range, October 1996.

MEVATEC Corporation, Report of Results, Groundwater Monitoring at the Main Post Landfill White Sands Missile Range, October 1996.

MEVATEC Corporation, Delineation of Groundwater Monitoring Contamination Near the Main Post Landfill and the Former STP Effluent Discharge Areas, White Sands Missile Range, December 1997.

White Sand Technical Services, LLC, Closure and Post-Closure Care Plan, Municipal and Asbestos Areas, Main Post Landfill White Sands Missile Range, December 2008.

White Sand Technical Services, LLC, Groundwater Monitoring Report, Calendar Year 2007, STP Percolation Ditches, SWMU 82, White Sands Missile Range, June 2008.

These documents are being submitted to the New Mexico Environment Department (NMED) Administrative Record as requested in your Notice of Disapproval (NOD) dated November 4, 2011 (HWB-WSMR-11-011). The NOD stated that the Permittee must submit copies of all documents listed in Comments 5, 9, 12, and 18 by February 13, 2012. No document is being provided for Comment 5. The Work Plan will be revised with the correct Open File Report number for the Kelly, 1973 reference. The document listed in Comment 18 titled "Geological Report for Preliminary Site Assessment at Main Post Landfill" by Tierra Engineering is not available and cannot be provided at this time. If the document becomes available, WSMR will provide a copy upon submittal of the revised Work Plan.

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

Should you have any questions regarding this matter, please contact Mr. Benito Avalos of our Environmental Compliance Branch at (575) 678-2225.

I am forwarding a copy of this letter without enclosures to Mr. Dave Cobrain, NMED-HWB; Ms. Leona Tsinnajinnie, NMED-HWB; Mr. Paul Torcoletti, EPA Region 6; and Mr. Sudhakar Matlapudi, Shaw Inc.

Sincerely,

Thomas A. Ladd

Thomas A. Ladd
Director, Public Works

Enclosures

DEMONSTRATION FOR GROUNDWATER MONITORING SUSPENSION REQUEST MAIN POST LANDFILL WHITE SANDS MISSILE RANGE

22 December 1995

Submitted to:

U.S. Army
White Sands Missile Range
Directorate of Environment and Safety
White Sands Missile Range, New Mexico 88002-5201

Prepared by:

MEVATEC Corporation
White Sands Missile Range
WSMR, New Mexico 88002

DEPARTMENT OF THE ARMY

U.S. ARMY WHITE SANDS MISSILE RANGE
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-

January 5, 1996

REPLY TO
ATTENTION OF

Environmental Services Division

Mr. J. Edward Hansen
State of New Mexico Environment Department
Permitting and Compliance Section
Solid Waste Bureau
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, New Mexico 87502

Dear Mr. Hansen:

Enclosed are the results of our Fate and Transport Modelling of the Main Post Landfill at White Sands Missile Range (WSMR). The modelling results indicate no potential for ground-water contamination which should be helpful in determining what flexibility can be granted WSMR for the Main Post Landfill under Section 110 of the New Mexico Solid Waste Management Regulations.

It is understood that the modelling results fulfill only the technical requirements and that a final determination can only be made after evidence from ground-water testing which demonstrates no contamination attributable to the Main Post Landfill is provided to your office. We anticipate providing this information to you by November 1997.

We would like to thank you for the extension from January 2, 1996 to January 11, 1996, for this report, granted during a telephone conversation on December 27, 1995, with Mr. John Kieling of your office and Mr. Javier Mendoza of our directorate.

Should you have any questions regarding this information, please contact Mr. Javier Mendoza, Environmental Services Division, Directorate of Environment and Safety, at (505) 678-2224/2415.

Sincerely,

Thomas A. Ladd

Thomas A. Ladd
Director, Environment and Safety

Enclosure

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EXECUTIVE SUMMARY

New regulations imposed by the US EPA and New Mexico Environment Department have required changes in solid waste management practices. The Main Post Landfill located at White Sands Missile Range has been affected by these regulations. The landfill accepts nonhazardous waste from all of the 850 residential units, as well as from all facilities located at the Main Post area.

The purpose of this study is to demonstrate that there is no potential of contamination of groundwater from contaminates discharged from the Main Post Landfill. Based on the findings of the study a Groundwater Monitoring Suspension Request (GWMSR) in accordance with the New Mexico Solid Waste Management Regulations is hereby submitted. Presented in this report are the findings of the study that determine the potential for the generation of leachate from the landfill and the fate and transport of that leachate to groundwater.

Information about the geology and hydrology of the area of the Main Post Landfill was collected and input into computer models. The Hydrologic Evaluation of Landfill Performance (HELP) and the Multimedia Exposure Assessment (MULTIMED) computer models, indicate that there is no potential for the contamination of groundwater below the Main Post Landfill. Based on these findings, a demonstration has been made that there is no potential for migration of hazardous constituents form the Main Post Landfill to the uppermost aquifer during the post-closure care period of 30 years.

LIST OF ACRONYMS

EPA	Environmental Protection Agency
GWMSR	Groundwater Monitoring Suspension Request
HELP	Hydrologic Evaluation of Landfill Performance
MPL	Main Post Landfill
MULTIMED	Multimedia Exposure Assessment Model
NMPM	New Mexico Prime Meridian
SCS	Soil Conservation Service
SWMR	Solid Waste Management Regulations
USDA	United Stated Department of Agriculture
WES	Waterways Experiment Station
WSMR	White Sands Missile Range

1.0 INTRODUCTION

1.1 Purpose and Scope

The purpose of this study is to present a demonstration for a Groundwater Monitoring Suspension Request (GWMSR) for the White Sands Missile Range - Main Post Landfill (MPL). The Solid Waste Management Regulations (SWMR-4, Section 801.C) allow for a Groundwater Monitoring Suspension Request (GWMSR) for solid waste facilities where it can be demonstrated that there is no potential for migration of hazardous constituents from the landfill to the uppermost aquifer during the active life of the landfill and the post-closure care period. The findings of the study will be presented to the Solid Waste Bureau of the New Mexico Environment Department. In order to determine the potential for groundwater contamination the following technical approach was followed:

- Developed a conceptual site model of the geology and hydrology based on information obtained from borings and wells located at, and in the vicinity of, the MPL.

- Completed HELP Model simulations to determine the potential magnitude of leachate generated from the MPL.

- Using the results obtained from the previous task, modeled the fate and transport of leachate to groundwater, which is approximately 200 feet deep, using the MULTIMED program.

1.2 Location and Description

The Main Post Landfill (MPL) is located approximately 3 miles east of the WSMR Main Post area (Figure 1-1) in portions of Section 21, 22, 27 and 28, T22S, R5E NMPM and occupies an area of approximately 25 acres. The MPL accepts non hazardous waste generated from all of the 850 residential units as well as from all facilities located at the Main Post area. This includes residential, yard and commercial waste.

The MPL consists of three sections (Figure 1-2) on the basis of period of usage and material disposed:

- Original Landfill - The original landfill area is at the center of MPL which opened in 1983. This area measures approximately 630 x 700 feet and is surrounded by an 8-foot high chain-link fence. Wastes disposed in the original landfill area consists of residential, office and other trash. Five filled and covered cells with approximate dimensions of 100 x 400 x 25 feet deep reportedly exist within the original landfill area.

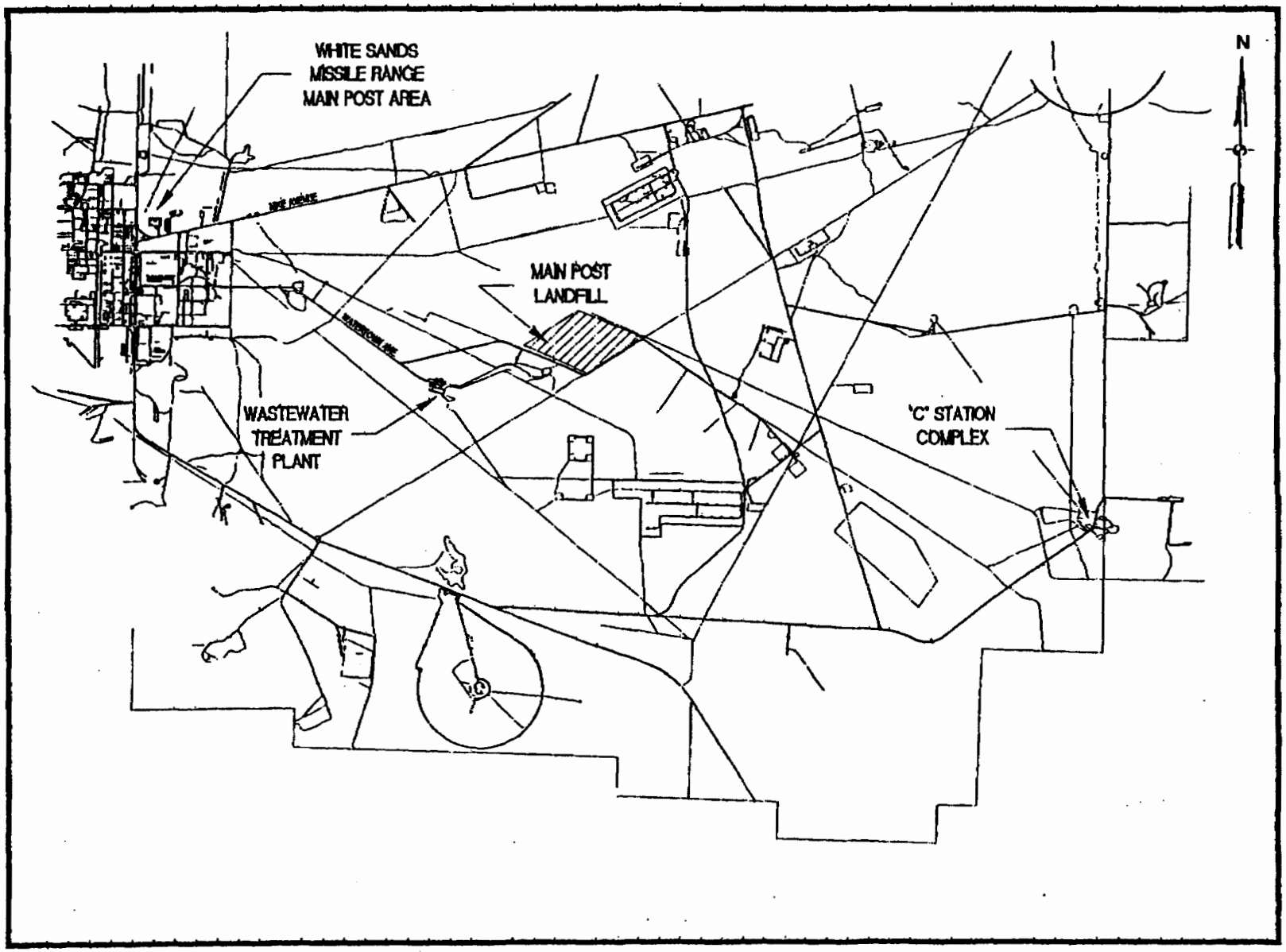


Figure 1-2 Site Plan of the Main Post Landfill

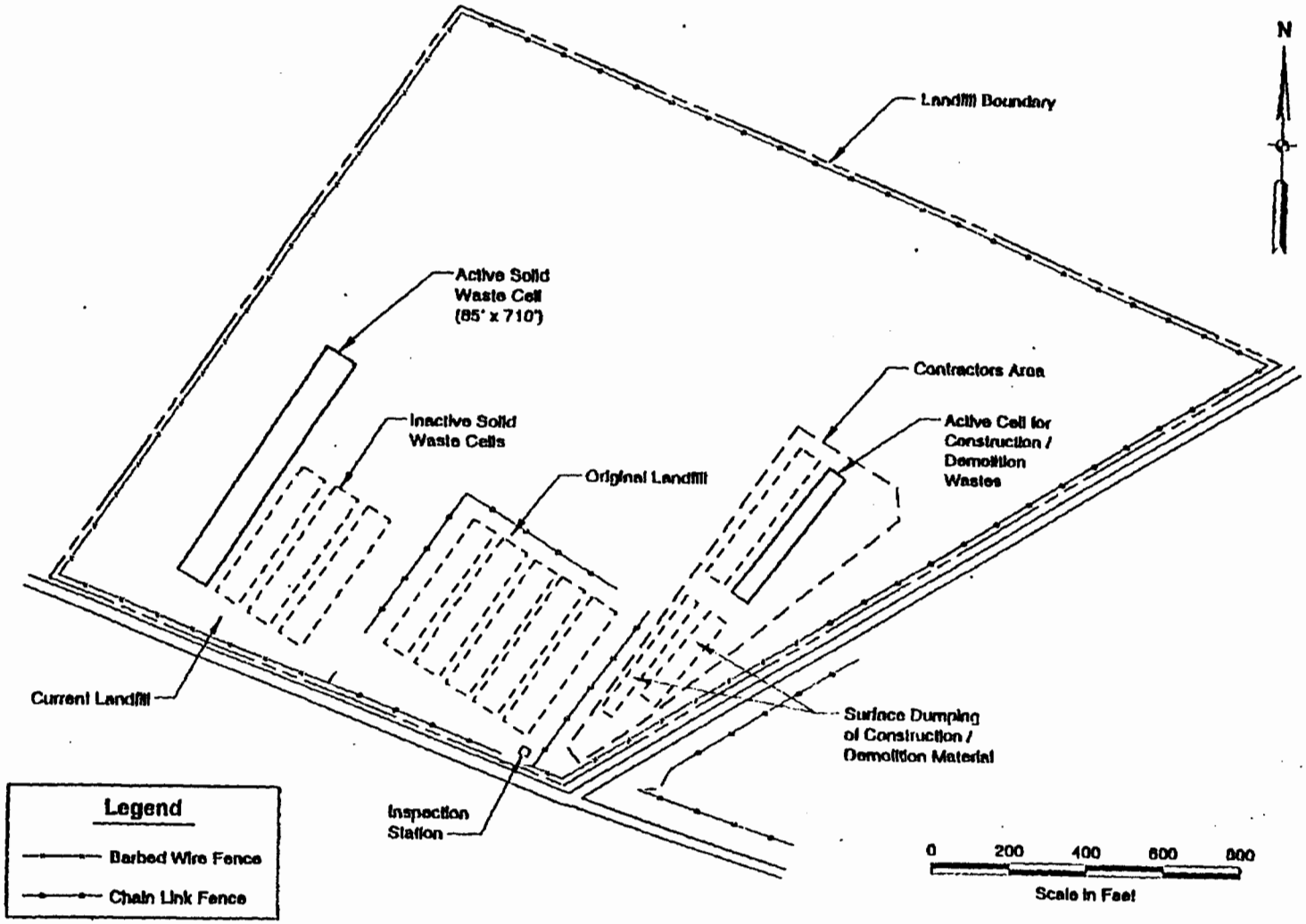


Figure 1-2 Site Plan of the Main Post Landfill

- Contractors Area - The contractors area is located east of the original landfill. This triangular parcel occupies about five acres and is used by WSMR contractors for the disposal of construction and demolition wastes. The older inactive construction landfill cells are located in the southern portion of this area. Two inactive, filled and covered cells are in the southern portion of the contractor's area and two cells, one active and one inactive, exist in the northern portion.

- Present landfill - The present landfill area, located immediately west of the original landfill, may eventually occupy an area of similar dimensions as the original landfill. A 4-foot high barbed wire fence separates the present landfill from the road to the south. An 8-foot chain line fence runs north-south between the original and present landfill areas. Wastes disposed in this area are similar to those disposed in the original landfill area and include residential, office and other municipal trash. Three inactive, filled and covered cells reportedly exist in the present landfill area. One active cell which measures approximately 85 x 710 x 35 feet deep is currently in operation.

2.0 COMPUTER MODELS

2.1 Introduction

Two computer programs were used to predict the potential for contamination of groundwater from leakage from the MPL, the Hydrologic Evaluation of Landfill Performance (HELP) Model and the Multimedia Exposure Assessment (MULTIMED) Model. The HELP Model is used to predict the volume of leachate that would be generated from a landfill. The MULTIMED Model is used to predict the fate and transport of contaminates through the unsaturated zone and in the groundwater aquifer. A discussion on each computer program is provided in the following paragraphs.

2.2 Hydrologic Evaluation of Landfill Performance (HELP) Description

The Hydrologic Evaluation of Landfill Performance (HELP) computer program is a quasi-two-dimensional hydrologic model of water movement across, into, through and out of landfills. The program was developed to conduct water balance analyses of landfills, cover systems and solid waste disposal and containment facilities. The HELP program was developed by the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, for the U.S. Environmental Protection Agency (EPA).

The input parameters for the program are average long term weather data, soil properties, and landfill design data. The program then uses solution techniques that account for the effects of surface storage, snowmelt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, leachate recirculation, unsaturated vertical

drainage, and leakage through soil, geomembrane or composite liners. The model then estimates the amounts of runoff, evapotranspiration, drainage, leachate collection and liner leakage.

2.3 Multimedia Exposure Assessment Model (MULTIMED) Description

The Multimedia Exposure Assessment Model simulates the transport and transformation of contaminates released from a waste disposal facility into the multimedia environment. MULTIMED utilizes analytical and semi-analytical solution techniques to solve the mathematical equations describing flow and transport.

The input parameters (SI units) for the program are unsaturated zone, saturated zone, aquifer, and contaminant characteristics. Some of the characteristics include: porosity, hydraulic conductivity, moisture content, bulk density, thickness, gradient, infiltration rate, etc..

3.0 SITE GEOLOGY AND HYDROLOGY

The MPL, located approximately 3 miles east/southeast of the Main Post, is situated on the perimeter of an alluvial fan, which in part, makes up the bolson fill deposits of the Tularosa Basin. The Tularosa Basin formed as a result of faulting which raised adjacent mountain ranges relative to the basin floor. Cenozoic sediments eroded from the Organ and San Andreas Mountains, accumulated in the basin forming several hundred meters of bolson-fill deposits comprised of gypsiferous sands, silts and clays. Alluvial fans extend from the flanks of the mountains into the basin.

Tierra Engineering (1993) drilled fifteen soil borings around the perimeter of the MPL. Two of the borings were drilled to a maximum depth of 141.5 feet below ground surface. Information from the soil borings indicate the geology in the vicinity of the MPL is characterized as interbedded sands and silty sands with caliche. Silty and sandy clays were noted from depths of 60-65 feet along the southwestern border of the landfill. No indication of soil moisture or groundwater saturation was noted on the boring logs.

The USDA Soil Conservation Service (SCS) Soil Survey of White Sands Missile Range, New Mexico (1976) classifies most of the surficial soils in the vicinity of the MPL as shallow, well-drained sandy to slightly clayey loam of the Dune land Doña Ana complex. The soils of this association consist of blowouts and wind-shifted active sand dune deposits. In a representative profile, the surface layer is light-brown sandy loam about 4 inches thick, and the subsoil is brown and light-brown clay loam about 20 inches thick. The substratum consists of pink, limey loam to light-brown clay loam. The soil is moderately permeable and slightly to strongly calcareous. This association extends to a depth of approximately 60 inches below land surface.

The WSMR Main Post derives its water supply from an aquifer in the upper bolson fill deposits. This aquifer contains water derived from mountain water sheds forming a wedge shaped belt of

potable water over 30 miles long. Good quality groundwater occurs near recharge areas, but becomes progressively more mineralized downgradient toward the interior of the Tularosa Basin. This is attributed to the slow migration rate of groundwater from recharge to discharge areas and the presence of readily soluble minerals in the bolson sediments.

The closest monitoring well, T-29, located slightly up and side gradient of the MPL, was drilled in 1982 to monitor water quality in the vicinity of the sewage treatment plant outfall channel. The lithologic log recorded from drill cuttings indicate alternating horizons of sands and gravels to a depth of 80 feet, at which a twenty-foot thickness of sandy clay was noted. A coarse-grained sand was recorded from 100-120 feet underlain by sandy clays down to 260 feet below ground surface. The well was completed at a depth of 255 feet, screened from 245 to 250 feet, and slotted intervals from 210-245 feet and 250-255 feet below ground surface. The measured depth to groundwater in August of 1995 was 202.5 feet. Depth to water measurements in other monitoring wells in the vicinity of the MPL indicated water levels of 208.9 feet (Well No. B-2) and 209.9 feet (Well No. T-35) below ground surface (Meyers, 1995).

Groundwater beneath the landfill is delineated into freshwater and saline water. As stated previously, the depth to groundwater in the area of the MPL is approximately 200 feet. The thickness of freshwater at the MPL is between 600 and 800 feet thick. The thickness of the saline portion of the aquifer is in excess of 2,000 feet. The general groundwater flow direction in the vicinity of the MPL is to the southeast away from the water supply wells for the Main Post. The calculated horizontal hydraulic conductivity of the freshwater portion of the aquifer in the Main Post area is 6 feet per day (700 m/yr) (Risser, 1988).

Water quality in the freshwater portion of the aquifer in the region of the MPL is generally of good quality. Laboratory analysis of a sample collected from T-29 indicates that the total dissolved solids concentration is 440 mg/l (USGS, 1989).

4.0 WEATHER DATA

The weather data required for the HELP Model is classified into four groups: evapotranspiration, precipitation, temperature, and solar radiation. The user may enter weather data using several options; data provided for selected U.S. cities that the user may use as default data, or the user may manually input data more characteristic of the landfill site. The White Sands Missile Range Forecast Section collects weather information for WSMR. This group published the Climate Calendar, May 1994 (Eschrich), which is a compilation of historical weather data. The report presents data collected from three weather monitoring stations at WSMR. From 1950 to 1978, weather data was collected at "A-Station" at Post Headquarters. From 1978 to 1979 weather data was collected at the "Golfball Site", located approximately 1.5 miles east of the MPL. From 1979 to present weather data is collected at "C-Station", located approximately 3 miles east of the MPL.

Average temperature, precipitation, relative humidity, and wind speed weather data for the period 1980-1993, compiled by the Forecast Section, were used in the HELP model. Solar radiation was stochastically generated by the model based on the precipitation data and latitude of the MPL.

The data input into the model included:

- mean monthly temperature
- mean monthly precipitation
- average wind speed
- quarterly average relative humidity
- latitude

5.0 SOIL DATA

5.1 HELP Model Data

The soil data required by the HELP Model includes the number of layers, layer types, properties of the layers, and initial moisture contents for each layer. For the purposes of modeling, the MPL has been divided into three layers; a 6-inch vegetative layer, 60-inches of cover material, and 300-inches of municipal solid waste. The vegetative layer and cover material was assigned a HELP Model default soil/material texture classification # 5 based on the descriptions of soil samples in the Preliminary Site Assessment (Tierra Engineering, 1990) and the surface soil types. The municipal solid waste layer was assigned a HELP Model default soil/material texture classification # 18 based on the observed compaction techniques used at the MPL. The HELP Model default soil, waste, and geosynthetic characteristics list is provided as Appendix A. The initial moisture contents for each layer was assigned, which are based on typical values for soils and municipal solid waste in semi-arid climates. The following table represents the default and assigned values for each of the layer:

Table 4-1 Soil/Material Properties

	Total Porosity (vol/vol)	Field Capacity (vol/vol)	Wilting Point (vol/vol)	Saturated Hydraulic Conductivity (cm/sec)	Initial Soil Water Content (vol/vol)
Vegetative Layer	0.4570	0.1310	0.0580	1.0×10^{-3}	0.1310
Cover Material	0.4570	0.1310	0.0580	1.0×10^{-3}	0.1000
Municipal Solid Waste	0.6710	0.2920	0.0770	1×10^{-3}	0.1000

The SCS runoff curve number assigned to the vegetative layer was 80, a high value which represents little to no vegetation. This was determined from the values suggested in the Peak Rates of Discharge from Small Discharge (SCS, 1985).

5.2 MULTIMED Model Data

The data required by the MULTIMED Model for the unsaturated and saturated zones includes the number of layers, layer types, properties of the layers, and initial moisture contents for each layer. For the purposes of modeling, the unsaturated zone below the MPL was assumed a single layer, 175 feet (53 meters) of sandy loam. This is a conservative assumption based on the descriptions of the soil samples collected during the Preliminary Site Assessment (Tierra Engineering, 1993). Layers of finer grained material, clays, that exist below the MPL were not incorporated into the model which results in a more conservative, "worst case", scenario. Parameters used for the soil were suggested values published in the MULTIMED Application Manual (1990).

The saturated zone or aquifer parameters were assigned similar values as the unsaturated zone with the exception of the hydraulic conductivity which is discussed in Section 2.0.

6.0 DESIGN DATA

Design data for the MPL is limited. There is no base liner, lateral drainage layer, vegetation, or final grading to provide positive drainage. The area of the MPL allowing runoff was estimated to be 50 percent based on a site visit. Grading of the landfill surface to promote positive drainage will increase the runoff fraction predicted by the model thus decreasing the potential for percolation of leachate.

7.0 HELP MODEL RESULTS

HELP Model simulations were performed using the default and assigned input parameters to estimate the potential for leachate generation. The model was run for a 30-year duration to simulate the post-closure period specified in the New Mexico Solid Waste Management Regulations.

The HELP Model generated output data for the amount of runoff, evapotranspiration, percolation/leakage through the municipal solid waste, and change in water storage for the layers. Evapotranspiration is the most significant factor in removal of moisture, amounting to 11.16 inches of the 12.13 inches of rainfall occurring at the site. Runoff was minimal due to high evapotranspiration rates. The HELP Model calculated peak daily value for leakage from the MPL was 2.69 cubic feet (0.0076 cubic meters). This volume of predicted leachate is generated over an area of 25 acres. The HELP Model results are provided in Appendix B.

8.0 MULTIMED MODEL RESULTS

MULTIMED Model simulations were performed using unsaturated zone and aquifer characteristics and data generated from the HELP Model. The model was simulated for a period of 30 years, the anticipated post-closure care period. The infiltration rate was assumed to be the peak daily value calculated by the HELP Model and assumed to be concentrated over an area of one square meter. This rate was then increased by a factor of 10 which resulted in an infiltration rate of 0.0762 meters per year which is a conservative, "worst case" scenario. The point of compliance was modeled at a distance of one meter from the point of the infiltration and leachate dispersion set to zero. Conservative chemical characteristics of the leakage were assumed; that is, the source was assumed not to decay, degrade, or be chemically adsorbed. An example would be a conservative ion such as chloride. The source concentration was input as 1 mg/l so that the results are expressed as a mass fraction of whatever source concentration is being considered. Another conservative factor was that the freshwater aquifer thickness was reduced from the estimated 100 meters to 10 meters in thickness, reducing the potential for mixing. This might not be a factor since the point of compliance was assigned an extremely short distance of 1 meter. A Conceptual Site Model identifying the layers and input parameters is provided as Appendix C.

The MULTIMED model results showed that the modeled contaminant was not intercepted in the point of compliance during the 30 year simulation. The results of the MULTIMED Model are provided in Appendix D.

9.0 CONCLUSIONS

Based on the HELP Model, there is minimal potential for the generation of leachate from the MPL. The significance of the limited generation of leachate is that the potential of contamination of groundwater as a result of the MPL is highly unlikely. Results of the MULTIMED Model demonstrate that with the even with the greatly exaggerated infiltration rates and extensive depth to groundwater, degradation of groundwater will not occur. This analysis is based on conservative or "worse case" situations that were modeled to provide an added factor of safety.

Based on these findings, a demonstration has been made that there is no potential for migration of hazardous constituents form the MPL to the uppermost aquifer during the post-closure care period of 30 years.

10.0 CERTIFICATION OF SUSPENSION REQUEST DEMONSTRATION

I hereby certify that; to the best of my professional judgement, the information provided in this request for suspension of groundwater monitoring requirements for the **White Sands Missile Range - Main Post Landfill** is accurate and complete and the request includes a demonstration that there is no potential for migration of hazardous constituents from the landfill to the uppermost aquifer during the active life of the landfill and the post-closure care period and the demonstration is based upon:

1. site-specific field measurements, sampling, and analysis of physical, chemical, and biological processes affecting contaminant fate and transport; and,

2. contaminant fate and transport predictions that maximize contaminant migration and consider impacts on public health, welfare and environment.

22 December 1995
Date

Signature of qualified* groundwater scientist

Marvin Magee, P.E.
Printed name

*Attached resume which demonstrates conformity with §105.GG

MARVIN MAGEE, P.E.
Task Manager

EDUCATION:

M.S. Civil Engineering, New Mexico State University. Completed course work.
B.S. Geological Engineering, New Mexico State University, 1987

EXPERIENCE:

Since joining MEVATEC Corporation Mr. Magee's responsibilities have included project management and design for numerous environmental projects including solid waste, liquid waste, environmental assessments, environmental site investigations, and leaking underground storage tank investigations and remediations.

Prior to joining MEVATEC he consulted numerous clients on solid waste management and environmental site investigations, including the development of several large regional solid waste landfills. Mr. Magee was also responsible for overseeing the operations of several solid waste facilities in southern New Mexico. Management of these projects included permitting design and compliance with state and federal regulatory agencies.

Prior to working in the environmental field Mr. Magee worked on numerous geotechnical engineering projects including site investigations, foundation design, pavement design, mining development plans, and geotechnical laboratory testing.

SUMMARY OF PROJECTS:

1993 - Present	**South Central Regional Solid Waste Landfill, Doña Ana County, New Mexico:** The South Central Regional Solid Waste Authority selected MEVATEC to permit and design a municipal solid waste landfill to serve the City of Las Cruces and Doña Ana County. As part of the permitting process, a groundwater monitoring suspension was granted after demonstrations that there was no threat to groundwater using the HELP and MULTIMED model. As Project Manager, Mr. Magee is responsible for preparing the permit documents and for the design of the facility. This multimillion dollar facility is expected to be opened in early 1996.
1993 - Present	**Doña Ana County Liquid Waste Disposal Facility, Doña Ana County, New Mexico:** Mr. Magee designed and prepared the contract documents for the construction of this facility. The facility is designed to receive and treat liquid waste from septic tanks located within Doña Ana County. The cost of construction of the facility is approximately one million dollars and will be open in the fall of 1994.
1993 - Present	**Leaking Underground Storage Tank Investigations and Remediations:** Mr. Magee has served as Project Manager and lead engineer for the investigation and remediation of contaminated underground storage tank sites in southern New Mexico. Extensive contamination of soils and groundwater by hydrocarbons has been determined at several sites that have been investigated. Innovative methodologies of contaminant remediation are being studied to clean up these sites.

MARVIN MAGEE, P.E.
Task Manager

1993 - 1994	**T or C Bell Gas, New Mexico Environment Department, Truth or Consequences, New Mexico:** Mr. Magee was Project Manager for the investigation to determine the extent of contamination from leaking underground storage tanks located on the property. The investigation included advancing boreholes, installing monitor wells, analyzing soil and groundwater samples, and performing pilot remediation studies. The extent of contamination from the site was defined and remediation techniques recommended. The site is located in the downtown commercial district, groundwater is approximately three feet deep and fluctuates during seasons, and there are commercial hot springs in the immediate area. Due to these complex problems, Mr. Magee was required to use innovative techniques to perform the investigation and to evaluate the findings.
1993 - 1994	**Mesquite Liquid Waste Disposal Facility Closure Plans, Doña Ana County, New Mexico:** Mr. Magee was Project Manager for the preparation of closure plans for the facility. Interaction with Doña Ana County, New Mexico Environment Department, and the Bureau of Land Management was required to develop plans agreeable to all agencies.
1993	**Corralitos Landfill Site Suitability Study, Doña Ana County, New Mexico:** Mr. Magee served as Project Manager for the study of the site for a regional solid waste landfill. The site was evaluated for sitting criteria set by the EPA's and the New Mexico Environment Department's Solid Waste Regulations. The "Fatal Flaw" analysis of the site was performed and the site was determined to be ideal for the disposal facility. Mr. Magee is now serving as Project Manager for the permitting and design of the South Central Solid Waste Landfill to be located at the site.
1992 - 1993	**Carlsbad/Eddy County Regional Landfill, City of Las Cruces, New Mexico:** Mr. Magee served as Project Manager for the siting investigation for the selection of the location for this project. The process involved extensive fatal flaw studies and geologic investigations. Numerous siting problems were encountered during the selection process for the facility. A permit was recently issued by the New Mexico Environment Department for the chosen site.
1992 - 1993	**Loving Landfill Closure, Eddy County, New Mexico:** Mr. Magee developed closure plans and implemented the groundwater monitoring system for the site. The complex geology and hydrology of the site due to past karst activities, made modeling of the groundwater difficult.
1990 - Present	**Carlsbad Landfill, Carlsbad, New Mexico:** Mr. Magee developed the closure plans and groundwater monitoring system for this project. In addition, he is responsible for coordination with the City of Carlsbad, New Mexico Environment Department and the Bureau of Land Management.

MARVIN MAGEE, P.E.
Task Manager

CERTIFICATIONS:

Professional Engineer, New Mexico P.E. # 12714
SWANA - Certified Sanitary Landfill Operator
OSHA 40-Hour OSHA Hazardous Waste Operations
OSHA 8-Hour Hazardous Waste Operations, Manager/Supervisor

PROFESSIONAL AFFILIATIONS:

American Society of Civil Engineers
Solid Waste Association of North America
Chi Epsilon

PUBLICATIONS:

Powers, D.W. and Magee, M.R., 1993, Site selection and characterization of the Sand Point Landfill site, Eddy County, New Mexico: New Mexico Geological Society Guidebook, 44th Field Conference, Carlsbad Region, New Mexico and Texas, p. 353-357.

Gao, F., Magee, M.R., and Stokes, L.R., 1991, Municipal Solid Waste Landfills in Southern New Mexico: 46th Annual Purdue University Industrial Waste Conference, West Lafayette, Indiana

APPENDIX - A

HELP Model Default Soil, Waste, and Geosynthetic Characteristics

DEFAULT SOIL, WASTE, AND GEOSYNTHETIC CHARACTERISTICS

Classification			Total Porosity	Field Capacity	Wilting Point	Saturated Hydraulic Conductivity
HELP	USDA	USCS	vol/vol	vol/vol	vol/vol	cm/sec
1	CoS	SP	0.417	0.045	0.018	1.0×10^{-2}
2	S	SW	0.437	0.062	0.024	5.8×10^{-3}
3	FS	SW	0.457	0.083	0.033	3.1×10^{-3}
4	LS	SM	0.437	0.105	0.047	1.7×10^{-3}
5	LFS	SM	0.457	0.131	0.058	1.0×10^{-3}
6	SL	SM	0.453	0.190	0.085	7.2×10^{-4}
7	FSL	SM	0.473	0.222	0.104	5.2×10^{-4}
8	L	ML	0.463	0.232	0.116	3.7×10^{-4}
9	SiL	ML	0.501	0.284	0.135	1.9×10^{-4}
10	SCL	SC	0.398	0.244	0.136	1.2×10^{-4}
11	CL	CL	0.464	0.310	0.187	6.4×10^{-5}
12	SiCL	CL	0.471	0.342	0.210	4.2×10^{-5}
13	SC	SC	0.430	0.321	0.221	3.3×10^{-5}
14	SiC	CH	0.479	0.371	0.251	2.5×10^{-5}
15	C	CH	0.475	0.378	0.265	1.7×10^{-5}
16	Barrier Soil		0.427	0.418	0.367	1.0×10^{-7}
17	Bentonite Mat (0.6 cm)		0.750	0.747	0.400	3.0×10^{-9}
18	Municipal Waste (900 lb/yd^3 or 312 kg/m^3)		0.671	0.292	0.077	1.0×10^{-3}
19	Municipal Waste (channeling and dead zones)		0.168	0.073	0.019	1.0×10^{-3}
20	Drainage Net (0.5 cm)		0.850	0.010	0.005	1.0×10^{-1}
21	Gravel		0.397	0.032	0.013	3.0×10^{-1}
22	L*	ML	0.419	0.307	0.180	1.9×10^{-5}
23	SiL*	ML	0.461	0.360	0.203	9.0×10^{-6}
24	SCL*	SC	0.365	0.305	0.202	2.7×10^{-6}
25	CL*	CL	0.437	0.373	0.266	3.6×10^{-6}
26	SiCL*	CL	0.445	0.393	0.277	1.9×10^{-6}
27	SC*	SC	0.400	0.366	0.288	7.8×10^{-7}
28	SiC*	CH	0.452	0.411	0.311	1.2×10^{-6}
29	C*	CH	0.451	0.419	0.332	6.8×10^{-7}
30	Coal-Burning Electric Plant Fly Ash*		0.541	0.187	0.047	5.0×10^{-5}
31	Coal-Burning Electric Plant Bottom Ash*		0.578	0.076	0.025	4.1×10^{-3}
32	Municipal Incinerator Fly Ash*		0.450	0.116	0.049	1.0×10^{-2}
33	Fine Copper Slag*		0.375	0.055	0.020	4.1×10^{-2}
34	Drainage Net (0.6 cm)		0.850	0.010	0.005	3.3×10^{-1}

* Moderately Compacted

(Continued)

(continued). DEFAULT SOIL, WASTE, AND GEOSYNTHETIC CHARACTERISTICS

Classification		Total Porosity	Field Capacity	Wilting Point	Saturated Hydraulic Conductivity
HELP	Geomembrane Material	vol/vol	vol/vol	vol/vol	cm/sec
35	High Density Polyethylene (HDPE)				2.0×10^{-13}
36	Low Density Polyethylene (LDPE)				4.0×10^{-13}
37	Polyvinyl Chloride (PVC)				2.0×10^{-11}
38	Butyl Rubber				1.0×10^{-12}
39	Chlorinated Polyethylene (CPE)				4.0×10^{-12}
40	Hypalon or Chlorosulfonated Polyethylene (CSPE)				3.0×10^{-12}
41	Ethylene-Propylene Diene Monomer (EPDM)				2.0×10^{-12}
42	Neoprene				3.0×10^{-12}

(concluded)

APPENDIX - B

HELP Model Results

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                 HELP MODEL VERSION 3.04a  (10 JULY 1995)                 **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP3\DATA4.D4
TEMPERATURE DATA FILE:        C:\HELP3\DATA7.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\DATA13.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\DATA11.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\DATA50.D10
OUTPUT DATA FILE:             C:\HELP3\OUTDAT50.OUT


TIME:  16: 6     DATE:  12/18/1995


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

     TITLE:  White Sands Missile Range - Main Post Landfill

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


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


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   5
          THICKNESS                    =      6.00   INCHES
          POROSITY                     =      0.4570 VOL/VOL
          FIELD CAPACITY               =      0.1310 VOL/VOL
          WILTING POINT                =      0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.1310 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  2.01
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

THICKNESS	=	60.00	INCHES
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.1310	VOL/VOL
WILTING POINT	=	0.0580	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	300.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	80.00	
FRACTION OF AREA ALLOWING RUNOFF	=	50.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	25.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.586	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	10.968	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.392	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	36.786	INCHES
TOTAL INITIAL WATER	=	36.786	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
EL PASO TEXAS

STATION LATITUDE	=	32.35	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.20	

START OF GROWING SEASON (JULIAN DATE)	=	66
END OF GROWING SEASON (JULIAN DATE)	=	315
EVAPORATIVE ZONE DEPTH	=	24.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	4.95 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	40.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	31.30 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	50.70 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	50.70 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.75	0.62	0.31	0.46	0.64	0.85
1.50	2.92	1.80	1.02	0.58	1.46

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
42.00	47.40	53.70	62.10	70.00	78.60
80.70	78.10	72.00	61.60	49.60	42.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.35 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.89	0.59	0.24	0.49	0.71	0.78
	1.27	2.37	1.59	0.97	0.70	1.51
STD. DEVIATIONS	0.83	0.66	0.23	0.61	0.75	0.75
	1.03	1.32	1.27	0.87	0.87	1.15
RUNOFF						

TOTALS	0.005	0.000	0.000	0.002	0.005	0.000
	0.000	0.005	0.012	0.001	0.001	0.003
STD. DEVIATIONS	0.024	0.000	0.000	0.014	0.024	0.000
	0.001	0.012	0.040	0.004	0.003	0.016

EVAPOTRANSPIRATION

TOTALS	0.921	0.566	0.438	0.557	1.189	0.729
	1.248	1.718	1.377	1.166	0.538	0.720
STD. DEVIATIONS	0.485	0.395	0.355	0.391	0.932	0.627
	0.878	0.818	0.729	0.723	0.447	0.399

PERCOLATION/LEAKAGE THROUGH LAYER 3

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

****

****

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

	INCHES		CU. FEET	PERCENT
PRECIPITATION	12.13	(2.471)	1100646.2	100.00
RUNOFF	0.035	(0.0535)	3136.11	0.285
EVAPOTRANSPIRATION	11.165	(2.1736)	1013245.06	92.059
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00001	(0.00002)	0.784	0.00007
CHANGE IN WATER STORAGE	0.928	(1.7405)	84257.85	7.655

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	2.78	252285.000
RUNOFF	0.133	12100.1748
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000030	2.68690
SNOW WATER	2.32	210729.5160

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.2920

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0580

****

****

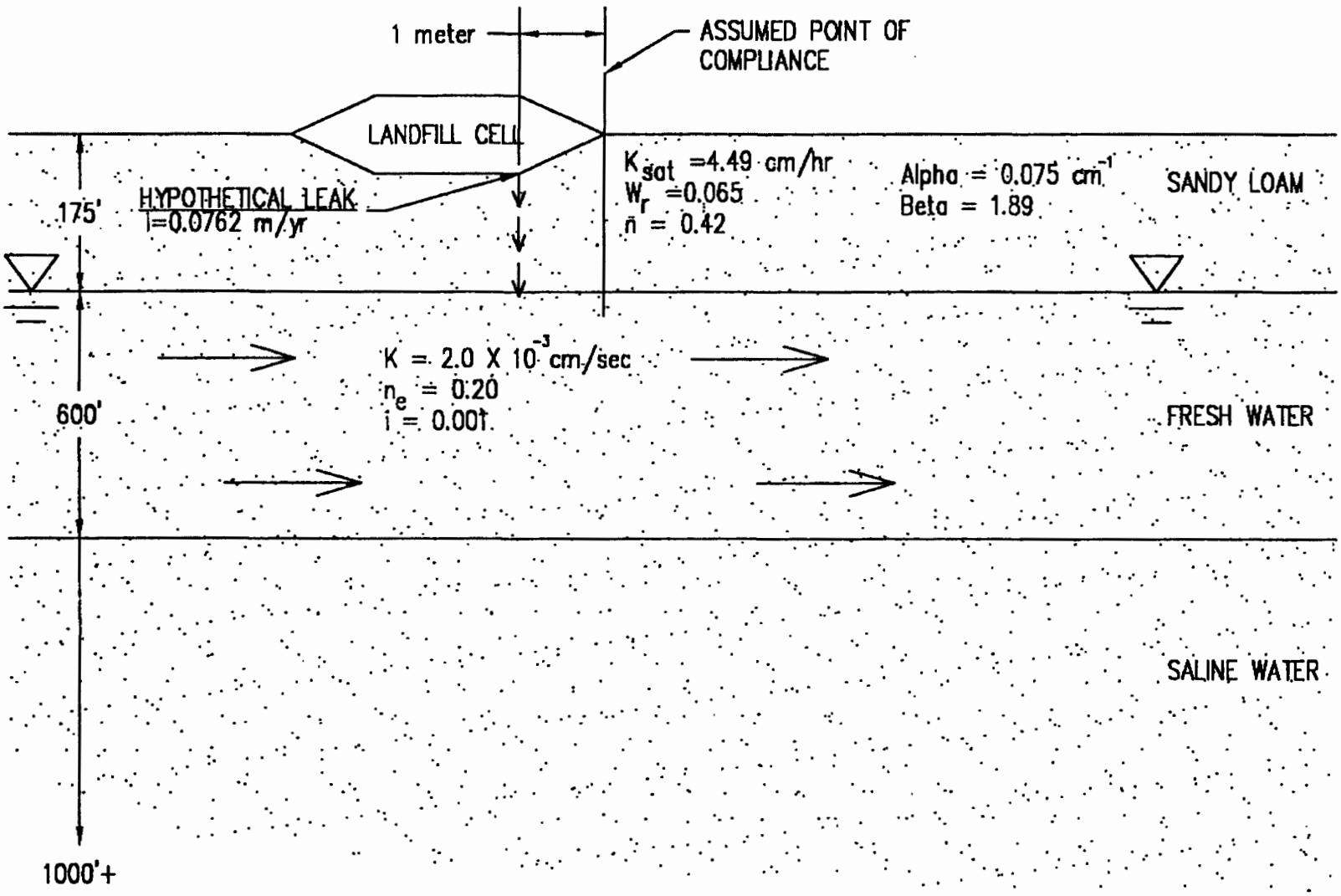
FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	0.4913	0.0819
2	9.8904	0.1648
3	54.2582	0.1809
SNOW WATER	0.000	

****
****

APPENDIX - C

Conceptual Site Model



MEVATEC CORPORATION

CONCEPTUAL SITE MODEL

DRAWING NOT TO SCALE

APPENDIX C

APPENDIX - D

MULTIMED Model Results

1

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.01, June 1991)

1

Run options
--- -------

WSMR - Main Post Landfill

Base Run
Chemical simulated is DEFAULT CHEMICAL

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration input by user
Run was transient
Reject runs if Y coordinate outside plume
Do not reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
UNSATURATED ZONE FLOW MODEL PARAMETERS
(input parameter description and value)

NP	- Total number of nodal points	240
NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1
NVFLAYR	- Number of layers in flow model	10

OPTIONS CHOSEN
--- ---
Van Genuchten functional coefficients
User defined coordinate system
1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	5.30	1
2	5.30	1
3	5.30	1
4	5.30	1
5	5.30	1
6	5.30	1
7	5.30	1
8	5.30	1
9	5.30	1
10	5.30	1

DATA FOR MATERIAL 1

VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	4.42	-999.	0.100E-10	0.100E+05
Unsaturated zone porosity	--	CONSTANT	0.430	-999.	0.100E-08	0.990
Air entry pressure head	m	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Depth of the unsaturated zone	m	CONSTANT	53.0	-999.	0.100E-08	-999.

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Residual water content	--	CONSTANT	0.650E-01	-999.	0.100E-08	1.00
Brook and Corey exponent,EN	--	CONSTANT	0.000E+00	-999.	0.000E+00	10.0
ALFA coefficient	1/cm	CONSTANT	0.750E-01	-999.	0.000E+00	1.00
Van Genuchten exponent, ENN	--	CONSTANT	1.89	-999.	1.00	5.00

1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used		1
NTSTPS	- Number of time values concentration calc		40
DUMMY	- Not presently used		1
ISOL	- Type of scheme used in unsaturated zone		1
N	- Stehfest terms or number of increments		18
NTEL	- Points in Lagrangian interpolation		3
NGPTS	- Number of Gauss points		104
NIT	- Convolution integral segments		2
IBOUND	- Type of boundary condition		2
ITSGEN	- Time values generated or input		1.
TMAX	- Max simulation time	--	0.0
WTFUN	- Weighting factor	--	1.2

OPTIONS CHOSEN
------- ------

Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations

1

DATA FOR LAYER 1
---- --- -----

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Thickness of layer	m	CONSTANT	53.0	-999.	0.100E-08	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	0.100E-02	0.100E+05
Percent organic matter	--	CONSTANT	0.000E+00	-999.	0.000E+00	100.
Bulk density of soil for layer	g/cc	CONSTANT	1.49	-999.	0.100E-01	5.00
Biological decay coefficient	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.

1

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Solid phase decay coefficient	1/yr	DERIVED	-999.	-999.	0.000E+00	0.100E+11
Dissolved phase decay coefficient	1/yr	DERIVED	-999.	-999.	0.000E+00	0.100E+11
Overall chemical decay coefficient	1/yr	DERIVED	-999.	-999.	0.000E+00	0.100E+11
Acid catalyzed hydrolysis rate	1/M-yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Base catalyzed hydrolysis rate	1/M-yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Reference temperature	C	CONSTANT	25.0	-999.	0.000E+00	100.
Normalized distribution coefficient	ml/g	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Distribution coefficient	--	CONSTANT	0.000E+00	-999.	0.000E+00	0.100E+11
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Air diffusion coefficient	cm2/s	CONSTANT	0.000E+00	-999.	0.000E+00	10.0
Reference temperature for air diffusion	C	CONSTANT	25.0	-999.	0.000E+00	100.
Molecular weight	g/M	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Mole fraction of solute	--	CONSTANT	0.000E+00	-999.	0.100E-08	1.00

Vapor pressure of solute	mm Hg	CONSTANT	0.000E+00	-999.	0.000E+00	100.
Henry's law constant	atm-m^3/M	CONSTANT	0.000E+00	-999.	0.100E-09	1.00
Overall 1st order decay sat. zone	1/yr	DERIVED	0.000E+00	0.000E+00	0.000E+00	1.00
Not currently used		CONSTANT	-999.	-999.	0.000E+00	1.00
Not currently used		CONSTANT	-999.	-999.	0.000E+00	1.00

1

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Infiltration rate	m/yr	CONSTANT	0.762E-01	-999.	0.100E-09	0.100E+11
Area of waste disposal unit	m^2	CONSTANT	1.00	-999.	0.100E-01	-999.
Duration of pulse	yr	CONSTANT	30.0	-999.	0.100E-08	-999.
Spread of contaminant source	m	DERIVED	2.00	-999.	0.100E-08	0.100E+11
Recharge rate	m/yr	CONSTANT	0.000E+00	-999.	0.000E+00	0.100E+11
Source decay constant	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Initial concentration at landfill	mg/l	CONSTANT	1.00	-999.	0.000E+00	-999.
Length scale of facility	m	DERIVED	1.00	-999.	0.100E-08	0.100E+11
Width scale of facility	m	DERIVED	0.150	-999.	0.100E-08	0.100E+11
Near field dilution		DERIVED	1.00	0.000E+00	0.000E+00	1.00

1

AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Particle diameter	cm	CONSTANT	0.200	-999.	0.100E-08	100.
Aquifer porosity	--	CONSTANT	0.200	-999.	0.100E-08	0.990
Bulk density	g/cc	CONSTANT	1.49	-999.	0.100E-01	5.00
Aquifer thickness	m	CONSTANT	10.0	-999.	0.100E-08	0.100E+06
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	0.100E-08	0.100E+06
Conductivity (hydraulic)	m/yr	CONSTANT	700.	-999.	0.100E-06	0.100E+09
Gradient (hydraulic)		CONSTANT	0.100E-02	-999.	0.100E-07	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	0.100E-09	0.100E+09
Retardation coefficient	--	DERIVED	1.00	-999.	1.00	0.100E+09
Longitudinal dispersivity	m	FUNCTION OF X	1.00	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	0.100E-02	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	0.100E-02	-999.	-999.	-999.
Temperature of aquifer	C	CONSTANT	22.0	-999.	0.000E+00	100.
pH	--	CONSTANT	7.80	-999.	0.300	14.0

Organic carbon content (fraction)		CONSTANT	0.100E-05	-999.	0.100E-05	1.00
Well distance from site	m	CONSTANT	1.00	-999.	1.00	-999.
Angle off center	degree	CONSTANT	0.000E+00	-999.	0.000E+00	360.
Well vertical distance	m	CONSTANT	0.000E+00	-999.	0.000E+00	1.00

1

TIME	CONCENTRATION
0.300E+01	0.00000E+00
0.600E+01	0.00000E+00
0.900E+01	0.00000E+00
0.120E+02	0.00000E+00
0.150E+02	0.00000E+00
0.180E+02	0.00000E+00
0.210E+02	0.00000E+00
0.240E+02	0.00000E+00
0.270E+02	0.00000E+00
0.300E+02	0.00000E+00

APPENDIX - F

References

INSTALLATION OF MONITORING WELLS
AT
THE MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

Submitted to:

U.S. Army
White Sands Missile Range
National Range Directorate of Environment and Safety
White Sands Missile Range, New Mexico 88002-5201

Submitted by:

MEVATEC Corporation
Building S-146W
White Sands Missile Range, New Mexico 88002

October 1996

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Installation of Monitoring Wells at the Main Post Landfill, White Sands Missile Range.

5. FUNDING NUMBERS

6. AUTHOR(S)
Dana Downs, Senior Scientist

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(ES)
MEVATEC Corporation
Box 399
WSMR, NM 88002

8. PERFORMING ORGANIZATION REPORT NUMBER
300ii/96/003F

9. SPONSORING/MONITORING AGENCY NAMES(S) AND ADDRESS(ES)
White Sands Missile Range
STEWS- NRES
White Sands Missile Range, New Mexico 88002-5048

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
Technical Inspector
Javier Mendoza (505) 678-2415

12a. DISTRIBUTION AVAILABILITY STATEMENT
On Request, Distribution D

12b. DISTRIBUTION CODE

13. ABSTRACT (MAXIMUM 200 WORDS)
Report summarizes the installation of one upgradient and three downgradient monitoring wells at the Main Post Landfill, White Sands Missile Range. Wells were installed in compliance with the New Mexico Solid Waste Management Regulations.

14. SUBJECT TERMS
Monitoring well, drilling, groundwater

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT
Unclassified

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Unclassified

19. SECURITY CLASSIFICATION OF ABSTRACT
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20. LIMITATION OF ABSTRACT
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3.	LOCATION AND DESCRIPTION OF PROJECT LOCATION	2
4.	MONITORING WELL CONSTRUCTION	5
5.	LITHOLOGIC EVALUATION	6
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10.	REFERENCES	7

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Appendices

A MPL-01 MONITORING WELL INSTALLATION INFORMATION

B MPL-02 MONITORING WELL INSTALLATION INFORMATION

C MPL-03 MONITORING WELL INSTALLATION INFORMATION

D MPL-04 MONITORING WELL INSTALLATION INFORMATION

LIST OF ACRONYMS USED IN THIS REPORT

AML	Assessment Monitoring Level
bgs	Below ground surface
ft.	Feet
ID	Inside diameter
mm	millimeter
MPL	Main Post Landfill
NAVD	North Americal Vertical Datum
NMED	New Mexico Environment Department
NMSWMR	New Mexico Solid Waste Management Regulations
NRES-E	National Range Directorate of Environment and Safety - Environment Services Division
PVC	Polyvinylchloride
REC	Record of Environmental Consideration
RPPBA	Real Property Planning Board Action
TI	Technical Inspector
UTM	Universal Transverse Mercator Coordinate System
WSMR	White Sands Missile Range

INSTALLATION OF MONITORING WELLS
AT
THE MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

1. INTRODUCTION

In partial compliance with the directives of the New Mexico Solid Waste Management Regulations, one upgradient and three downgradient monitoring wells were installed at the Main Post Landfill, in May 1996. The wells were installed to establish and monitor background groundwater quality in the vicinity of the Main Post Landfill. Information obtained from this effort includes detailed lithologic logs of each test hole, borehole geophysical logs, depth of groundwater saturatation and groundwater flow gradient.

2. SCOPE OF WORK

Prior to the commencement of installation activities, a White Sands Missile Range (WSMR) Record of Environmental Consideration (REC) and WSMR Real Property Planning Board Action (RPPBA) Memorandum were prepared and submitted for approval of the proposed monitoring well location. The well locations weres identified and approved by the WSMR National Range Directorate of Environment and Safety - Environmental Services Division (NRES-E) Technical Inspector (TI). Following approval of the RPPBA and REC, a Site-Specific Health and Safety Plan was prepared to address site-specific hazards associated with the work, and distributed to all site personnel. Field activities were performed in accordance with the Statement of Work prepared by the NRES-E TI.

Well installation activities consisted of drilling each test hole to a depth of 240 feet, collecting lithologic samples at 5-ft. depth intervals, and geophysical borehole logging to verify the lithology and zone of groundwater saturation. Following monitoring well installation each well was developed and surveyed for horizontal and vertical location.

Following well development, groundwater from all four wells will be sampled during five events over a 12 month period. The wells will be sampled for selected baseline physical characteristics and chemical constituents in order to establish background groundwater quality in the vicinity of the landfill. The results of the five sampling events will be presented as independent letter reports. A final summary report will be issued summarizing the mean results of each physical and chemical constituent.

3. LOCATION AND DESCRIPTION OF PROJECT AREA

WMSR is situated in the Tularosa Basin of south-central New Mexico in the counties of Doña Ana, Socorro, Lincoln, Otero and Sierra. The WSMR headquarters and all installation support activities are located at the Main Post, located 45 miles north of El Paso, Texas and 27 miles east-northeast of Las Cruces, New Mexico.

The Main Post Landfill (MPL), located approximately 3 miles east of the WSMR Main Post Headquarters (Figure 3-1), occupies approximately 25 acres. The landfill accepts nonhazardous waste generated from all of the 850 residential units, as well as facilities located at the Post Headquarters. This includes residential, yard, and commercial waste. The landfill has been in operation since 1983.

The MPL is divided into three sections based on period of usage and materials disposed (Figure 3-2). These sections consist of the original landfill, the contractor area, and the present sanitary landfill.

- **Original Landfill** - At the center of the MPL is the original landfill, which began accepting waste in 1983. The area is nearly square and measures approximately 630 by 700 feet and is surrounded by an 8-foot high chain link fence. Wastes disposed in the original landfill area consist of residential, office, and other nonhazardous wastes. There are five covered cells, each approximately 100 by 400 by 25 feet deep.

- **Contractor Area** - The contractor area is located east of the original landfill. The parcel is triangular in shape and occupies approximately five acres. The landfill is used by WSMR contractors for the disposal of construction/demolition wastes. There are two inactive covered cells present in the southern portion of the contractor area. Two additional cells, one active and one inactive, are located in the northern portion of the area. Wastes consist primarily of concrete, brick, stone and soil.

- **Present Landfill** - The present landfill is located immediately west of the original landfill. The present landfill occupies similar dimensions as the original landfill. Wastes disposed in this area include residential, office and municipal trash. There are three inactive, filled and covered cells in the present fill area. One active cell which measures 85 by 710 by 35 feet deep, is currently in operation.

The WSMR Main Post obtains water from wells drilled into upper bolson Tertiary/Quaternary unconsolidated alluvial deposits. This aquifer contains water derived from mountain water sheds forming a wedge-shaped belt of potable water over 30 miles long. Good quality groundwater occurs near recharge areas, but becomes progressively more mineralized downgradient toward the interior of the Tularosa Basin. This is attributed to the slow migration rate of groundwater from recharge to discharge areas and the presence of readily soluble minerals in the bolson sediments.

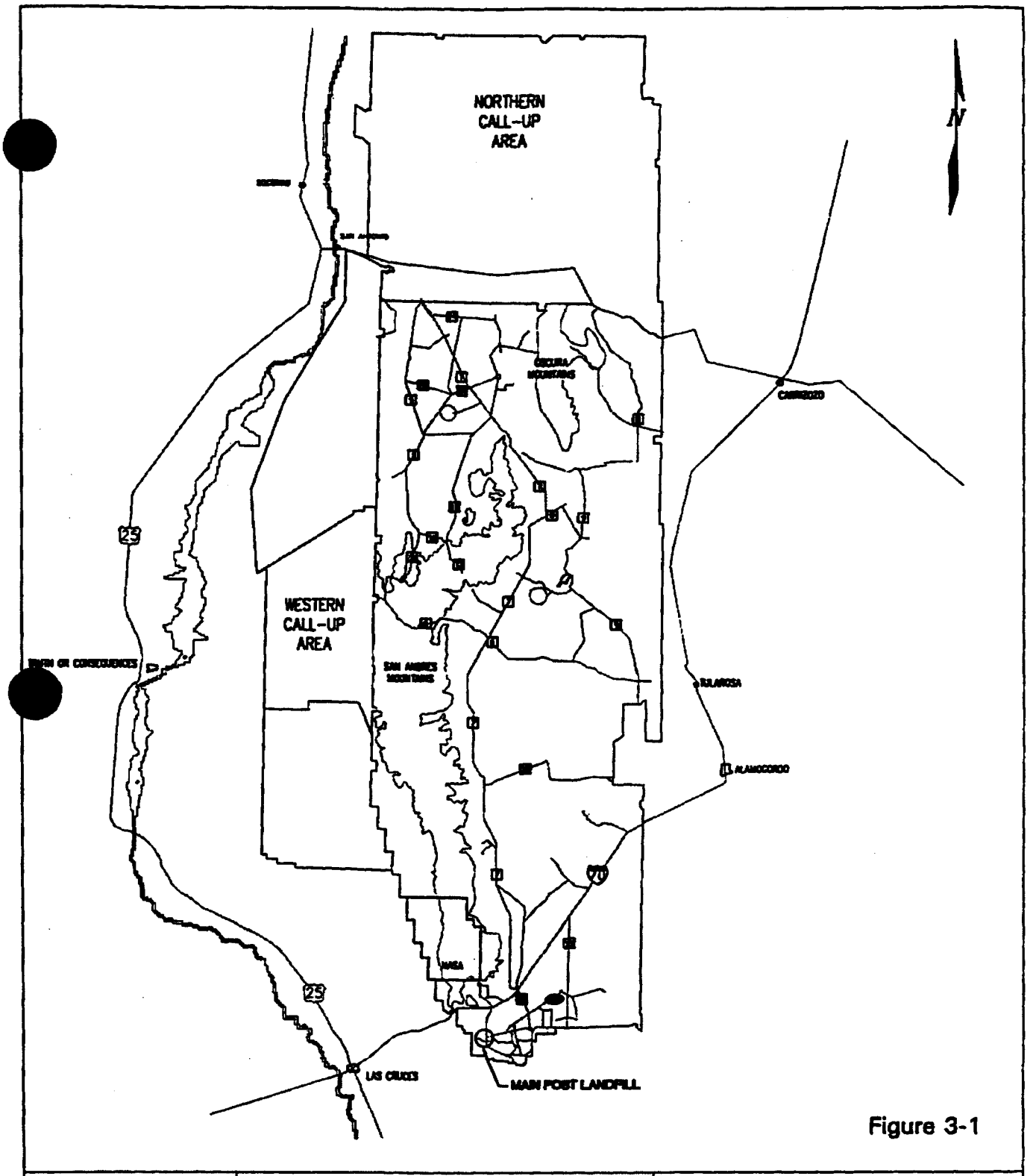


Figure 3-1

DEWATERS CORPORATION	SITE LOCATION MAP	Background Groundwater Monitoring Main Post Landfill White Sands Missile Range

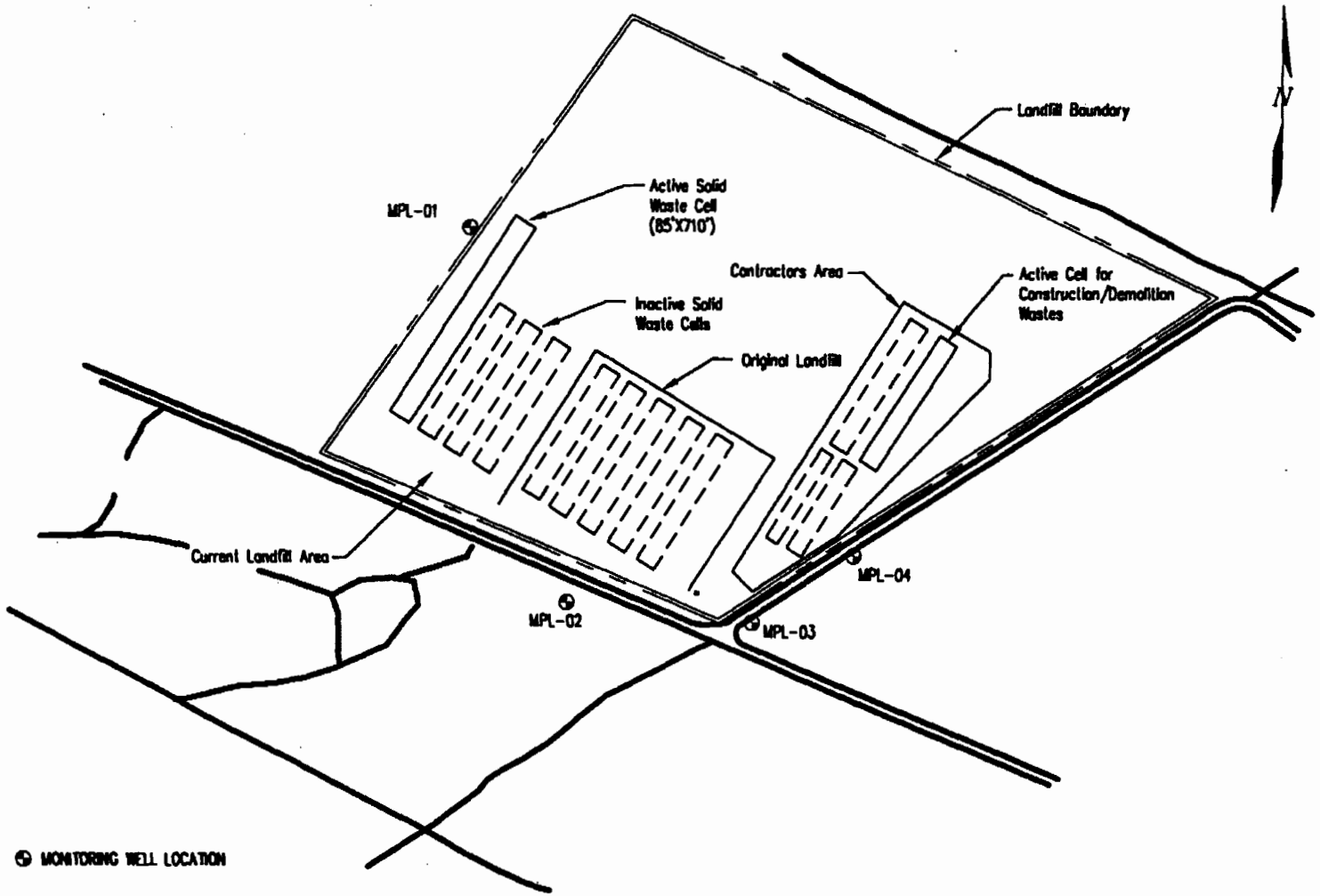


Figure 3-2 Configuration of Cells at the Main Post Landfill

NEWATEC CORPORATION

WHITE SANDS MISSILE RANGE

The four monitoring wells are screened within the unconsolidated sediments of the Tularosa Basin. These sediments consist of alternating sequences of Quaternary/Tertiary sands, gravels, and clays originating from the surrounding Organ, San Andres, San Augustin and Sacramento mountains. The geology at each of the well locations was found to be very similar, resulting in similar well construction. As such, construction details for each well are discussed simultaneously.

4. MONITORING WELL CONSTRUCTION

The well construction field activities commenced on 15 May and were completed on 31 May 1996. Test holes were drilled using a truck-mounted Gardner Denver 1500 mud-rotary drill rig, operated by GeoProjects International. All test holes were drilled to a total depth of 240 feet using 7-7/8-inch tri-cone or blade bit. Drill cuttings were collected at 5-foot depth intervals for lithologic evaluation. Starting at 140 feet below ground surface, 2-foot split-barrel samples were collected at 20-foot intervals to obtain relatively undisturbed soil samples. Each test hole was logged by Southwest Geophysical Services, using long-short normal resistivity, spontaneous potential, single point resistance, caliper, neutron, gamma-gamma (bulk density) and natural gamma. Borehole geophysical logs are provided as part of each well installation appendix.

After identification of the well screen interval, the lower unused interval of all test holes was backfilled with hydrated bentonite chips to serve as a lower seal. Displaced drill fluids and cuttings were disposed in a shallow pit on site.

Each monitoring well was constructed using 4-inch diameter, flush-threaded, schedule 40 PVC risers with a 20-foot section of 0.010-inch slotted, Johnson Pre-Pack® PVC screen (See Appendix A, B C and D for well construction information). The screen interval for the upgradient well MPL-01 was positioned at a depth of 195 to 215 feet below ground surface. The screen interval for the downgradient well MPL-02 was placed at depth of 195 to 215, MPL-03 at a depth of 203 to 223, and MPL-04 at a depth interval of 200-220 feet below ground surface. A five foot section of blank PVC casing was placed at the base of each screen to serve as a sediment trap. Clean, graded 20-40 mesh size silica sand of was added to complete the screened interval filter packs from five feet above each screen to five feet below each sand trap. Five feet or more of hydrated bentonite chips were added above each filter pack to serve as an upper seal. Each borehole annulus was completed with a cement/bentonite slurry to ground surface. A horizontal and vertical location survey was conducted of each well by Wilson Survey (Table 4-1).

Well development was initiated by the addition of a 10 percent polyphosphate solution to break down mud cake and drill fluids in the filter pack. Drill fluids were removed using a 3-inch diameter, 10-ft. steel bailer hoisted by a development rig. Development was completed using a 2-inch diameter submersible pump. Well development was considered complete when the water appeared to be clear, and water temperature, conductivity and pH varied less than 10 percent.

Table 4-1. Monitoring Well Construction Data, Main Post Landfill

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MPL-01 (Upgradient well)	220.0 ft.	4012.56 ft.	32°22'22.511" 106°26'06.387"	3,582,677.656 364,991.885	200.47
MPL-02 (Downgradient well)	220.0 ft	4004.55	32°22'.09.222" 106°26'02.074"	3,582266.920 365,099.100	194.79
MPL-03 (Downgradient well)	228.0 ft	3997.75	32°22'08.570" 106°25'54.253"	3,582,244.105 365,303.249	188.77
MPL-04 (Downgradient well)	225.0 ft	3993.50	32°22'10.966" 106°25'49.972"	3,582,316.395 365,416.103	184.82

* Universal Transverse Mercator Coordinate System, Zone 13, NAD83 and NAVD 88.
**bgs - below ground surface

5. LITHOLOGIC EVALUATION

In addition to the field lithologic logs prepared as a general description of borehole geology, the drill cuttings collected at 5-foot intervals from the boring were examined using a binocular microscope to develop a detailed borehole lithologic log. The cuttings were examined to describe grain size, sorting, mineralogy or lithology, degree of grain roundness, color, depth below land surface, and thickness intervals. In general, the results of the lithologic examination indicates the geology in the vicinity of the landfill is characterized as fine- to medium-grained sands with caliche from the surface to 80 feet below ground surface. These sands are underlain by silts and silty clays from 80 to about 175 feet. From 175 to 240 feet below ground surface, the geology is characterized as silts and fine- to coarse grained sands. The field lithologic log and the detailed lithologic log for each boring are provided as part of each well construction appendix.

6. BOREHOLE GEOPHYSICS

Of the seven geophysical logs run in each of the test holes , the single-point resistance log and the long and short normal resistivity logs provided the best information for interpretation regarding the location of the zone of water saturation. In general, the logs show the curves flattening at about 195 to 202 feet below ground surface, indicating water saturation. Based on this information, the intervals were selected for screening. Copies of the geophysical logs are provided as part of each well construction appendix.

7. SITE RESTORATION

At the completion of well installation and development activities, drill cuttings and fluids were disposed in a shallow pit adjacent to the well site. Each well site was then graded to its original condition.

8. GROUNDWATER SAMPLING

The monitoring wells at the Main Post Landfill were installed to conduct background groundwater monitoring in the vicinity of the landfill. Background monitoring is the initial stage of an overall groundwater montoring program. Background groundwater monitoring is conducted to characterize the baseline conditions of the upgradient and downgradient groundwater quality at the site, and to establish assessment monitoring levels (AMLs) (NMED, 1995). Background monitoring will be conducted during the first twelve months following well installation and will begin the first month following well completion. The monitoring involves the collection and analysis of five independent groundwater samples from each well. The results of the sample analysis are used as the basis for determining whether subsequent groundwater monitoring is required under the detection or assessment monitoring programs.

9. CONCLUSION

The upgradient and downgradient monitoring wells were installed at the Main Post Landfill, in compliance with the NM Solid Waste Management Regulations. Five consecutive groundwater samples will be collected over a time period of twelve months to establish background groundwater physical and chemical characteristics in the vicinity of the landfill. The results of the background groundwater monitoring program will be presented under separate cover.

10. REFERENCES

Compton, R.R., 1962, Manual of field geology: New York, John Wiley and Sons, Inc. 378 p.

Goddard, E.N., chm., and others, 1948, Rock-color chart: Washington, National Research Council (reprinted by Geological Society of America, 1951, 1963, 1970, 1975, 1979, 1980).

Myers, R.G. and Pinckley K.M., 1985, Test wells T23, T29, and T30, White Sands Missile Range and Fort Bliss Military Reservation, Doña Ana County, New Mexico: U.S. Geological Survey Open File Report 84-805, 28 p.

New Mexico Environment Department Solid Waste Bureau, 1995, New Mexico Solid Waste Management Regulations 20 NMAC 9.1, 203 p.

APPENDIX A
MONITORING WELL INSTALLATION INFORMATION
WELL NO. MPL-01

APPENDIX A
MONITORING WELL INSTALLATION INFORMATION
WELL MPL-01

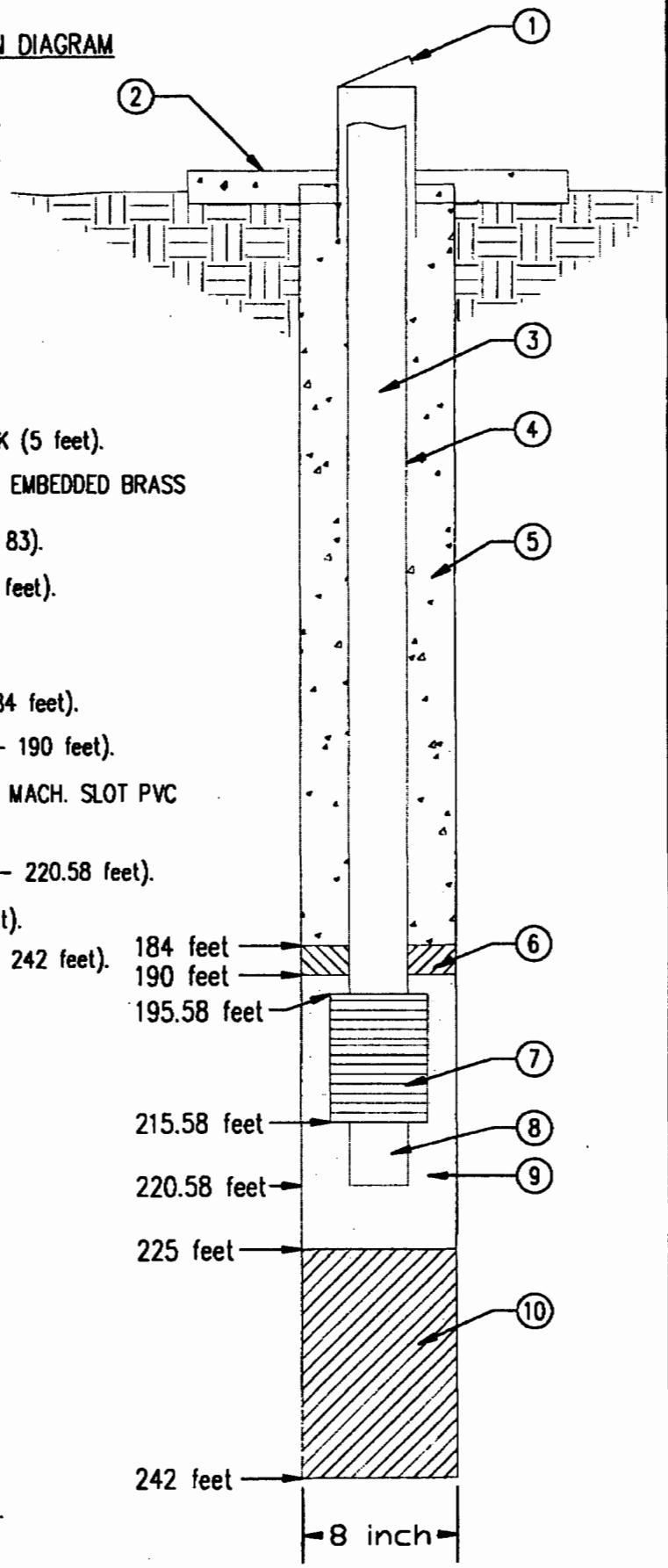
Monitoring Well Number :	MPL-01
Monitoring Well Description:	Upgradient Well for the Main Post Landfill
Location:	22S.05E.28.124 White Sands Missile Range
Driller/ Drilling Contractor:	Lee Gebbert NM Driller No. 1311 GeoProjects International Austin, Texas
Drilling Rig/Method:	Gardner Denver 1500/Mud Rotary 7⅞-inch tri- cone and blade bits
Dates of Drilling:	15-16 May 1996
Total Depth of Test Hole:	242 feet
Diameter of Test Hole:	8 inches
Date Well Construction Completed:	17 May 1996
Geophysical Logging Contractor:	Southwest Geophysical Services, Inc. 4200 Skyline Drive Farmington, New Mexico 87401
Geophysical Logging Services:	Long-short normal resistivity Spontaneous potential Single point resistivity Neutron Gamma-gamma Caliper Natural gamma
Location Survey Contractor:	Wilson Survey Co. Inc. 240 Thunderbird Drive, Suite B El Paso, Texas 79912

APPENDIX A
MONITORING WELL INSTALLATION INFORMATION (cont.)
WELL MPL-01

Horizontal Location at Brass Cap:	North American Datum (1983) Latitude: 32°22'22.511"N Longitude: 106°26'06.387W Univ. Transverse Mercator, Zone 13 Northing: 3,582,677.656 Easting: 364,991.885
Vertical Location at Brass Cap:	North American Vertical Datum (1988) - 4012.56 ft.
Well Development:	Approximately 320 gallons of drill fluids/aqueous liquids were purged using a 3-inch diameter steel bailer. Due to a slow recovery rate, the well was purged dry and allowed to reach static conditions before the next purging session. Development continued until the parameters of temperature, pH and conductivity remained below a 10% variance.
Surface Completion	A 5-foot long, 6-inch diameter, steel casing with a hinged, locking steel cap was installed over the PVC casing and embedded into the cement/bentonite grout. A 3-foot square, 12-inch thick concrete pad was constructed around the protective casing. Six inches of the concrete pad extend above ground surface. The protective casing extends approximately 36 inches above the surface of the concrete pad. A brass survey marker is embedded into the concrete pad, approximately 12 inches from the steel casing. Four 4-inch diameter steel posts, seven feet long, were placed equidistant from the well and embedded into the ground. The steel posts extend 3 feet above the ground. The steel casing and protective posts are painted with rust-protective safety - yellow paint.

APPENDIX A – MONITORING WELL CONSTRUCTION DIAGRAM

WELL NUMBER: MPL-01
WELL NAME: UPGRADIENT M.W. AT MAIN POST LANDFILL
GEOLOGIST: DANA DOWNS



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (5 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) W/ EMBEDDED BRASS MARKER, ELEVATION 4012.56 feet (NAVD 1988). LAT. 32°22'22.511" LONG. 106°26'06.387" (NAD 83).
3. UPPER CASING: 4 inch SCH. 40 PVC (0 – 195.58 feet).
4. CENTRALIZERS AT: 40 feet, 80 feet, 120 feet, 160 feet, 195.58 feet, & 215.58 feet.
5. BACKFILL: CEMENT/5% BENTONITE SLURRY (0 – 184 feet).
6. UPPER SEAL: HYDRATED BENTONITE CHIPS (184 – 190 feet).
7. JOHNSON PRE-PACK, 4 inch I.D., SCH. 40, NO. 10 MACH. SLOT PVC 20 feet LONG (195.58 – 215.58 feet).
8. LOWER SAND TRAP: 4 inch SCH. 40 PVC (215.58 – 220.58 feet).
9. FILTER PACK: CLEAN SILICA SAND (190 – 225 feet).
10. LOWER SEAL: HYDRATED BENTONITE CHIPS (225 – 242 feet).

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 242 feet.
2. TEST HOLE DIAMETER: 8 inch.
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. DRAWING NOT TO SCALE.

APPENDIX A
FIELD LOG
AND
DETAILED LITHOLOGIC LOG
WELL MPL-01

The following logs were prepared by examination of drill cuttings by the site geologist. The Field Log represents a general description of lithologic conditions and drilling activities for the length of the borehole. The Detailed Lithologic Log was prepared by microscopic examination of drill cuttings.

For the lithologic description, grain size was determined in accordance with that described by Myers and Pinckley (1985) (See Table D-1), and rounding was determined from comparison with the grain models shown in the Manual of Field Geology (Compton, 1962). The degree of roundness can range from very angular to well rounded. Sorting is the degree to which grains in a sample approach the same size. This value can range from very well sorted (grains all the same size) to very poorly sorted (a wide range of grain sizes with no dominant grain sizes). The colors and any accompanying code numbers in the lithologic descriptions refer to the colors from the Rock-Color Chart (Goddard, 1948) prepared by the Rock-Color Chart Committee and distributed by the Geological Society of America. Color determination was made from dry samples.

Classification of Detrital Sediments by Grain Diameter

Description	Size in mm	Size in inches
Pebbles	4-64	0.15-2.5
Granules	2-4	0.08-0.15
Very coarse sand	1.0-2.0	0.04-0.15
Coarse sand	0.5-1.0	0.02-0.04
Medium sand	0.25-0.5	0.01-0.02
Fine sand	0.125-0.25	0.005-0.01
Very fine sand	0.0625-0.125	0.0025-0.005
Silt	0.004-0.0625	0.00015-0.0025
Clay	less than 0.004	less than 0.00015

Field Lithologic Log
Well MPL-01

Project:	Background Groundwater Monitoring		
Location:	Main Post Landfill		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 1500
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Elevation Brass Marker:	4012.56 ft.
Geologist:	D. Downs	Dates of Drilling:	May 15-16, 1996

Depth (feet)	Date/Time	Description of Material	Remarks
5	5-16-96 1055	Sand, medium- to coarse-grained	
6-7			Hit boulder
10	1056	Sand, medium- to coarse-grained, with clay	
15	1100	Sand, fine- to coarse-grained, with reddish brown clay and caliche fragments	
20	1102	Sand, medium- to coarse-grained, with caliche fragments	Add 20 ft section
25	1110	Sand, medium- to coarse-grained	
30	1115	Sand, fine- to coarse-grained	
35	1120	Sand, medium- to coarse-grained, with pebbles	Difficult drilling, stem wobbling at 38 ft.
40	1123	Sand, medium- to coarse-grained	1125 - add 20 ft section 43.5 ft.- drilling slows
45	1130	Clay, medium brown, with fine- to medium-grained sand, fine sands are silty, sandy silty clay with caliche	

Depth (feet)	Date/Time	Description of Material	Remarks
50	1135	Clay, silty, with very fine-grained sand and caliche	
55	1140	Clay, silty, light tan, with caliche	56.5 - 58 ft light grey to light tan clay with sand
60	1145	Sand, medium- to coarse-grained, with gravel	Add 20 ft section
65	1150	Clay, silty, brown, with fine- to coarse-grained sand	Very little coarse sand being recirculated
70	1155	Clay, silty, light tan to light brown, with medium- to coarse-grained sand	
75	1200	Clay, silty, brown, with caliche	Silty clay, drill stem wobbling
80	1205	Clay, silty, brown, with sand	Add 20 ft section
85	1215	Clay, brown, with silt	Slow drilling
87	1218	Clay, brown, hard and dry	
90	1225	Clay hard with medium- to coarse-grained sand, dry to slightly moist	
95	1230	Clay, brown, with silty sand	
100	1235	Clay, brown, with silt and sand	Split-barrel sample 100-102 ft.
105	1435	Clay, sandy	105-106 ft thin sandy layers
110	1440	Sand, coarse-grained with pebbles, with a small amount of clay	
115	1445	Sand, fine- to coarse-grained with pebbles, clean, poorly sorted	
116	1446	Clay with silt	

Depth (feet)	Date/Time	Description of Material	Remarks
120	1448	Clay with fine- to coarse-grained sand	Pull drill stem to do spoon at 120-122 ft see detailed lith. log
125	1520	Clay, silty	Stem back in, add 20 ft. section
130	1525	Clay, sandy, with coarse-grained sand	
133	1527	Sand, fine- to coarse-grained, clean, interbedded	
134	1530	Clay and sandy clay	
135	1535	Clay and sandy clay	
136	1545	Clay, hard	Difficult drilling- hard clay
140	1550	Clay, sandy, with fine- to coarse-grained sand	Pull drill stem to take split barrel sample of 140-142 see detail log
145	1630	Clay, sandy, coarse- to medium-grained sand	
150	1640	Clay with fine- to coarse-grained sand	Clay difficult drilling
155	1650	Clay with coarse-grained sand	Slow drilling
160	1700	Clay, sandy, with coarse-grained sand	No split spoon sample here. Told driller to continue
165	1725	Clay, sandy, with coarse-grained sand	Still in clays
167	1728	Sand, small interval	Using natural clays for mud. Thinned out mud.
170	1730	Clay, sandy, with coarse-grained sand	Easier drilling form 167 down.
175	1730	Sand, coarse- to medium-grained	
180	1731	Sand, coarse- to medium-grained	Split-barrel sample at 180-182 see detail log

Depth (feet)	Date/Time	Description of Material	Remarks
185	5-16-96 0830	Clay, reddish brown, with sand	Tripped back in
190	835	Clay, silty, reddish brown	185-190 Difficult drilling in clay
194	0836	Sand, one inch thick	
195	0840	Clay, brown, sticky	
196	0842	Sand, coarse-grained	
200	0845	Sand, medium- to coarse-grained from 196 with some gravel size fraction	Trip out to take split barrel at 200-202 ft. See detail lith log
205	0925	Sand, coarse-grained, with small amount of clay	
210	0930	Sand, coarse- to medium-grained, with brownish red clay	
215	0940	Sand with brownish red clay	
220	0940	Sand, medium- to coarse-grained with a very small amount of clay	Trip out to take split barrel sample 220-222
225	1030	Sand and reddish brown clay	
230	1035	Sand, coarse-grained, with a small amount of clay	
234	1040	Sand and gravel	
235	1045	Clay, silty, sandy	
242	1055	Sand and reddish brown clay	Total depth borehole

Appendix A
Detailed Lithologic Log for MPL-01

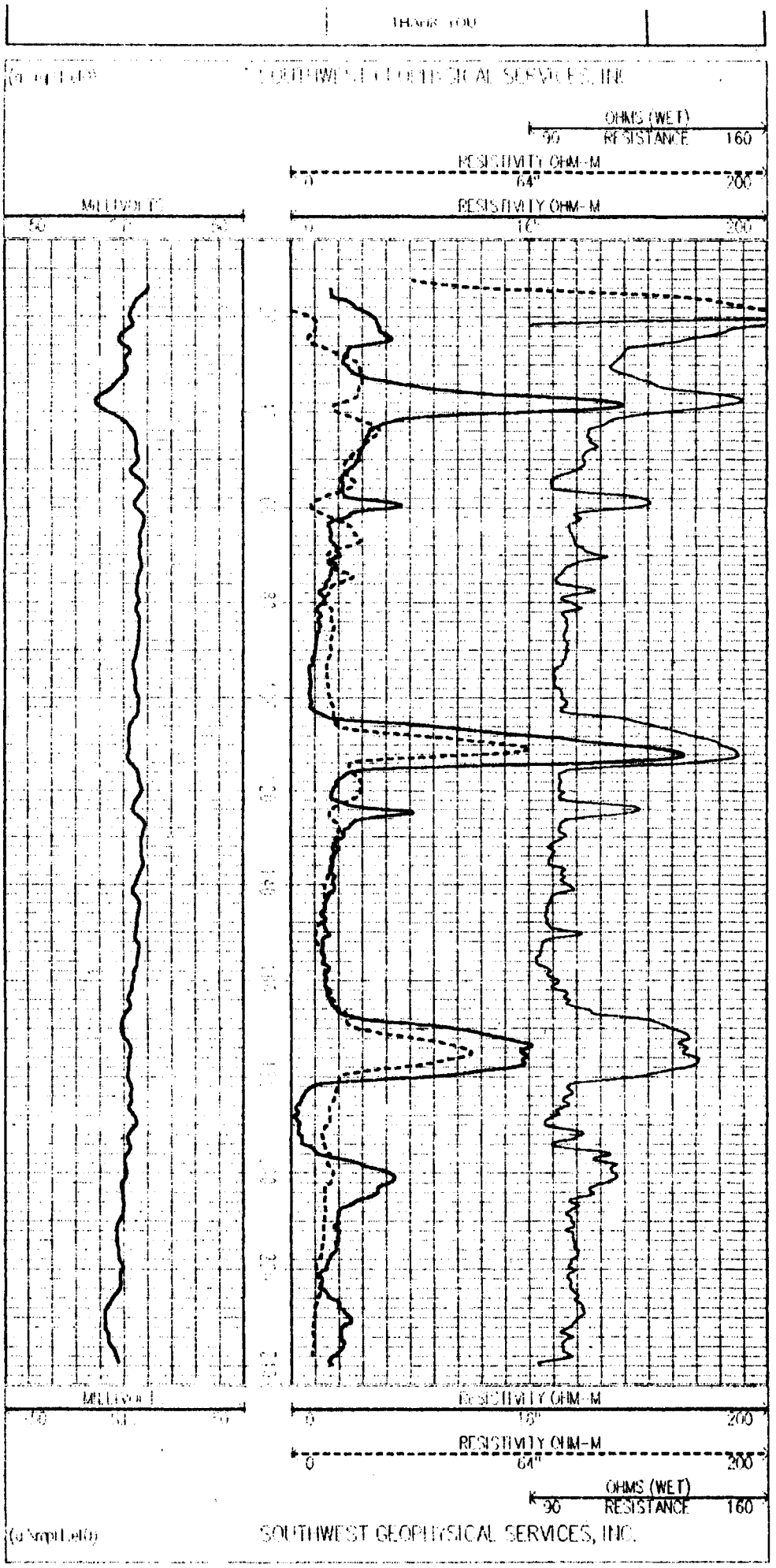
Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium- to coarse-grained; angular to subangular, moderately to poorly sorted; composed of quartz, feldspar, hornblende, biotite; 6 to 7 foot interval contains a small amount of volcanic ash lithic grains, light brown (10YR 5/6) clay, and white (N9) caliche; from 10 to 20 feet clay becomes greyish-orange (10YR 7/4), and sand grains become fine- to medium-grained; from 20 to 45 feet volcanic ash lithic grains and clays are absent, minor muscovite present, and caliche becomes more abundant; from 35 to 45 feet pebble-size fraction is present.	45	0-45
Sand, fine- to medium-grained, and greyish orange (10YR 7/4) silt; subangular to subrounded, moderately sorted; composed of quartz, feldspar, and minor hornblende; white (N9) caliche.	5	45-50
Sand, fine- to medium-grained, greyish orange (10YR 7/4) silt, and white (N9) caliche; subrounded to rounded, moderately sorted; composed of quartz, feldspar, a small amount of hornblende, and a very small amount of muscovite; from 55 to 60 feet yellow brown (10YR 6/2) clay is present.	10	50-60
Sand, medium- to coarse-grained, light brown (5YR 6/4) clay, white (N9) caliche, and a small amount of selenite; subangular to subrounded, well sorted; composed of quartz, chert, and a small percentage of mafic minerals; from 70 to 75 feet clay content increases and white (N9) caliche is more consolidated.	15	60-75

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, pale reddish brown (10R 5/4), light brown (5YR 6/4) silt, white (N9) caliche, and a small amount fine- to coarse-grained sand; subrounded to rounded, moderately sorted; composed of quartz, chert, and very small amounts of muscovite and feldspar.	5	75-80
Silt, greyish orange (10YR 7/4) and fine- to coarse-grained sand, greyish orange (10YR 7/4) clay, and white (N9) caliche; subangular to subrounded, moderately sorted; composed of quartz, chert, and small amounts of feldspar and hornblende.	5	80-85
Clay, light brown (5YR 6/4), fine- to coarse-grained sand, and white (N9) caliche; subangular to rounded, well sorted; composed of quartz, chert, and small amounts of feldspar and hornblende.	25	85-110
Sand, fine- to coarse-grained, light brown (5YR 6/4) clay, and white (N9) caliche; subangular to subrounded, moderately sorted; composed of quartz, chert, and a small amount of feldspar; from 115 to 120 feet light brown (5YR 6/4) clay content decreases and subrounded to rounded chert pebbles appear.	15	110-125
Clay, light brown (5YR 6/4), greyish orange (10YR 7/4) silt, fine- to coarse-grained sand, and white (N9) caliche; subrounded to subangular, well sorted; composed of quartz, chert, and a very small amount of muscovite; from 130 to 135 feet light brown (5YR 6/4) clay content decreases and greyish orange (10YR 7/4) silt content increases.	10	125-135

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium- to coarse-grained, silt, white (N9) caliche, and minor amounts of pale reddish brown (10R 5/4) clay; subangular to subrounded, well sorted, composed of quartz, chert, and a small percentage of mafic minerals.	5	135-140
Clay, pale reddish brown (10R 5/4), fine- to coarse-grained sand, light brown (5YR 6/4) silt, and white (N9) and very pale orange (10YR 8/2) caliche; subangular to angular, poorly sorted; composed of quartz, chert, a small amount of feldspar and hornblende, and a very small amount of muscovite.	25	140-165
Sand, fine- to coarse-grained, greyish orange (10YR 7/4) silt, and white (N9) caliche; subrounded to subangular, moderately sorted, composed of quartz, chert, and moderate red (5YR 4/6) and dark grey (N3) (sedimentary) rock.	10	165-175
Sand, coarse- to very-coarse grained with a small amount of fine pebble gravel, and a small amount of white (N9) caliche; subrounded to subangular, moderately sorted; sand is composed of quartz, chert, a small amount of granite, and dark grey (N3) (sedimentary) rock.	10	175-185
Clay, light brown (5YR 6/4), and fine-grained to granule sand; subrounded, moderately sorted; composed of quartz, chert, and small amount of granite and dark grey (N3) (sedimentary) rock; from 190 to 200 feet white (N9) and very pale orange (10YR 8/2) caliche present, less sand present, and a small amount of greyish orange (10YR 7/4) silt is present.	15	185-200

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium-grained to granule, and a small amount of moderate orange pink (10R 7/4) caliche; subangular to subrounded, moderately sorted, composed of quartz, chert, moderate red (5R 4/6) and dark grey (N3) (sedimentary) rock.	5	200-205
Sand, medium-grained to granule, white (N9) and moderate reddish orange (10R 6/6) caliche; angular to subrounded, poorly sorted; composed of quartz, chert, and dark grey (N3) and very dark red (5R 2/6) (sedimentary) rock; from 210 to 215 feet a small amount of light brown (5YR 6/4) clay is present.	10	205-215
Sand, medium- to coarse-grained, light brown (5YR 6/4) silt, light brown (5YR 6/4) clay, and white (N9) caliche; subangular to rounded, well sorted; composed of quartz, chert, and light grey (N7), medium grey (N5), and moderate red (5R 4/6) (sedimentary) rock.	5	215-220
Clay, greyish orange (10YR 7/4), fine- to medium-grained sand, and a small amount of white (N9) caliche; subrounded to subangular, moderately sorted; composed of quartz, chert, and medium grey (N5) and light grey (N7) (sedimentary) rock.	10	220-230
Sand, medium- to coarse-grained, light brown (5YR 6/4) clay; white (N9) caliche, and a small amount of greyish orange (10YR 7/4) silt; subrounded to subangular, well sorted; composed of quartz, chert, and moderate red (5R 4/6), light grey (N7) and dark grey (N3) (sedimentary) rock; from 235 to 240 feet greyish orange (10YR 7/4) silt and light brown (5YR 6/4) clay become more abundant.	10	230-240

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, light brown (5YR 6/4), fine- to medium-grained sand, and small amounts of greyish orange (10YR 7/4) silt and white (N9) caliche; subangular to subrounded, well sorted; composed of quartz, chert, and dark grey (N3) (sedimentary) rock.	4	240-244


THANK YOU
SOUTHWEST GEOPHYSICAL SERVICES, INC.
OHMS (WET)
90 RESISTANCE 160
RESISTIVITY OHM-M
0 64" 200
MILLIVOLTS
RESISTIVITY OHM-M
0 16" 200
MILLIVOLTS
RESISTIVITY OHM-M
0 16" 200
RESISTIVITY OHM-M
0 64" 200
OHMS (WET)
90 RESISTANCE 160
SOUTHWEST GEOPHYSICAL SERVICES, INC.

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	LOG MEASURED FROM: GL ELEVATION:	GAMMA RAY NEUTRON COMPENSATED DENSITY NEUTRON

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL
WELL: MPL-MW 1
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

	RUN NO. 1		RUN NO. 1
DATE	5/16/96	FLUID LEVEL	FULL
DEPTH DRILLER	242 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	241 FT	FLUID VISCOSITY	
BOTTOM LOGGED	[illegible]	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	S.F.L.	CIRCULATION TEMP.	
CASING SIZE	8 5/8 OD	BOT HOLE TEMP.	
CASING SIZE	[illegible]	TOOL #	ELOG
BIT SIZE	7 7/8 IN	LOGGED BY:	SHEPPARD MARTIN
BIT SIZE	[illegible]	WITNESSED BY:	DANA DOWNS

REMARKS:

THANK YOU

COMPANY: MEVATEC
WELL: MPL-01

(ansgpl.dd) SOUTHWEST GEOPHYSICAL SERVICES, INC.

OHMS (WET)

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
CALIPER NATURAL GAMMA RAY BULK DENSITY NEUTRON	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL
WELL: [illegible]
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: [illegible] STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

	RUN NO. 1		RUN NO. 1
DATE	[illegible]	FLUID LEVEL	FULL
DEPTH DRILLER	[illegible] FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	[illegible] FT	FLUID VISCOSITY	
BOTTOM LOGGED	[illegible] FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	[illegible] FT	CIRCULATION TEMP.	
CASING SIZE	[illegible]	BOT HOLE TEMP.	
CASING SIZE	[illegible]	TOOL #	[illegible]
BIT SIZE	[illegible]	LOGGED BY:	SHERRY MARTIN
BIT SIZE	[illegible]	WITNESSED BY:	DAVID [illegible]

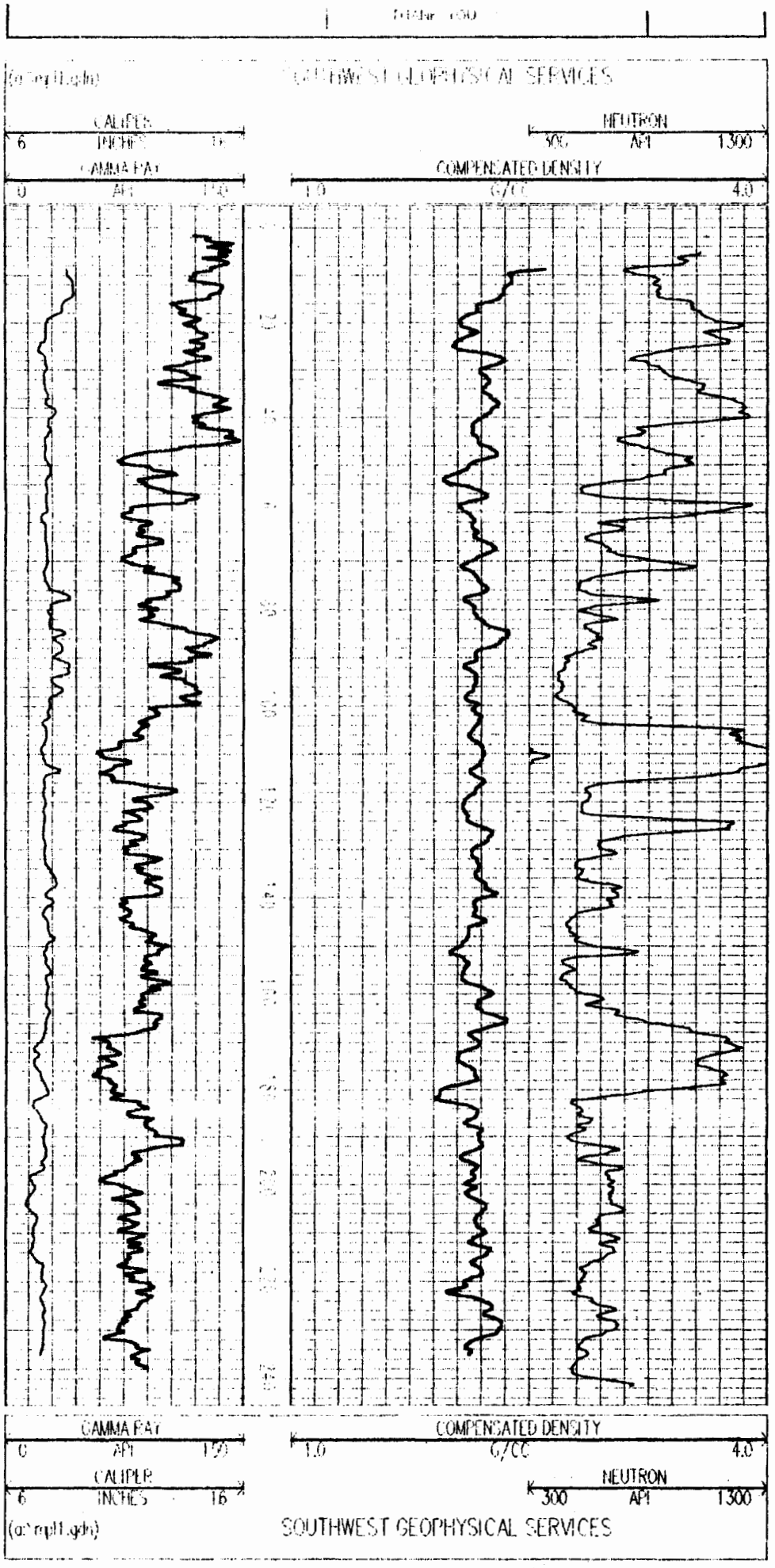
REMARKS:

THANK YOU

COMPANY: MEVATEC
WELL: MPL-01

(Caption Log) SOUTHWEST GEOPHYSICAL SERVICES

NEUTRON


SOUTHWEST GEOPHYSICAL SERVICES
CALIPER
6 INCHES 16
NEUTRON
300 API 1300
GAMMA RAY
0 API 150
COMPENSATED DENSITY
1.0 G/CC 4.0
GAMMA RAY
0 API 150
COMPENSATED DENSITY
1.0 G/CC 4.0
CALIPER
6 INCHES 16
NEUTRON
300 API 1300
SOUTHWEST GEOPHYSICAL SERVICES

APPENDIX B

MONITORING WELL INSTALLATION INFORMATION
WELL NO. MPL-02

APPENDIX B
MONITORING WELL INSTALLATION INFORMATION
WELL NO. MPL-02

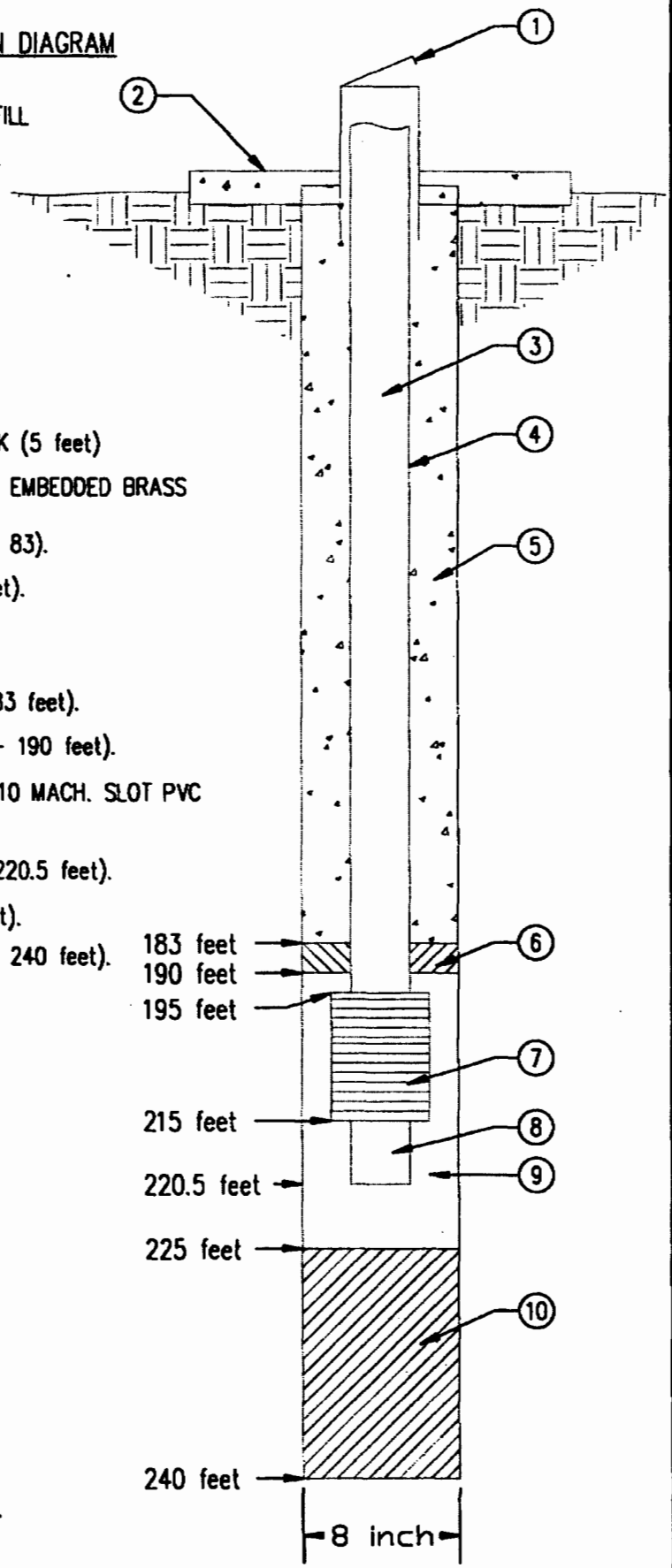
Monitoring Well Number :	MPL-02
Monitoring Well Description:	Downgradient Well for the Main Post Landfill
Location:	22S.05E.28.144 White Sands Missile Range
Driller/ Drilling Contractor:	Lee Gebbert NM Driller No. 1311 GeoProjects International Austin, Texas
Drilling Rig/Method:	Gardner Denver 1500/Mud rotary 7⅞-inch and tri-cone and blade bits
Dates of Drilling:	18-19 May 1996
Total Depth of Test Hole:	240 feet
Diameter of Test Hole:	8 inches
Date Well Construction Completed:	19 May 1996
Geophysical Logging Contractor:	Southwest Geophysical Services, Inc. 4200 Skyline Drive Farmington, New Mexico 87401
Geophysical Logging Services:	Long-short normal resistivity Spontaneous potential Single point resistivity Neutron Gamma-gamma Caliper Natural gamma
Location Survey Contractor:	Wilson Survey Co. Inc. 240 Thunderbird Drive, Suite B El Paso, Texas 79912

APPENDIX B
MONITORING WELL INSTALLATION INFORMATION (cont.)
WELL MPL-02

Horizontal Location at Brass Cap:	North American Datum (1983) Latitude: 32°22'09.222" N Longitude: 106°26'02.074" W Univ. Transverse Mercator, Zone 13 Northing: 3,582,266.920 Easting: 365,099.100
Vertical Location at Brass Cap:	North American Vertical Datum (1988) - 4004.55 ft.
Well Development:	Approximately 280 gallons of drill fluids/aqueous liquids were purged by the drilling contractor using a 3-inch diameter steel bailer. Development continued using a 4-inch diameter submersible pump until the parameters of temperature, pH and conductivity remained below a 10% variance.
Surface Completion	A 5-foot long, 6-inch diameter, steel casing with a hinged, locking steel cap was installed over the PVC casing and embedded into the cement/bentonite grout. A 3-foot square, 12-inch thick concrete pad was constructed around the protective casing. Six inches of the concrete pad extend above ground surface. The protective casing extends approximately 36 inches above the surface of the concrete pad. A brass survey marker is embedded into the concrete pad, approximately 12 inches from the steel casing. Four 4-inch diameter steel posts, seven feet long, were placed equidistant from the well and embedded into the ground. The steel posts extend 3 feet above the ground. The steel casing and protective posts are painted with rust-protective safety - yellow paint.

APPENDIX B – MONITORING WELL CONSTRUCTION DIAGRAM

WELL NUMBER: MPL-02
L NAME: DOWNGRADIENT M.W. AT MAIN POST LANDFILL
OGIST: DANA DOWNS



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (5 feet)
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) W/ EMBEDDED BRASS MARKER, ELEVATION 4004.55 feet (NAVD 1988). LAT. 32° 33'09.222" LONG. 106° 26'02.074" (NAD 83).
3. UPPER CASING: 4 inch SCH. 40 PVC (0 – 195 feet).
4. CENTRALIZERS AT: 40 feet, 80 feet, 120 feet, 160 feet, 195 feet, & 215 feet.
5. BACKFILL: CEMENT/5% BENTONITE SLURRY (0 – 183 feet).
6. UPPER SEAL: HYDRATED BENTONITE CHIPS (183 – 190 feet).
7. JOHNSON PRE-PACK , 4 inch I.D., SCH. 40, NO. 10 MACH. SLOT PVC 20 feet LONG (195 – 215 feet).
8. LOWER SAND TRAP: 4 inch SCH. 40 PVC (215 – 220.5 feet).
9. FILTER PACK: CLEAN SILICA SAND (190 – 225 feet).
10. LOWER SEAL: HYDRATED BENTONITE CHIPS (225 – 240 feet).

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 240 feet.
2. TEST HOLE DIAMETER: 8 inch.
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. DRAWING NOT TO SCALE.

APPENDIX B
FIELD LOG
AND
DETAILED LITHOLOGIC LOG
WELL MPL-02

The following logs were prepared by examination of drill cuttings by the site geologist. The Field Log represents a general description of lithologic conditions and drilling activities for the length of the borehole. The Detailed Lithologic Log was prepared by microscopic examination of drill cuttings.

For the lithologic description, grain size was determined in accordance with that described by Myers and Pinckley (1985), and rounding was determined from comparison with the grain models shown in the Manual of Field Geology (Compton, 1962). The degree of roundness can range from very angular to well rounded. Sorting is the degree to which grains in a sample approach the same size. This value can range from very well sorted (grains all the same size) to very poorly sorted (a wide range of grain sizes with no dominant grain sizes). The colors and any accompanying code numbers in the lithologic descriptions refer to the colors from the Rock-Color Chart (Goddard, 1948) prepared by the Rock-Color Chart Committee and distributed by the Geological Society of America. Color determination was made from dry samples.

Classification of Detrital Sediments by Grain Diameter

Description	Size in mm	Size in inches
Pebbles	4-64	0.15-2.5
Granules	2-4	0.08-0.15
Very coarse Sand	1.0-2.0	0.04-0.15
Coarse sand	0.5-1.0	0.02-0.04
Medium sand	0.25-0.5	0.01-0.02
Fine sand	0.125-0.25	0.005-0.01
Very fine sand	0.0625-0.125	0.0025-0.005
Silt	0.004-0.0625	0.00015-0.0025
Clay	less than 0.004	less than 0.00015

Field Lithologic Log
Well MPL-02

Project:	Background Groundwater Monitoring		
Location:	Main Post Landfill		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 1500
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Elevation Brass Marker: 4004.55	
Geologist:	D. Downs	Dates of Drilling: May 18-19, 1996	

Depth (feet)	Date/Time	Description of Material	Remarks
5	**5-18-96** 1530	Silt, reddish brown, with sand, gravel, and a small amount of clay	
10	1535	Sand, medium- to coarse-grained, clean, with caliche	
15	1540	Sand, medium- to coarse-grained, clean, with caliche	
20	1545	Sand, fine- to medium-grained	Add 20 ft section using natural clay for mud
25	1550	Sand, fine- to medium-grained, with caliche	
30	1551	Sand, medium- to coarse-grained	
35	1553	Sand, medium- to coarse-grained	
40	1555	Sand, medium- to coarse-grained, with caliche	Add 20 ft section
45	1615	Sand, silty, with caliche	Very little water loss
50	1618	Sand, silty, with clay	
55	1622	Clay, reddish brown, with medium- to coarse-grained sand	

Depth (feet)	Date/Time	Description of Material	Remarks
60	1625	Clay, silty, with sand and caliche fragments	Add 20 ft section
65	1630	Clay, silty, sandy, with caliche and gravel	
70	1635	Sand, silty, no clay	
75	1640	Clay, silty, with caliche fragments	Smooth drilling
80	1645	Clay, silty, reddish brown, stiff	Add 20 ft section
85	1650	Clay, brown, stiff, with sand	
90	1652	Clay, brownish red, with sand	
95	1655	Clay, with silt and caliche	
100	1700	Sand, with reddish brown clay	
105	1710	Clay, silty, sandy, with caliche fragments	
110	1715	Clay, silty, sandy	
115	1730	Clay with silt and very fine-grained sand	Slower drilling - clays
120	1735	Clay with silt and very fine-grained sand	
125	1740	Sand, medium- to coarse-grained, with caliche	
130	1745	Sand, medium- to coarse-grained	
135	1750	Silt and very fine-grained sand	
140	1800	Silt, light tan, with a small amount of sand	Stop drilling for the day. (Split barrel 140-142 ft.)
145	**5-19-96** 0900	Silt with fine- to medium-grained sand	
150	0910	Sand, coarse-grained, with silt grading down into clay	
155	0915	Clay, light brown, with silt and very fine- to medium-grained sand	
160	0920	Sand, coarse- to medium-grained, with silt and a small amount of clay	Split barrel 160-162 ft.

Depth (feet)	Date/Time	Description of Material	Remarks
165	0950	Sand, coarse- to very coarse-grained, with very small amounts of gravel and clay	
170	0950	Sand, coarse- to very coarse-grained, with gravel	
175	1000	Sand, coarse- to medium-grained, with silt	
180	1005	Sand, coarse- to very fine-grained, with silt	Split-barrel sample 180-182 ft.
185	1040	Sand, coarse- to fine-grained, with clay	Slow drilling in clay 185-187.5 ft
190	1055	Clay with silt and medium- to coarse-grained sand	
195	1100	Sand, silty, with small amounts of clay	Silty
200	1120	Sand and gravel grading from poor to well sorted	Split barrel sample 200-202 ft.
205	1130	Sand, medium- to coarse-grained, with silt, no clay	
210	1135	Sand, fine- to medium-grained	
213	1140	Silt with sand	
215	1150	Sand, very fine- to coarse-grained, with pebbles	
220	1200	Sand, very fine-grained, with small amounts of clay, silty clay and caliche	Split-barrel sample from 220-222 ft.
225	1250	Sand, silty, fine- to medium-grained	
230	1252	Clay, silty, with a small amount of sand and caliche	
235	1255	Clay, sandy, with silt and caliche	
240	1300	Clay, silty, with caliche	Total depth borehole

Appendix B
Detailed Lithologic Log for MPL-02

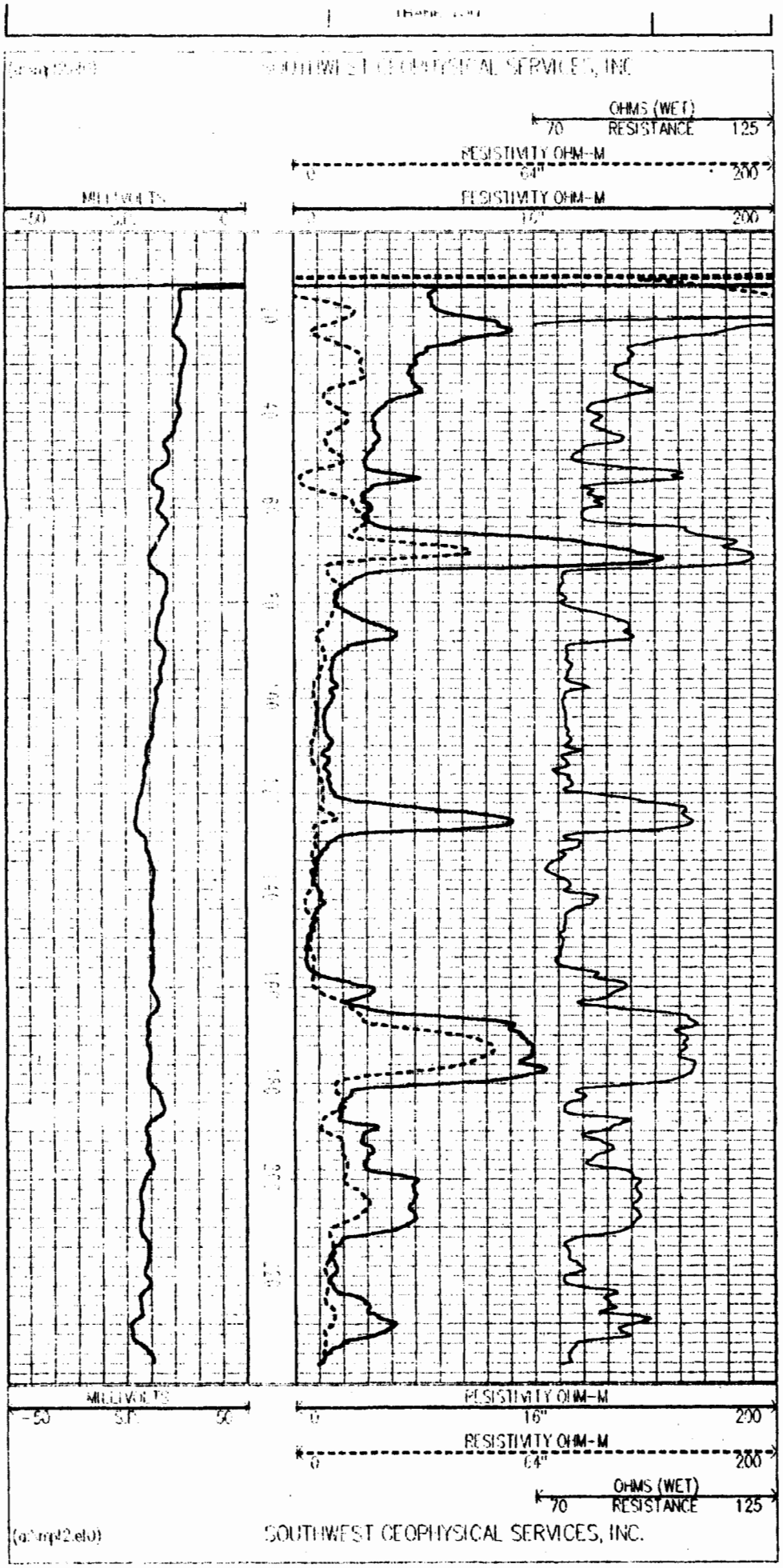
Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium- to very coarse-grained with pebbles up to 0.25 inches, and moderate yellowish brown (10YR 5/4) silt; angular to subangular, poorly sorted, composed of quartz, chert, medium grey (N5) (sedimentary) rock, granite, and very small amount of muscovite; small amount of greyish orange (10YR 7/4) clay.	10	0-10
Sand, very coarse-grained to pebble size; angular to subangular, poorly sorted; composed of granite, quartz, feldspar, and very small amount of muscovite; greyish orange (10YR 7/4) caliche coating grains and as a cement; from 15 to 20 feet grain size decreases to coarse-grained and pebbles.	10	10-20
Sand, medium- to very coarse-grained with pebbles up to 0.25 inches; angular to subangular, very poorly sorted; composed of quartz, granite, feldspar, biotite, hornblende, and a small amount of muscovite; greyish orange (10YR 7/4) caliche coating grains and as a cement; from 30 to 45 feet greyish orange (10YR 7/4) caliche content increases, grain size decreases, grains become subangular to subrounded, and hornblende is absent.	25	20-45
Sand, medium-grained to granule, and light brown (5YR 6/4) silt; subangular to subrounded, moderately sorted; composed of quartz, feldspar, granite, and biotite; small amount of very pale orange (10YR 8/2) caliche; from 50 to 55 feet a small amount of light brown (5YR 6/4) clay is present.	10	45-55

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, light brown (5YR 6/4), and medium- to coarse-grained sand with pebbles up to 0.6 inches; subangular to subrounded, very poorly sorted; sand is composed of quartz, feldspar, muscovite, and weathered granite; very small amount of light brown (5YR 6/4) silt; very pale orange (10YR 8/2) caliche; very pale orange (10YR 8/2) caliche content increases from 60 to 65 feet.	10	55-65
Sand, fine-grained to granule, and light brown (5YR 6/4) silt; angular to subrounded, poorly sorted, composed of quartz, chert, muscovite, dark reddish brown (10R 3/4) and dark grey (N3) (sedimentary) rock; pale yellowish orange (10YR 8/6) caliche.	5	65-70
Sand, coarse-grained; subangular to rounded, very well sorted; composed of quartz, chert, dark grey (N3) and dark reddish brown (10R 3/4) (sedimentary) rock, and weathered granite; small amount of pale yellowish orange (10YR 8/6) caliche coating most grains.	5	70-75
Clay, moderate brown (5YR 4/4), light brown (5YR 6/4) silt, and medium- to coarse-grained sand; subrounded to rounded, poorly sorted; composed of quartz and chert.	5	75-80
Clay, light brown (5YR 6/4), greyish orange pink (5YR 7/2) caliche, and a small amount of fine- to medium-grained sand; subrounded to rounded, very well sorted; composed of quartz and chert.	5	80-85

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium to coarse-grained, and light brown (5YR 6/4) silt; subangular to subrounded, well sorted, composed of quartz, chert, dark reddish brown (10R 3/4) (sedimentary) rock, and a very small amount of feldspar; light brown (5YR 6/4) clay; very pale orange (10YR 8/2) caliche.	10	85-95
Clay, moderate brown (5YR 4/4), light brown (5YR 6/4) silt, very pale orange (10YR 8/2) caliche, and a small amount of very fine- to fine-grained sand; subrounded to rounded, very well sorted; composed of quartz and chert; very pale orange (10YR 8/2) caliche and sand content increase from 100 to 125 feet.	30	95-125
Sand, medium- to very coarse-grained with pebbles up to 0.25 inches; subangular to rounded, well sorted; composed of quartz, chert, granite, and dark reddish brown (10R 3/4) (sedimentary) rock; very pale orange (10YR 8/2) caliche; small amount of light brown (5YR 6/4) clay.	5	125-130
Sand, medium- to very coarse-grained with pebbles up to 0.6 inches; subangular to rounded, poorly sorted; composed of quartz, chert, granite, dark reddish brown (10R 3/4) and medium grey (N5) (sedimentary) rock, and a very small amount of feldspar.	5	130-135
Sand, very fine to medium-grained; subangular to rounded, well sorted; composed of quartz, chert, and a small amount of muscovite; very small amount of greyish orange (10YR 7/4) clay; light brown (5YR 6/4) silt.	15	135-150

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, coarse- to very coarse-grained, and light brown (5YR 6/4) silt; subrounded to subangular, very well sorted; composed of quartz, chert, feldspar, granite, and small amount of muscovite; greyish orange (10YR 7/4) clay; white (N9) caliche.	10	150-160
Sand, fine- to coarse-grained, and greyish brown (5YR 3/2) clay; subangular to subrounded, moderately sorted, composed of quartz, chert, dark reddish brown (10R 3/4) (sedimentary) rock, and a very small amount of biotite.	5	160-165
Sand, coarse- to very coarse-grained and pebbles up to 0.3 inches, and light brown (5YR 6/4) clay; subangular to subrounded, moderately sorted; composed of quartz, chert, granite, and dark reddish brown (10R 3/4) (sedimentary) rock; very small amount of white (N9) caliche.	5	165-170
Sand, very coarse-grained to pebble size; subangular to rounded, poorly sorted; composed of quartz, chert, granite, and medium grey (N5) and dark reddish brown (10R 3/4) (sedimentary) rock; small amount of greyish orange (10YR 7/4) silt.	10	170-180
Sand, fine- to coarse-grained and a small amount of fine pebble gravel up to 0.2 inches, and greyish orange (10YR 7/4) silt; subrounded to rounded, well sorted; composed of quartz, chert, and dark reddish brown (10R 3/4) (sedimentary) rock; light brown (5YR 6/4) clay; small amount of very pale orange (10YR 8/2) caliche.	30	180-210

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium- to very coarse-grained with pebbles up to 0.3 inches; subangular to subrounded, well sorted; consists of quartz, chert, and dark reddish brown (10R 3/4), light grey (N7), and medium grey (N5) (sedimentary) rock.	10	210-220
Clay, moderate brown (5YR 3/4), and very fine to fine-grained sand, subangular to subrounded, very well sorted; sand composed of quartz and chert; small amount of light brown (5YR 6/4) silt.	10	220-230
Clay, moderate brown (5YR 4/4), greyish orange (10YR 7/4) silt, and white (N9) caliche with a small amount of fine-grained sand; subangular to subrounded, well sorted; sand composed of quartz and chert; sand content increases from 235 to 240 feet.	10	230-240


SOUTHWEST GEOPHYSICAL SERVICES, INC.
OHMS (WET)
70 RESISTANCE 125
RESISTIVITY OHM-M
0 64" 200
MILLIVOLTS
-50 50
RESISTIVITY OHM-M
0 16" 200
MILLIVOLTS
-50 50
RESISTIVITY OHM-M
0 16" 200
RESISTIVITY OHM-M
0 64" 200
OHMS (WET)
70 RESISTANCE 125
SOUTHWEST GEOPHYSICAL SERVICES, INC.

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	LOG MEASURED FROM: GL ELEVATION:	GAMMA RAY NEUTRON COMPENSATED DENSITY NEUTRON

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL
WELL: MPL-MW-2
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

COMPANY: MEVATEC
WELL: MPL-02

	RUN NO. 1		RUN NO. 1
DATE	5/19/96	FLUID LEVEL	20 FT
DEPTH DRILLER	230 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	230.5 FT	FLUID VISCOSITY	
BOTTOM LOGGED	230.0 FT	FL. RESISTIVITY	
TOP LOGGED INT	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	[illegible] FT	CIRCULATION TEMP.	
CASING SIZE	[illegible] IN OD	BOT HOLE TEMP.	
CASING SIZE	PVC	TOOL #	FLOC
BIT SIZE	7 & 7 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	[illegible]	WITNESSED BY:	DANA DOWNS

REMARKS:

THANK YOU

(cxmp12.89) SOUTHWEST GEOPHYSICAL SERVICES, INC

OHMS (WET)

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
CALIPER NATURAL GAMMA RAY BULK DENSITY NEUTRON	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL
WELL: MPL-MW-2
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

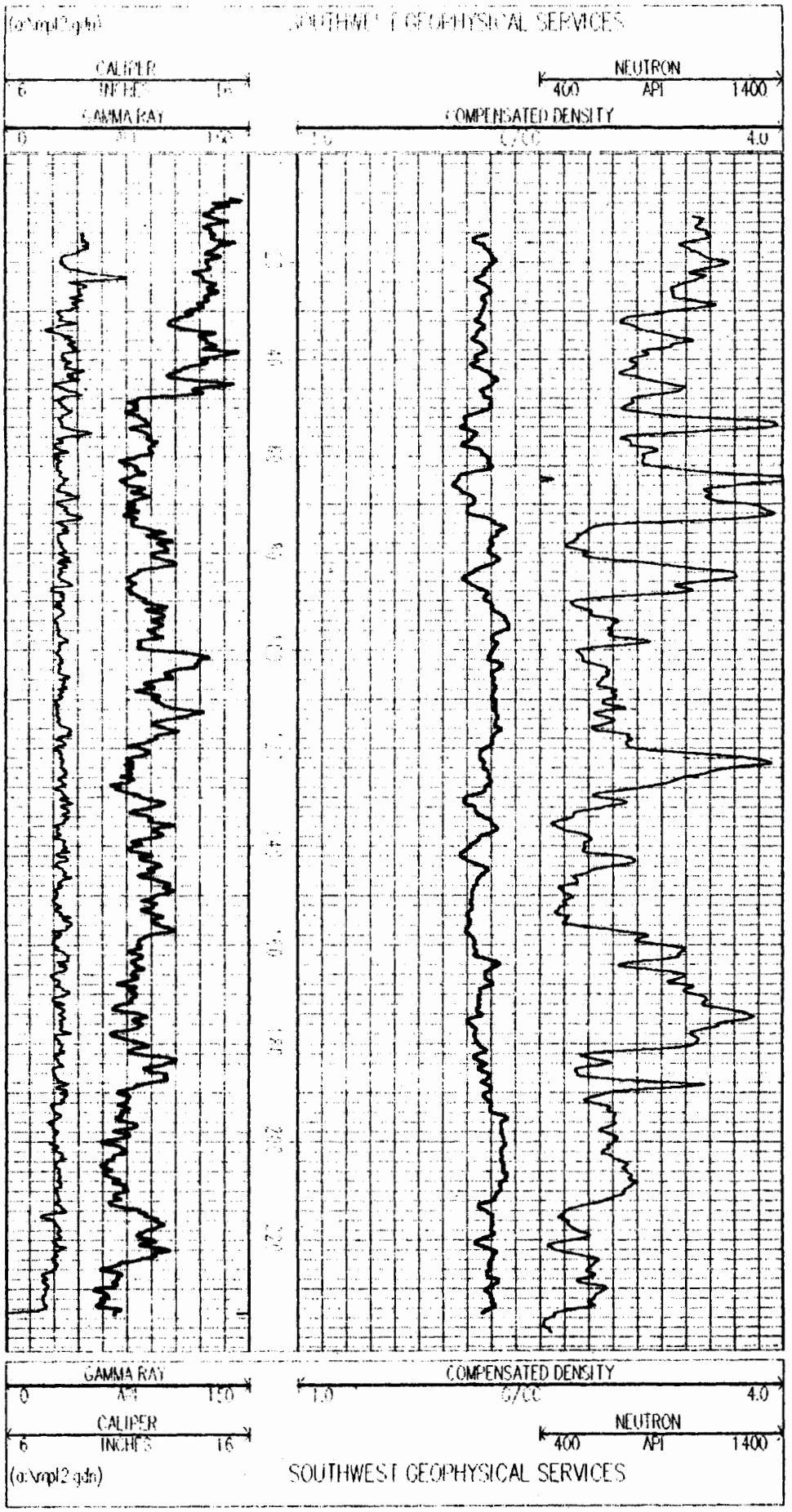
	RUN NO. 1		RUN NO. 1
DATE	5/19/96	FLUID LEVEL	FULL
DEPTH DRILLER	240 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	241 FT	FLUID VISCOSITY	
BOTTOM LOGGED	239 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	5 FT	CIRCULATION TEMP.	
CASING SIZE	5 IN OD	BOT HOLE TEMP.	
CASING SIZE	[illegible]	TOOL #	COMBO/SFD/PEL
BIT SIZE	[illegible]	LOGGED BY:	SHERRY MARIN
BIT SIZE	[illegible]	WITNESSED BY:	DANA DOWNS

REMARKS:

THANK YOU

COMPANY: MEVATEC
WELL: MPL-02

THANK YOU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SOUTHWEST GEOPHYSICAL SERVICES
CALIPER
6
INCHES
16
GAMMA RAY
0
API
150
NEUTRON
400
API
1400
COMPENSATED DENSITY
1.0
G/CC
4.0
GAMMA RAY
0
API
150
CALIPER
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INCHES
16
COMPENSATED DENSITY
1.0
G/CC
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NEUTRON
400
API
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(a:\rpl2.gdh)
SOUTHWEST GEOPHYSICAL SERVICES

APPENDIX C

MONITORING WELL INSTALLATION INFORMATION
WELL NO. MPL-03

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APPENDIX C
MONITORING WELL INSTALLATION INFORMATION
WELL NO. MPL-03

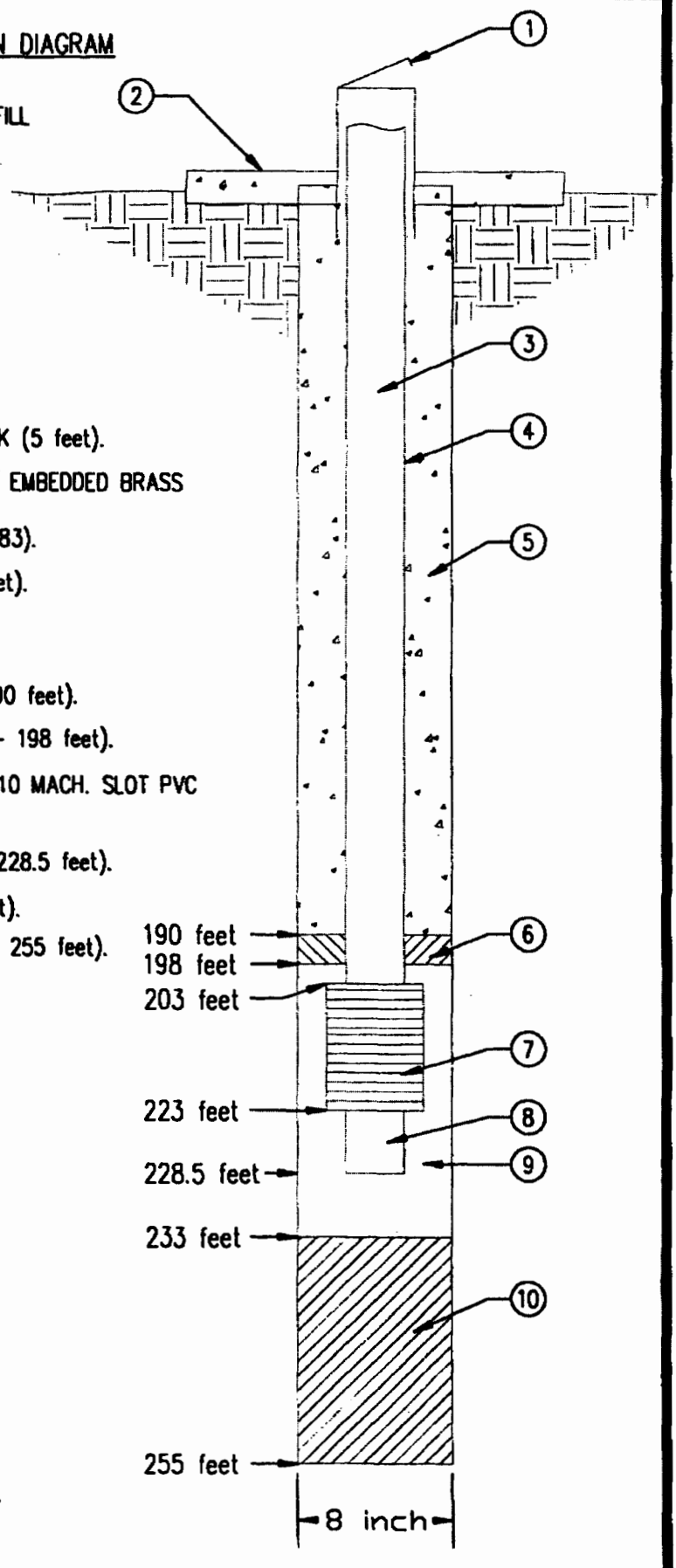
Monitoring Well Number:	MPL-03
Monitoring Well Name:	Downgradient Well for the Main Post Landfill
Location:	22S.05E.28.233 White Sands Missile Range
Driller/ Drilling Contractor:	Lee Gebbert NM Driller No. 1311 GeoProjects International Austin, Texas
Drilling Rig/Method:	Gardner Denver 1500/Mud rotary 7⅞ -inch tri-cone and blade bits
Dates of Drilling:	20- 21 May 1996
Total Depth of Test Hole:	255 feet
Diameter of Test Hole:	8 inches
Date Well Construction Completed:	22 May 1996
Geophysical Logging Contractor:	Southwest Geophysical Services, Inc. 4200 Skyline Drive Farmington, New Mexico 87401
Geophysical Logging Services:	Long-short normal resistivity Spontaneous potential Single point resistivity Neutron Gamma-gamma Caliper Natural gamma
Location Survey Contractor:	Wilson Survey Co. Inc. 240 Thunderbird Drive, Suite B El Paso, Texas 79912

APPENDIX C
MONITORING WELL INSTALLATION INFORMATION (cont.)
WELL MPL-03

Horizontal Location at Brass Cap:	North American Datum (1983) Latitude: 32°22'08.570" N Longitude: 106°25'54.253" W Univ. Transverse Mercator, Zone 13 Northing: 3,582,244.105 Easting: 365,303.249
Vertical Location at Brass Cap:	North American Vertical Datum (1988) - 3997.75 ft.
Well Development:	Approximately 220 gallons of drill fluids/aqueous liquids were purged by the drilling contractor using a 3-inch diameter steel bailer. Development continued using a 4-inch diameter submersible pump until the parameters of temperature, pH and conductivity remained below a 10% variance.
Surface Completion	A 5-foot long, 6-inch diameter, steel casing with a hinged, locking steel cap was installed over the PVC casing and embedded into the cement/bentonite grout. A 3-foot square, 12-inch thick concrete pad was constructed around the protective casing. Six inches of the concrete pad extend above ground surface. The protective casing extends approximately 36 inches above the surface of the concrete pad. A brass survey marker is embedded into the concrete pad, approximately 12 inches from the steel casing. Four 4-inch diameter steel posts, seven feet long, were placed equidistant from the well and embedded into the ground. The steel posts extend 3 feet above the ground. The steel casing and protective posts are painted with rust-protective safety - yellow paint.

APPENDIX C - MONITORING WELL CONSTRUCTION DIAGRAM

WELL NUMBER: MPL-03
NAME: DOWNGRADIENT M.W. AT MAIN POST LANDFILL
OGIST: DANA DOWNS



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (5 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) W/ EMBEDDED BRASS MARKER, ELEVATION 3997.75 feet (NAVD 1988). LAT. 32° 22'08.570" LONG.106° 25'54.253" (NAD 83).
3. UPPER CASING: 4 inch SCH. 40 PVC (0 - 203 feet).
4. CENTRALIZERS AT: 60 feet, 100 feet, 140 feet, 180 feet, 203 feet, & 223 feet.
5. BACKFILL: CEMENT/5% BENTONITE SLURRY (0 - 190 feet).
6. UPPER SEAL: HYDRATED BENTONITE CHIPS (190 - 198 feet).
7. JOHNSON PRE-PACK , 4 inch I.D., SCH. 40, NO. 10 MACH. SLOT PVC 20 feet LONG (203 - 223 feet).
8. LOWER SAND TRAP: 4 inch SCH. 40 PVC (223 - 228.5 feet).
9. FILTER PACK: CLEAN SILICA SAND (198 - 233 feet).
10. LOWER SEAL: HYDRATED BENTONITE CHIPS (233 - 255 feet).

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 255 feet.
2. TEST HOLE DIAMETER: 8 inch.
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. DRAWING NOT TO SCALE.

APPENDIX C
FIELD LOG
AND
DETAILED LITHOLOGIC LOG
WELL MPL-03

The following logs were prepared by examination of drill cuttings by the site geologist. The Field Log represents a general description of lithologic conditions and drilling activities for the length of the borehole. The Detailed Lithologic Log was prepared by microscopic examination of drill cuttings.

For the lithologic description, grain size was determined in accordance with that described by Myers and Pinckley (1985), and rounding was determined from comparison with the grain models shown in the Manual of Field Geology (Compton, 1962). The degree of roundness can range from very angular to well rounded. Sorting is the degree to which grains in a sample approach the same size. This value can range from very well sorted (grains all the same size) to very poorly sorted (a wide range of grain sizes with no dominant grain sizes). The colors and any accompanying code numbers in the lithologic descriptions refer to the colors from the Rock-Color Chart (Goddard, 1948) prepared by the Rock-Color Chart Committee and distributed by the Geological Society of America. Color determination was made from dry samples.

Classification of Detrital Sediments by Grain Diameter

Description	Size in mm	Size in inches
Pebbles	4-64	0.15-2.5
Granules	2-4	0.08-0.15
Very coarse sand	1.0-2.0	0.04-0.15
Coarse sand	0.5-1.0	0.02-0.04
Medium sand	0.25-0.5	0.01-0.02
Fine sand	0.125-0.25	0.005-0.01
Very fine sand	0.0625-0.125	0.0025-0.005
Silt	0.004-0.0625	0.00015-0.0025
Clay	less than 0.004	less than 0.00015

Field Lithologic Log
Well MPL-03

Project:	Background Groundwater Monitoring		
Location:	Main Post Landfill		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 1500
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Elevation Brass Marker: 3,997.75 ft.	
Geologist:	D. Downs	Dates of Drilling: May 21, 1996	

Depth (feet)	Date/Time	Description of Material	Remarks
5	5-21-96 0730	Sand, fine- to coarse-grained, with caliche	
10	0740	Sand, fine- to coarse-grained, with caliche	
15	0745	Sand, fine- to coarse-grained, with caliche and gravel	
20	0747	Sand, medium- to fine-grained, with caliche	Add 20 ft section
25	0750	Sand, medium- to coarse-grained, angular, with caliche	
30	0753	Sand with a small amount of silty clay	
35	0755	Silt with caliche and a small amount of clay	
40	0800	Sand medium- to coarse-grained	Add 20 ft section
45	0805	Silt and caliche with sand	
50	0810	Sand, medium- to coarse-grained	
55	0815	Silt and caliche	
60	0820	Sand, silty, with caliche	
65	0825	Clay, silty, with sand and caliche	
70	0825	Clay, silty, with caliche	

Depth (feet)	Date/Time	Description of Material	Remarks
75	0827	Clay, silty, with caliche	
80	0830	Clay, silty, with coarse-grained sand and caliche	
85	0835	Clay, silty, with gravel and caliche	Add 20 ft section
90	0836	Clay, silty, with caliche	
95	0845	Silt with caliche	
100	0850	Silt with caliche	
105	0900	Silt with caliche	
110	0905	Silt, sandy. with caliche	
115	0910	Sand, medium- to coarse-grained, with silt	
120	0912	Sand with silt and caliche	
125	0914	Silt, sandy, with caliche and a small amount of clay	
130	0920	Sand, medium- to coarse-grained, with gravel	
135	0920	Sand, medium- to coarse-grained, with gravel	
137		Clay	
140	0922	Silt, clay, and sand	Split barrel sample 140-142 ft. See lith. log for desc.
145	1010	Clay, silty, and sand	
150	1030	Clay, stiff, with sand	
155	1050	Clay with coarse-grained sand and caliche	
157		Sand, coarse-grained	End of clay
160	1100	Sand, well sorted, clean with very small amount of clay.	Split barrel sample from 160-162 ft.
165	1130	Sand, coarse- to medium-grained	
170	1135	Sand, coarse- to medium-grained, with gravel	

Depth (feet)	Date/Time	Description of Material	Remarks
175	1140	Sand, coarse- to medium-grained, with a small amount of clay	
178.5	1142	Clay	
180	1145	Clay, silty, with sand and caliche	Split-barrel sample 180-182, break for lunch
185	1350	Silt and sand with clay	
190	1355	Sand, coarse-grained, with silt	
195	1357	Sand, coarse-grained	
200	1405	Sand, coarse-grained, with clay	Split barrel sample 200-202 ft.
204		Sand with silty clay and gravel	
210	1455	Sand with silty clay	
215	1458	Sand, coarse-grained, with a very small amount of clay	
220	1500	Sand, medium- to fine-grained, wet	Split-barrel sample 220-222 ft.
225	1540	Sand with small amounts of caliche and clay	
230	1545	Clay with sand and caliche	
235	1605	Clay with silty clay and sand	
240	1615	Clay, silty, with sand	No sample - drill to 255 ft. to verify lithology
245	1625	Clay, silty, with sand	
250	1630	Clay, silty, with sand and caliche	
255	1635	Clay, silty, with sand and caliche	Total depth borehole

Appendix C
Lithologic Log for MPL-03

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, fine-grained to pebbles up to 0.25 inches; angular to subrounded, poorly sorted; composed of quartz, feldspar, granite, dark reddish brown (10R 3/4) and medium grey (N5) (sedimentary) rock, chert, and a very small amount of biotite; very pale orange (10YR 8/2) caliche coating grains.	15	0-15
Sand, very coarse-grained to pebbles up to 0.4 inches; subangular, moderately sorted; composed of quartz, feldspar, granite, medium grey (N5) (sedimentary) rock, and chert; very pale orange (10YR 8/2) caliche coating grains.	5	15-20
Sand, medium-grained to pebbles up to 0.3 inches; subangular to subrounded, moderately sorted; composed of quartz, feldspar, granite, medium grey (N5) (sedimentary) rock, and a very small amount of hornblende; very pale orange (10YR 8/2) caliche.	5	20-25
Sand, coarse-grained to pebbles up to 0.4 inches; angular to subrounded, moderately sorted; composed of quartz, feldspar, granite, and chert; very pale orange (10YR 8/2) caliche; a small amount of dark yellow orange (10YR 6/6) silt from 30 to 35 feet.	10	25-35
Clay, light brown (5YR 6/4), and greyish orange (10YR 7/4) silt with a small amount of very fine- to medium-grained sand, subrounded to rounded, very well sorted; sand is composed of quartz and chert; moderate orange pink (5YR 8/4) caliche.	5	35-40

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, coarse-grained to pebbles up to 0.4 inches; angular to subangular, well sorted; composed of quartz, feldspar, granite; very small amount of very pale orange (10YR 8/2) caliche.	5	40-45
Silt, greyish orange (10YR 7/4), and medium- to coarse-grained sand; subangular to subrounded, well sorted; composed of quartz, chert, granite, and dark reddish brown (10R 3/4) and dark grey (N3) (sedimentary) rock; very pale orange (10YR 8/2) caliche.	5	45-50
Sand, coarse-grained to pebbles up to 0.25 inches; subangular to subrounded, moderately sorted; composed of quartz, feldspar, chert, granite, and light grey (N7) (sedimentary) rock; very pale orange (10YR 8/2) caliche; small amount of greyish orange pink (5YR 7/2) silt.	5	50-55
Silt, pale yellowish brown (10YR 6/2), and medium- to coarse-grained sand; subangular to subrounded, well sorted; composed of quartz, chert, and dark reddish brown (10R 3/4) (sedimentary) rock; very pale orange (10YR 8/2) caliche.	5	55-60
Sand, medium- to coarse-grained, and pale yellowish brown (10YR 6/2) silt; subangular to subrounded, very well sorted; composed of quartz, chert, dark reddish brown (10R 3/4) (sedimentary) rock, and granite; white (N9) caliche.	5	60-65

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, light brown (5YR 6/4), and greyish orange (10YR 7/4) silt with very fine- to coarse-grained sand; subangular, well sorted; composed of quartz and chert; very small amount of yellowish grey (5YR 7/2) clay and white (N9) caliche; contains a small amount of granule to pebbles from 80 to 90 feet.	40	65-105
Silt, light brown (5YR 6/4), moderate brown (5YR 4/4) clay, and fine- to coarse-grained sand; subangular to subrounded, well sorted; composed of quartz, chert, and a small amount of weathered granite; very pale orange (10YR 8/2) caliche.	5	105-110
Silt, greyish orange (10YR 7/4), and fine to medium-grained sand, subangular to subrounded, well sorted, composed of quartz, chert, and granite; white (N9) caliche; small amount of light brown (5YR 6/4) clay.	5	110-115
Sand, fine- to coarse-grained, and light brown (5YR 6/4) silt; subangular to subrounded, moderately sorted; composed of quartz, chert, and dark reddish brown (10R 3/4), medium grey (N5), and light grey (N7) (sedimentary) rock; small amount of greyish orange (10YR 7/4) clay; greyish orange (10YR 7/4) clay content increases and white (N9) caliche present from 120 to 130 feet.	15	115-130

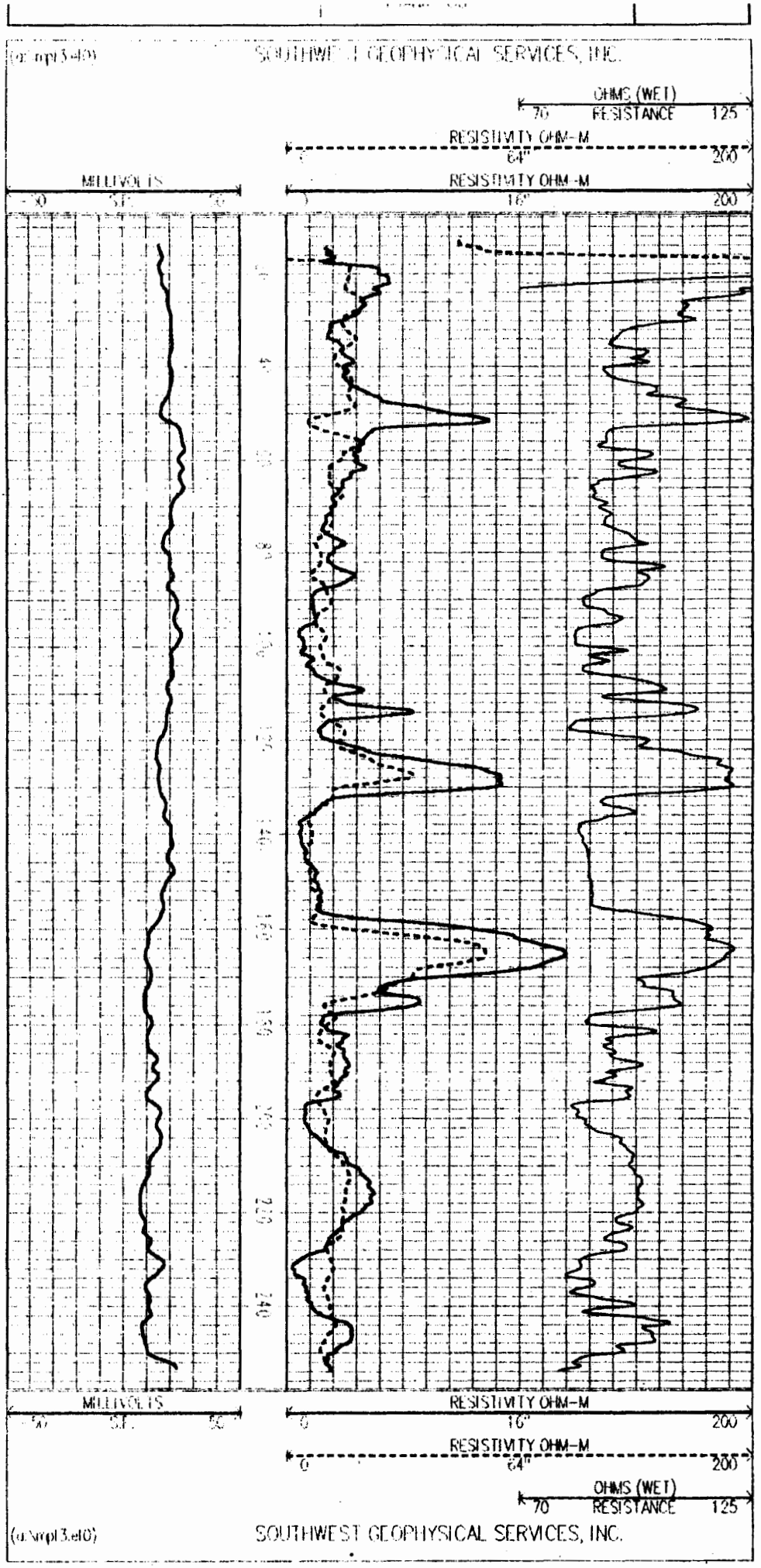
Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium- to very coarse-grained and pebbles up to 0.25 inches; subangular to subrounded, well sorted; composed of quartz, chert, dark reddish brown (10R 3/4) and medium grey (N5) (sedimentary) rock, and a small amount of granite; very small amount of white (N9) caliche.	5	130-135
Sand, medium- to very coarse-grained and pebbles up to 0.5 inches, subangular to rounded, moderately sorted, composed of quartz, chert, dark reddish brown (10R 3/4), medium grey (N5), and light grey (N7) (sedimentary) rock, and granite.	5	135-140
Clay, white (N9) and light brown (5YR 6/4) , yellowish grey (5Y 7/2) caliche, greyish orange pink (5YR 7/2) silt, and a small amount of coarse- to very coarse-grained sand; subangular to subrounded, well sorted; composed of quartz, chert, medium grey (N5) and light grey (N7) (sedimentary) rock, and granite.	10	140-150
Clay, light brown (5YR 6/4), and medium- to very coarse-grained sand; subangular to rounded, well sorted; composed of quartz, chert, dark grey (N3) and moderate reddish orange (10R 6/6) (sedimentary) rock, and granite; very pale orange (10YR 8/2) caliche.	10	150-160
Sand, fine- to coarse-grained with a small amount pebbles up to 0.3 inches, and moderate brown (5YR 4/4) clay; subrounded to rounded, well sorted; composed of quartz, chert, and medium grey (N5) and moderate brown (5YR 3/4) (sedimentary) rock.	2	160-162

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, light brown (5YR 6/4) and medium to very coarse-grained sand, subangular to rounded, well sorted, composed of quartz, chert, dark grey (N3) and moderate orange pink (10R 7/4) (sedimentary) rock, and granite; very pale orange (10YR 8/2) caliche.	3	162-165
Sand, coarse-grained to granule with a small amount of pebbles to 0.25 inches; subangular to subrounded, well sorted; composed of quartz, chert, medium grey (N5), dark gray (N3), and dark reddish brown (10R 3/4) (sedimentary) rock, and granite.	5	165-170
Sand, coarse-grained to medium pebble gravel up to 0.5 inches; subangular to rounded, moderately sorted; composed of quartz, chert, light gray (N7) and moderate reddish brown (10R 3/4) (sedimentary) rock, and granite.	5	170-175
Sand, medium-grained to granule with pebbles up to 0.25 inches; subangular to rounded, moderately sorted; composed of quartz, chert, moderate reddish brown (10R 3/4), medium grey (N5), and dark grey (N3) (sedimentary) rock, and granite; light brown (5YR 6/4) clay.	5	175-180
Clay, moderate brown (5YR 4/4), silt, and very fine- to medium-grained sand; subrounded to rounded, very well sorted; composed of quartz, chert, and moderate reddish brown (10R 3/4) (sedimentary) rock; small amount of white (N9) caliche.	5	180-185

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, fine-grained to granule, and greyish orange (10YR 7/4) silt; subangular to rounded, moderately sorted; composed of quartz, chert, and dark reddish brown (10R 3/4) and medium grey (sedimentary) rock; light brown (5YR 6/4) clay; very small amount of white (N9) caliche.	5	185-190
Sand, medium-grained to granule, and light brown (5YR 6/4) silt; subangular to subrounded, well sorted; composed of quartz, chert, and medium grey (N5), light grey (N7), and dark reddish brown (10R 3/4) (sedimentary) rock.	10	190-200
Sand, fine- to coarse-grained, and light brown (5YR 6/4) silt; subangular to rounded, very well sorted; composed of quartz, chert, and dark reddish brown (10R 3/4) (sedimentary) rock; moderate brown (5YR 4/4) clay.	5	200-205
Sand, medium-grained to granule, and greyish orange (10YR 7/4) silt; angular to subrounded, moderately sorted; composed of quartz, chert, dark reddish brown (10R 3/4) and medium grey (N5) (sedimentary) rock, and a very small amount of feldspar; light brown (5YR 6/4) clay; granule fraction decreases from 210 to 215 feet.	10	205-215
Sand, medium- to very coarse-grained; subangular to subrounded, well sorted; composed of quartz, chert, medium grey (N5) and dark reddish brown (10R 3/4) (sedimentary) rock, and a very small amount of granite; small amount of light brown (5YR 6/4) clay.	5	215-220

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, fine- to coarse-grained; subrounded to rounded, very well sorted; composed of quartz, chert, and medium grey (N5) and dark reddish brown (10R 3/4) (sedimentary) rock.	5	220-225
Sand, fine- to very coarse-grained; subangular to subrounded, well sorted; composed of quartz, chert, and medium grey (N5) and dark grey (N3) (sedimentary) rock; light brown (5YR 6/4) clay; white (N9) caliche.	5	225-230
Clay, greyish orange (10YR 7/4), and medium- to coarse-grained sand; subangular to rounded, very well sorted; composed of quartz, chert, and light grey (N7), medium grey (N5), and dark reddish brown (10R 3/4) (sedimentary) rock; white (N9) caliche.	5	230-235
Clay, moderate brown (5YR 4/4), light brown (5YR 6/4) silt, and medium- to very coarse-grained sand; subangular to rounded, well sorted; composed of quartz, chert, and dark grey (N3) and dark reddish brown (10R 3/4) (sedimentary) rock; white (N9) caliche.	5	235-240
Sand, medium- to very coarse-grained, and greyish orange (10YR 7/4) silt; subangular to subrounded, very well sorted; composed of quartz, chert, and medium grey (N5), dark grey (N3), and dark reddish brown (10R 3/4) (sedimentary) rock; light brown (5YR 6/4) clay; white (N9) caliche.	5	240-245

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, light brown (5YR 6/4), greyish orange (10YR 7/4) silt, and medium- to very coarse-grained sand; subangular to rounded, moderately sorted; composed of quartz, chert, and dark grey (N3), medium grey (N5), and dark reddish brown (10R 3/4) (sedimentary) rock; white (N9) caliche; pebbles to 0.25 inches present from 250 to 255 feet.	10	245-255


SOUTHWEST GEOPHYSICAL SERVICES, INC.
OHMS (WET)
70 RESISTANCE 125
RESISTIVITY OHM-M
0 64" 200
MILLIVOLTS
-50 SP 50
RESISTIVITY OHM-M
0 16" 200
40
80
120
160
200
240
MILLIVOLTS
-50 SP 50
RESISTIVITY OHM-M
0 16" 200
RESISTIVITY OHM-M
0 64" 200
OHMS (WET)
70 RESISTANCE 125
SOUTHWEST GEOPHYSICAL SERVICES, INC.

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	LOG MEASURED FROM: GL ELEVATION:	GAMMA RAY NEUTRON COMPENSATED DENSITY NEUTRON

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL
WELL: MPL-MW-3
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

COMPANY: MEVATEC
WELL: MPL-03

	RUN NO. 1		RUN NO. 1
DATE	5/21/96	FLUID LEVEL	20 FT
DEPTH DRILLER	[illegible] FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	[illegible] FT	FLUID VISCOSITY	
BOTTOM LOGGED	[illegible] FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	[illegible]	CIRCULATION TEMP.	
CASING SIZE	[illegible]	BOT HOLE TEMP.	
CASING SIZE	PVC	TOOL #	[illegible]
BIT SIZE	[illegible]	LOGGED BY:	SHERRY MARIN
BIT SIZE	[illegible] ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:

THANK YOU

(g:\mpl3.el0) SOUTHWEST GEOPHYSICAL SERVICES, INC.

OHMS (WET)
70 RESISTANCE 125

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
CALIPER NATURAL GAMMA RAY BULK DENSITY NEUTRON	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL
WELL: MPL-MW-3
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

	RUN NO. 1		RUN NO. 1
DATE	5/21/96	FLUID LEVEL	FULL
DEPTH DRILLER	255.5 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	255.4 FT	FLUID VISCOSITY	
BOTTOM LOGGED	254.4 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	0 FT	CIRCULATION TEMP.	
CASING SIZE	4 IN OD	BOT HOLE TEMP.	
CASING SIZE	PVC	TOOL #	COMBO/CPD20
BIT SIZE	7 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	MUD ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:

THANK YOU

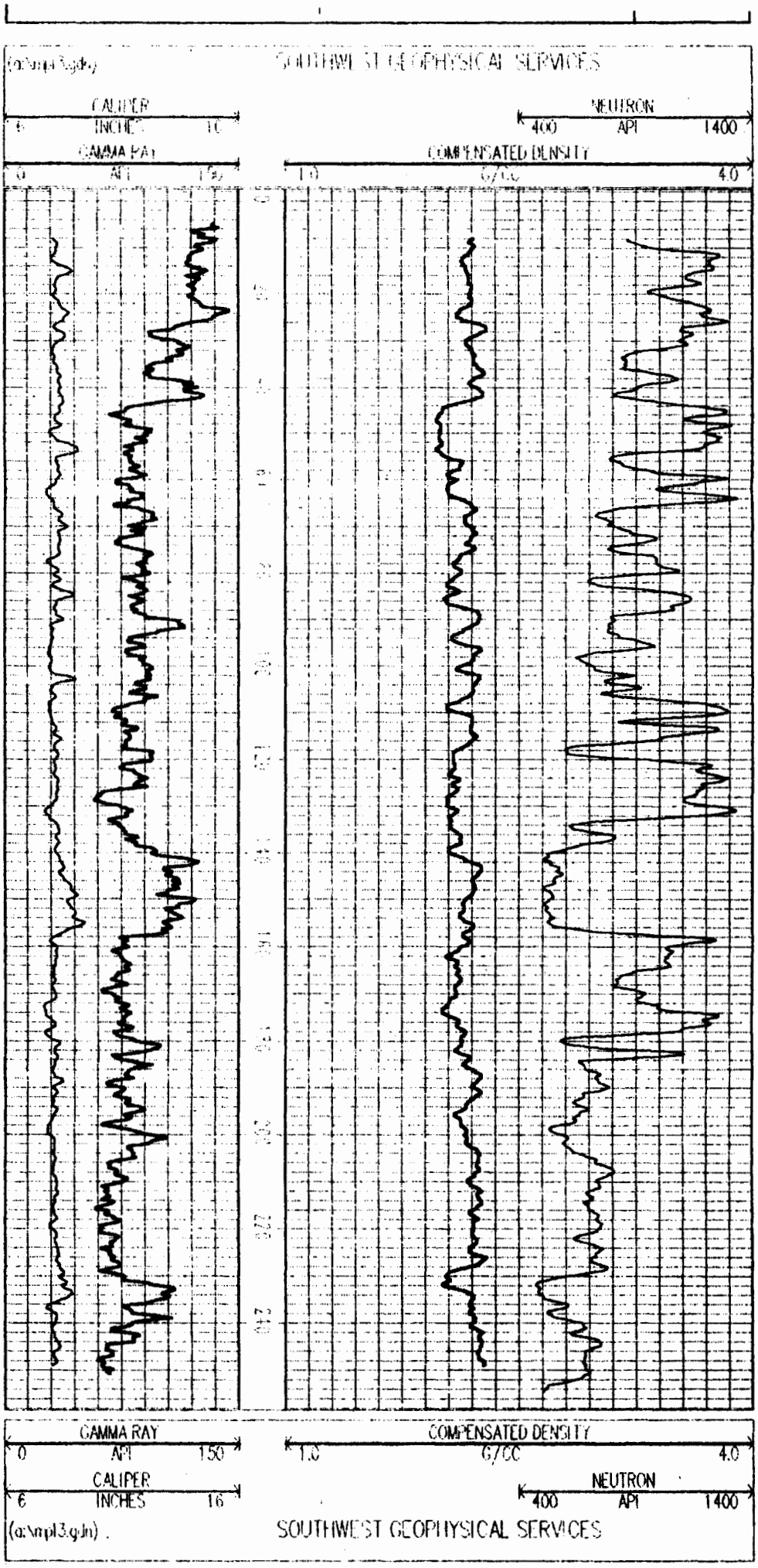
COMPANY: MEVATEC
WELL:
MPL-03

(Company)

SOUTHWEST GEOPHYSICAL SERVICES

CALIPER

NEUTRON


SOUTHWEST GEOPHYSICAL SERVICES
CALIPER
6 INCHES 16
NEUTRON
400 API 1400
GAMMA RAY
0 API 150
COMPENSATED DENSITY
1.0 G/CC 4.0
GAMMA RAY
0 API 150
COMPENSATED DENSITY
1.0 G/CC 4.0
CALIPER
6 INCHES 16
NEUTRON
400 API 1400
(a:\mpl3.gdn)
SOUTHWEST GEOPHYSICAL SERVICES

APPENDIX D

MONITORING WELL INSTALLATION INFORMATION
WELL NO. MPL-04

APPENDIX D
MONITORING WELL INSTALLATION INFORMATION
WELL NO. MPL-04

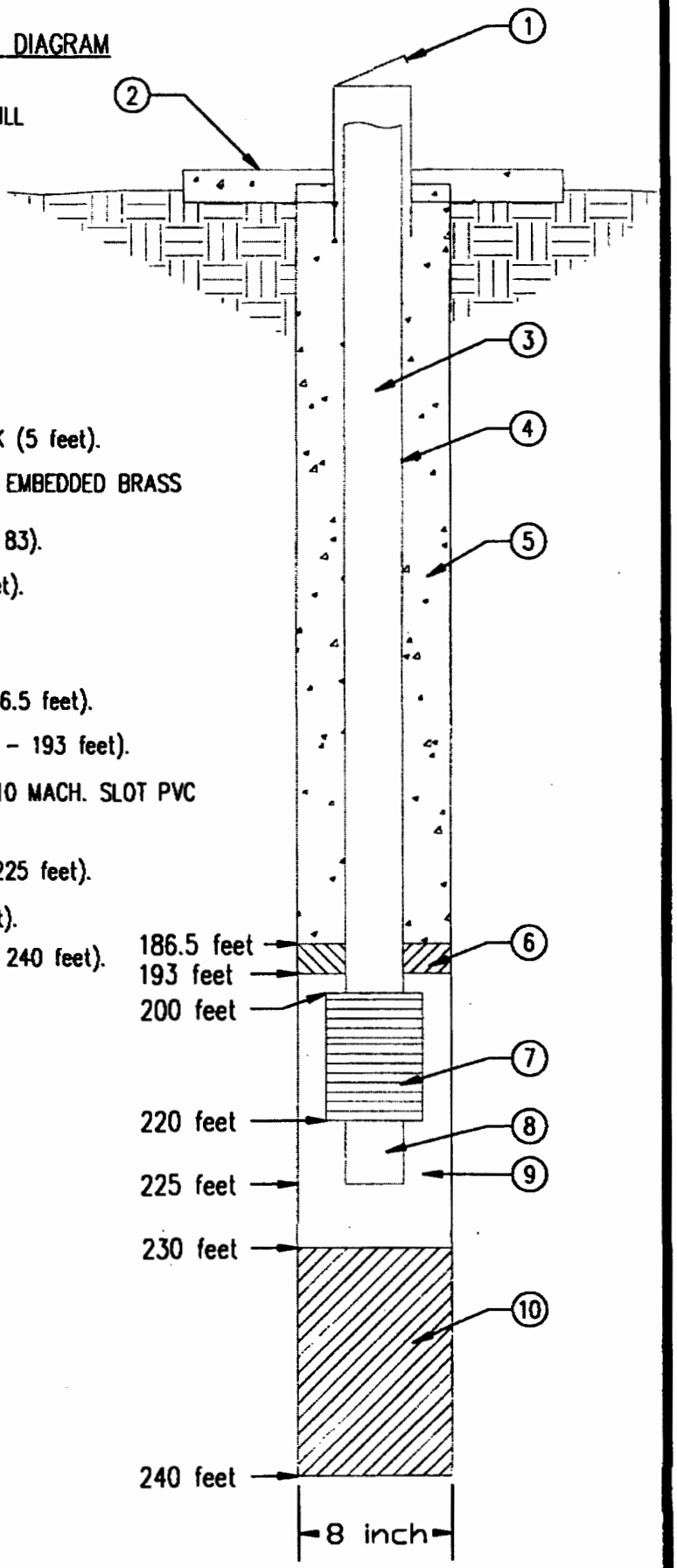
Monitoring Well Number:	MPL-04
Monitoring Well Name:	Downgradient Well for the Main Post Landfill
Location:	22S.05E.28.232 White Sands Missile Range
Driller/ Drilling Contractor:	Lee Gebbert NM Driller No. 1311 GeoProjects International Austin, Texas
Drilling Rig/Method:	Gardner Denver 1500/Mud rotary 7⅞-inch tri-cone and blade bits
Dates of Drilling:	29-30 May 1996
Total Depth of Test Hole:	240 feet
Diameter of Test Hole:	8 inches
Date Well Construction Completed:	30 May 1996
Geophysical Logging Contractor:	Southwest Geophysical Services, Inc. 4200 Skyline Drive Farmington, New Mexico 87401
Geophysical Logging Services:	Long-short normal resistivity Spontaneous potential Single point resistivity Neutron Gamma-gamma Caliper Natural gamma
Location Survey Contractor:	Wilson Survey Co. Inc. 240 Thunderbird Drive, Suite B El Paso, Texas 79912

APPENDIX D
MONITORING WELL INSTALLATION INFORMATION (cont.)
WELL MPL-04

Horizontal Location at Brass Cap:	North American Datum (1983) Latitude: 32°22'10.966" N Longitude: 106°25'49.972" W Univ. Transverse Mercator, Zone 13 Northing: 3,582,316.395 Easting: 365,416.103
Vertical Location at Brass Cap:	North American Vertical Datum (1988) - 3993.5 ft.
Well Development:	Approximately 245 gallons of drill fluids/aqueous liquids were purged by the drilling contractor using a 3-inch diameter steel bailer. Development continued using a 4-inch diameter submersible pump until the parameters of temperature, pH and conductivity remained below a 10% variance.
Surface Completion	A 5-foot long, 6-inch diameter, steel casing with a hinged, locking steel cap was installed over the PVC casing and embedded into the cement/bentonite grout. A 3-foot square, 12-inch thick concrete pad was constructed around the protective casing. Six inches of the concrete pad extend above ground surface. The protective casing extends approximately 36 inches above the surface of the concrete pad. A brass survey marker is embedded into the concrete pad, approximately 12 inches from the steel casing. Four 4-inch diameter steel posts, seven feet long, were placed equidistant from the well and embedded into the ground. The steel posts extend 3 feet above the ground. The steel casing and protective posts are painted with rust-protective safety - yellow paint.

APPENDIX D – MONITORING WELL CONSTRUCTION DIAGRAM

WELL NUMBER: MPL-04
WELL NAME: DOWNGRADIENT M.W. AT MAIN POST LANDFILL
GEOLOGIST: DANA DOWNS



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (5 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) W/ EMBEDDED BRASS MARKER, ELEVATION 3993.50 feet (NAVD 1988).
   LAT. 32° 22'10.966" LONG. 106° 25'49.972" (NAD 83).
3. UPPER CASING: 4 inch SCH. 40 PVC (0 – 200 feet).
4. CENTRALIZERS AT: 60 feet, 100 feet, 140 feet, 180 feet, 200 feet, & 220 feet.
5. BACKFILL: CEMENT/5% BENTONITE SLURRY (0 – 186.5 feet).
6. UPPER SEAL: HYDRATED BENTONITE CHIPS (186.5 – 193 feet).
7. JOHNSON PRE-PACK , 4 inch I.D., SCH. 40, NO. 10 MACH. SLOT PVC 20 feet LONG (200 – 220 feet).
8. LOWER SAND TRAP: 4 inch SCH. 40 PVC (220 – 225 feet).
9. FILTER PACK: CLEAN SILICA SAND (193 – 230 feet).
10. LOWER SEAL: HYDRATED BENTONITE CHIPS (230 – 240 feet).

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 240 feet.
2. TEST HOLE DIAMETER: 8 inch.
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. DRAWING NOT TO SCALE.

APPENDIX D
FIELD LOG
AND
DETAILED LITHOLOGIC LOG
WELL MPL-04

The following logs were prepared by examination of drill cuttings by the site geologist. The Field Log represents a general description of lithologic conditions and drilling activities for the length of the borehole. The Detailed Lithologic Log was prepared by microscopic examination of drill cuttings.

For the lithologic description, grain size was determined in accordance with that described by Myers and Pinckley (1985), and rounding was determined from comparison with the grain models shown in the Manual of Field Geology (Compton, 1962). The degree of roundness can range from very angular to well rounded. Sorting is the degree to which grains in a sample approach the same size. This value can range from very well sorted (grains all the same size) to very poorly sorted (a wide range of grain sizes with no dominant grain sizes). The colors and any accompanying code numbers in the lithologic descriptions refer to the colors from the Rock-Color Chart (Goddard, 1948) prepared by the Rock-Color Chart Committee and distributed by the Geological Society of America. Color determination was made from dry samples.

Classification of Detrital Sediments by Grain Diameter

Description	Size in mm	Size in inches
Pebbles	4-64	0.15-2.5
Granules	2-4	0.08-0.15
Very coarse sand	1.0-2.0	0.04-0.15
Coarse sand	0.5-1.0	0.02-0.04
Medium sand	0.25-0.5	0.01-0.02
Fine sand	0.125-0.25	0.005-0.01
Very fine sand	0.0625-0.125	0.0025-0.005
Silt	0.004-0.0625	0.00015-0.0025
Clay	less than 0.004	less than 0.00015

Field Lithologic Log
MPL-04

Project:	Background Groundwater Monitoring		
Location:	Main Post Landfill		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 1500
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Elevation Brass Marker:	3993.50 ft.
Geologist:	D. Downs	Dates of Drilling:	May 29, 1996

Depth (feet)	Date/Time	Description of Material	Remarks
5	**5-29-96** 0725	Sand, coarse-grained, with caliche	
10	0732	Sand and very fine-grained silt with a small amount of gravel	
15	0735	Sand, medium- to coarse-grained, with caliche	
20	0740	Sand, fine- to medium-grained	Add 20-ft. section
25	0746	Sand, coarse-grained, with silt and caliche	
30	0750	Silt with caliche fragments	
35	0801	Silt, sand, and caliche fragments	
40	0805	Silt, slightly cemented with caliche	
45	0810	Silt with small amounts sand and caliche	
50	0812	Sand, fine- to medium-grained	
55	0815	Clay, silty, grey, with sand	
60	0818	Clay, silty, with sand	
65	0825	Sand, silty, fine- to medium-grained, with caliche	
70	0828	Clay, silty, with caliche	

Depth (feet)	Date/Time	Description of Material	Remarks
75	0831	Clay, silty, with caliche	
80	0836	Clay, silty, with a very small amount of sand	81-89 ft slow difficult drilling - clay
85	0852	Clay, silty, with a very small amount of sand	
90	0963	Clay with cement and silt	
95	0907	Clay, silty, with cemented particles	
100	0917	Silt and silty clay	
105	0935	Clay, silty	
110	0940	Clay, silty, with caliche	
115	0945	Sand, silty, with caliche fragments	Sand at 113 ft - out of clay -sand from 113-118 ft., clay at 118 ft
120	0950	Clay, silty, with a small amount of organic matter	Slow drilling
125	1010	Clay and silt, reddish brown	
130	1015	Clay, silty, with caliche	Continued slow drilling
135	1025	Clay, silty, light grey	
140	1100	Clay, brown, stiff, with caliche and a very small amount organic matter, homogeneous	Split barrel sample 140-142 ft.
145	1155	Clay, silty, with caliche	
150	1235	Clay, silty, light brown	1210 - stopped to thin out mud, shovel out mud pit
155	1240	Silt with caliche and sand	
			1245- Lunch 1345 - return
160	1430	Silt and very fine-grained sand, well sorted, dark brown	Split barrel sample-160-162 ft - 100% recovery

Depth (feet)	Date/Time	Description of Material	Remarks
165	1450	Silt and very fine-grained sand with caliche	
170	1455	Sand with silt and caliche	
175	1458	Clay, silty, with sand	
180	1520	Sand, very fine- to fine-grained, well sorted, damp	Split barrel sample, 180-182 ft. 50% recovery
185	1550	Sand, medium- to coarse-grained, with a small amount of silt	
190	1555	Sand, silty, with caliche	
195	1600	Silt with a small amount of sand	
200	1630	Sand, medium- to fine-grained, well sorted, wet, good sand	Split barrel sample, 200-202 ft. 75% recovery
205	1645	Sand, medium- to coarse-grained, with a small amount of silt	
210	1650	Sand, medium- to coarse-grained, with a small amount of silt	
215	1655	Sand, medium- to coarse-grained, with a small amount of silt	
220	1730	Sand, medium- to fine-grained, wet, with small amount of clay and caliche	Split barrel sample - 220-222 ft. 90% recovery
224	1735	Clay	
225	1740	Sand with silty clay	
230	1751	Silt with sand	
235	1755	Silt with medium- to coarse-grained sand	
240	1800	Silt with medium- to coarse-grained sand and caliche	Total depth borehole

Appendix D
Detailed Lithologic Log for MPL-04

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium-grained with pebbles; angular to subangular, poorly sorted; composed of quartz, granite, feldspar, and medium grey (N5) and moderate reddish brown (10R 4/6) (sedimentary) rock; very pale orange (10YR 8/2) caliche coating most grains.	10	0-10
Sand, medium-grained to pebble size, and moderate brown (5YR 4/4) silt; subangular to subrounded, poorly sorted, composed of quartz, feldspar, granite, chert, and light grey (N7) (sedimentary) rock.	5	10-15
Sand, medium-grained to pebble size; subangular to subrounded, moderately sorted; composed of quartz, feldspar, granite, chert, and a very small amount of hornblende; white (N9) caliche.	5	15-20
Sand, fine- to very coarse-grained with few granules; subangular to subrounded, moderately sorted; composed of quartz, feldspar, granite, chert, and a very small amount of hornblende, and medium grey (N5) (sedimentary) rock; small amount of white (N9) caliche.	5	20-25
Sand, coarse-grained to pebble size; subangular to subrounded, well sorted; composed of quartz, feldspar, and granite; white (N9) caliche.	5	25-30
Silt, very pale orange (10YR 8/2), and very fine- to fine-grained sand; subangular to rounded, very well sorted; composed of quartz and chert; white (N9) caliche.	5	30-35

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Silt, greyish orange (10YR 7/4), and very fine- to medium-grained sand; subrounded to subangular, well sorted; composed of quartz and chert; white (N9) caliche.	5	35-40
Silt, very pale orange (10YR 8/2), white (N9) caliche, and very fine- to fine-grained sand; subrounded to rounded, very well sorted; composed of quartz and chert; from 45 to 50 feet sand content increases and white (N9) caliche content decreases.	10	40-50
Sand, medium- to very coarse-grained; subangular to subrounded, well sorted; composed of quartz, chert, and dark reddish brown (10R 3/4) and medium dark grey (N4) (sedimentary) rock.	5	50-55
Clay, pale yellowish brown (10YR 6/2), greyish orange (10YR 7/4) silt, and fine- to very coarse-grained sand; subangular to subrounded, well sorted; composed of quartz, chert, dark reddish brown (10R 3/4) and medium dark grey (N4) (sedimentary) rock, and a very small amount of gypsum.	5	55-60
Clay, light brown (5YR 6/4), greyish orange (5YR 7/2) silt, and fine-grained sand to pebble size; subangular to rounded, moderately sorted; composed of quartz, chert, and dark grey (N3), medium grey (N5), and dark reddish brown (10R 3/4) (sedimentary) rock; very small amount of white (N9) caliche.	5	60-65

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, fine-grained to pebble size; subangular to rounded, moderately sorted; composed of quartz, chert, and medium grey (N 5) and dark reddish brown (10R 3/4) (sedimentary) rock; light brown (5YR 6/4) silt; white (N9) caliche.	5	65-70
Clay, light brown (5YR 6/4), greyish orange (10YR 7/4) silt, very pale orange caliche (10YR 8/2), and very fine- to medium-grained sand; subangular to rounded, well sorted; composed of quartz, chert, and a small amount of medium dark grey (N4) (sedimentary) rock.	5	70-75
Silt, greyish orange (10YR 7/4), and very fine- to very coarse-grained sand; subangular to rounded, moderately sorted; composed of quartz, chert, and dark reddish brown (10R 3/4) (sedimentary) rock; very pale orange (10YR 8/2) caliche.	5	75-80
Clay, light brown (5YR 6/4), greyish orange (10YR 7/4) silt, white caliche (N9), and a small amount of very fine to medium-grained sand, subangular to subrounded, well sorted, composed of quartz, chert, and a small amount of muscovite; sand content increases from 85 to 90 feet.	10	80-90
Clay, light brown (5YR 6/4), greyish orange (10YR 7/4) silt, and very fine- to fine-grained sand with a small amount of granule size fragments, subangular to rounded, well sorted; composed of quartz, chert, and medium dark grey (N4) and dark reddish brown (10R 3/4) (sedimentary) rock.	5	90-95

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, light brown (5YR 6/4), light brown (5YR 6/4) silt, and very fine-grained sand with pebbles; subangular to rounded, moderately sorted; composed of quartz, chert, and light grey (N7) (sedimentary) rock; white (N9) caliche; pebbles decrease from 105 to 110 feet.	25	95-120
Clay, light brown (5YR 6/4), greyish orange (10YR 7/4) silt, and a small amount of very fine- to fine-grained sand; subangular to rounded, well sorted; composed of quartz and chert; small amount of organic matter.	5	120-125
Clay, light brown (5YR 6/4), and fine- to coarse-grained sand; subangular to rounded, well sorted; composed of quartz, chert, and medium dark grey (N4) (sedimentary) rock; small amount of white (N9) caliche.	5	125-130
Clay, light brown (5YR 6/4), greyish orange (10YR 7/4) silt, white (N9) caliche, and a small amount of very fine- to fine-grained sand; subangular to rounded, well sorted; composed of quartz, chert, and medium dark grey (N7) (sedimentary) rock.	5	130-135
Clay, light brown (5YR 6/4), greyish orange pink (5YR 7/2) silt, and very fine- to medium-grained sand; subangular to rounded, very well sorted; composed of quartz and chert; small amount of white (N9) caliche.	5	135-140

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Clay, light brown (5YR 6/4) and a small amount of moderate brown (5YR 4/4), light brown (5YR 6/4) silt, and fine- to coarse-grained sand; subangular to rounded, well sorted; composed of quartz, chert, and dark grey (N3) and medium grey (N5) (sedimentary) rock; small amount white (N9) caliche; very small amount of organic matter.	15	140-155
Silt, light brown (5YR 6/4), and very fine- to medium-grained sand; subangular to rounded, well sorted; composed of quartz, chert, and medium grey (N5) (sedimentary) rock.	10	155-165
Silt, greyish orange (10YR 7/4), and fine- to very coarse-grained sand, subangular to subrounded, well sorted; composed of quartz, chert, moderate brown (5YR 3/4) and medium dark grey (N4) (sedimentary) rock; white (N9) caliche.	5	165-170
Sand, very fine- to very coarse-grained, and light brown (5YR 6/4) silt; subangular to subrounded, moderately sorted; composed of quartz, chert, and light grey (N7) and medium grey (N5) (sedimentary) rock; white (N9) caliche.	5	170-175
Clay, light brown (5YR 6/4), very pale orange (10YR 8/2) silt, and very fine- to medium-grained sand; subangular to subrounded, well sorted; composed of quartz and chert; small amount of white (N9) caliche.	5	175-180

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, very fine- to coarse-grained, and light brown (5YR 6/4) silt; subangular to rounded, well sorted, composed of quartz, chert, and dark grey (N3) and dark reddish brown (10R 3/4) (sedimentary) rock; light brown (5YR 6/4) clay.	5	180-185
Sand, medium- to very coarse-grained, subangular to subrounded, well sorted, composed of quartz, chert, and dark grey (N3), medium grey (N5), and dark reddish brown (10R 3/4) (sedimentary) rock; light brown (5YR 6/4) silt.	5	185-190
Sand, fine to very coarse-grained, and light brown (5YR 6/4) silt; subangular to subrounded, moderately sorted; composed of quartz, chert, and dark grey (N3), dark reddish brown (10R 3/4), and medium grey (N5) (sedimentary) rock; white (N9) caliche; white (N9) caliche content decreases from 195 to 200 feet.	10	190-200
Sand, medium- to very coarse-grained; subangular to rounded, well sorted; composed of quartz, chert, and medium grey (N5), dark reddish brown (10R 3/4), dark grey (N3), and moderate brown (5YR 3/4) (sedimentary) rock; greyish orange (10YR 7/4) silt; small amount of light brown (5YR 6/4) clay.	5	200-205
Sand, medium-grained to pebble size; subangular to subrounded, moderately sorted; composed of quartz, chert, and dark reddish brown (10R 3/4), medium grey (N5), moderate brown (5YR 3/4), and dark grey (N3) (sedimentary) rock; light brown (5YR 6/4) silt; small amount of light brown (5YR 6/4) clay; light brown (5YR 6/4) clay is absent from 210 to 220 feet.	15	205-220

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, fine- to coarse-grained; subangular to rounded, well sorted; composed of quartz, chert, and dark reddish brown (10R 3/4), dark grey (N3), and medium grey (N5) (sedimentary) rock; pale yellowish brown (10YR 6/2) silt; small amount of light brown (5YR 6/4) clay.	5	220-225
Sand, medium- to very coarse-grained; subangular to subrounded, moderately sorted; composed of quartz, chert, and dark grey (N3), dark reddish brown (10R 3/4), and medium grey (N5) (sedimentary) rock; light brown (5YR 6/4) silt; small amount of moderate brown (5YR 4/4) clay; very small amount of white (N9) caliche.	10	225-235
Silt, greyish orange (10YR 7/4), and medium- to very coarse-grained sand; subangular to subrounded, moderately sorted; composed of quartz, chert, and dark grey (N3), medium grey (N5), and light grey (N7) (sedimentary) rock; very small amount of white (N9) caliche; white (N9) caliche content increases at 240 feet.	5	235-240

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	LOG MEASURED FROM: GL ELEVATION:	GAMMA RAY NEUTRON COMPENSATED DENSITY NEUTRON

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL
WELL: MPL-MW-4
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

COMPANY: MEVATEC
WELL: MPL-04

	RUN NO. 1		RUN NO. 1
DATE	[illegible]	FLUID LEVEL	20 FT
DEPTH DRILLER	240 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	[illegible] FT	FLUID VISCOSITY	
BOTTOM LOGGED	[illegible] FT	FL. RESISTIVITY	
TOP LOGGED INT.	[illegible]	FL. RES. @ B.H.T.	
CASING LEVEL	[illegible] FT	CIRCULATION TEMP.	
CASING SIZE	[illegible] OD	BOT HOLE TEMP.	
CASING SIZE	[illegible]	TOOL #	[illegible]
BIT SIZE	[illegible]	LOGGED BY:	[illegible]
BIT SIZE	[illegible]	WITNESSED BY:	[illegible]

REMARKS:

THANK YOU

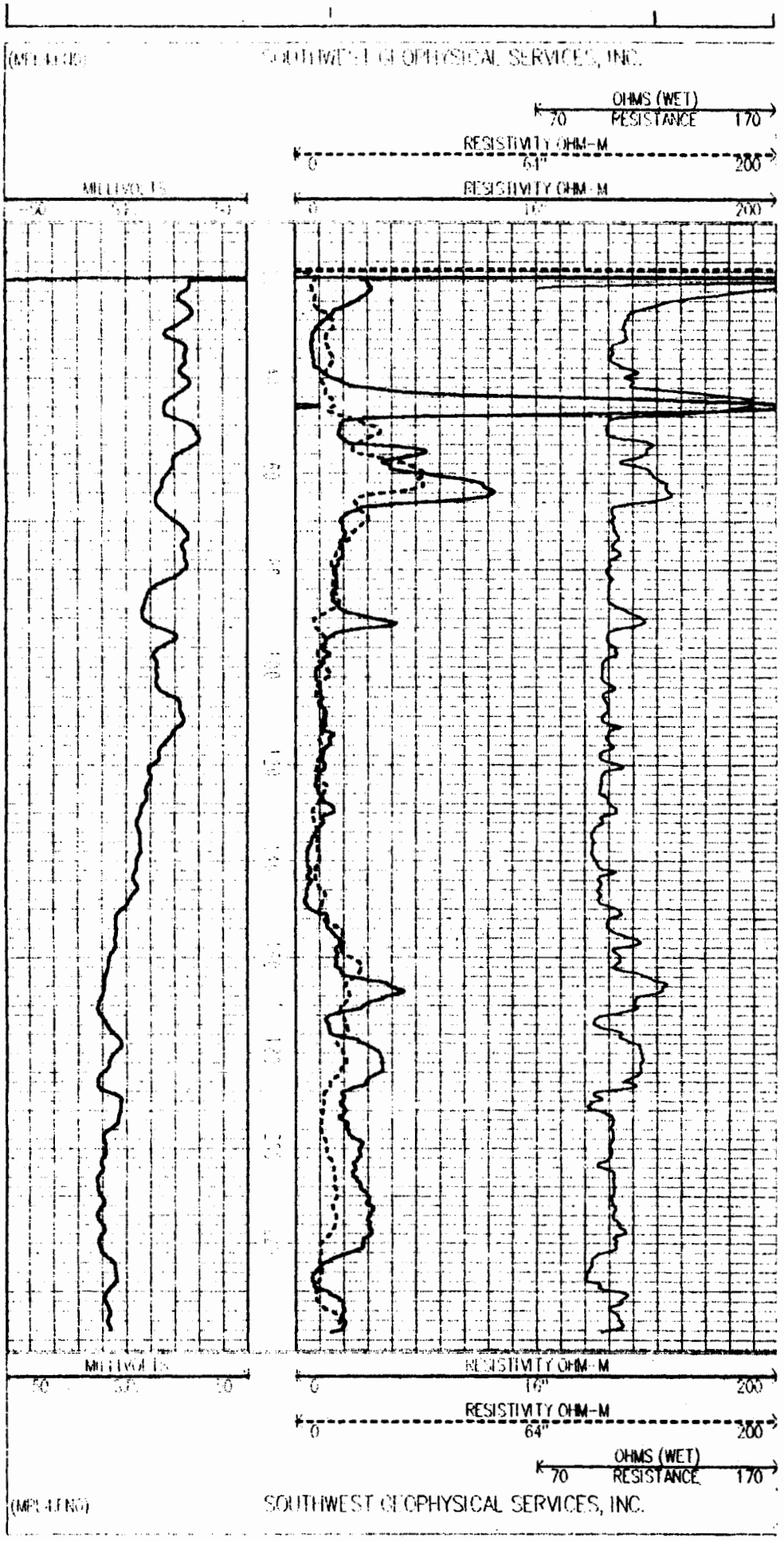
(MELANIE) SOUTHWEST GEOPHYSICAL SERVICES, INC.

OHMS (WET) RESISTANCE 70 — 170

RESISTIVITY OHM-M 0 — 64" — 200

MILLIVOLTS

RESISTIVITY OHM-M


SOUTHWEST GEOPHYSICAL SERVICES, INC.
OHMS (WET)
70 RESISTANCE 170
RESISTIVITY OHM-M
0 64" 200
MILLIVOLTS
RESISTIVITY OHM-M
0 16" 200
RESISTIVITY OHM-M
0 64" 200
OHMS (WET)
70 RESISTANCE 170
SOUTHWEST GEOPHYSICAL SERVICES, INC.

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GL	OTHER SERVICES:
CALIPER NATURAL GAMMA RAY BULK DENSITY NEUTRON	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN PIOST LANDFILL
WELL: MPL--MW -4
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

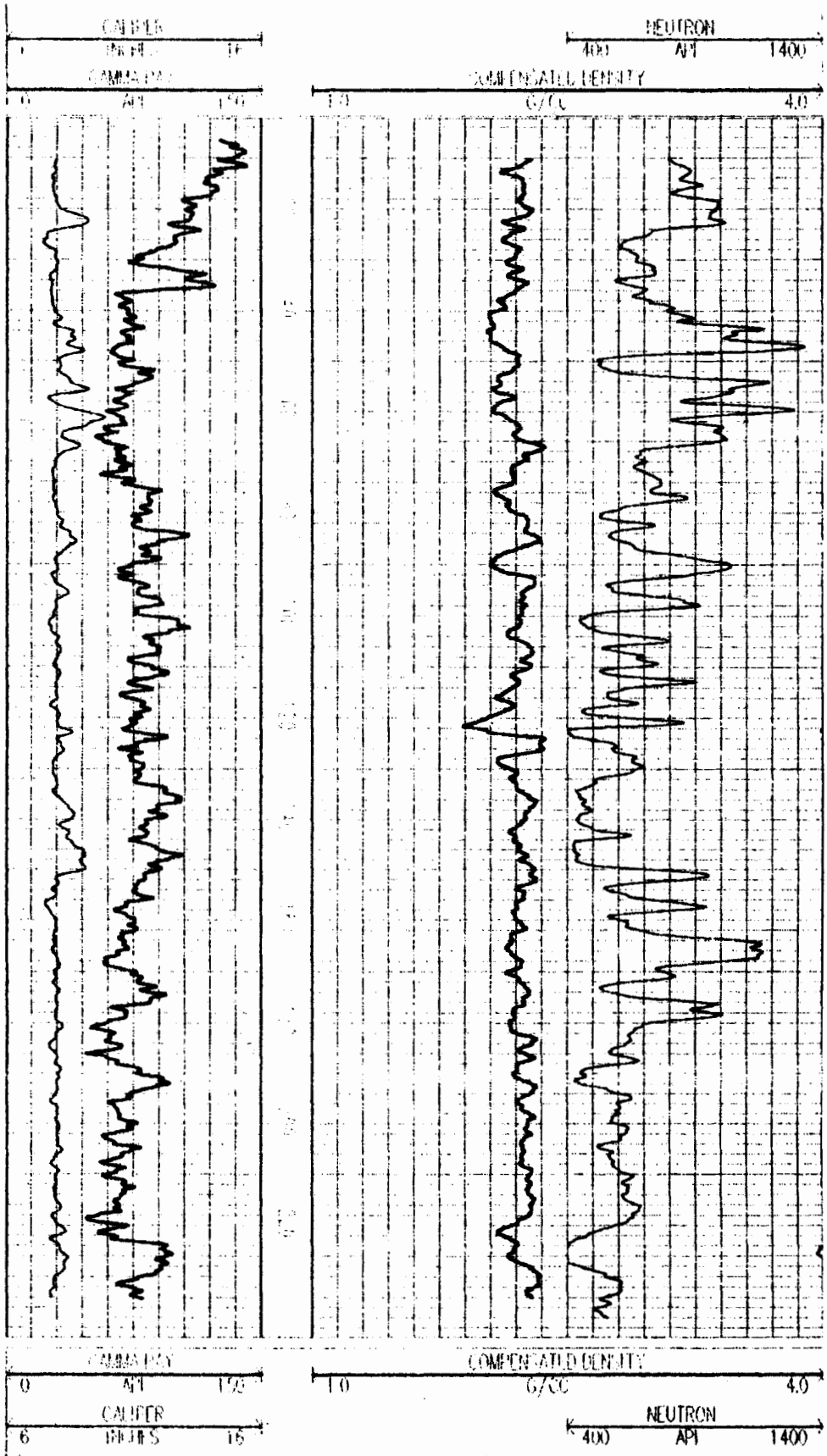
ELEVATION KB:
DF:
GL:

	RUN NO. 1		RUN NO. 1
DATE	[illegible]	FLUID LEVEL	FULL
DEPTH DRILLER	[illegible] FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	[illegible] FT	FLUID VISCOSITY	
BOTTOM LOGGED	[illegible] FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	[illegible] FT	CIRCULATION TEMP.	
CASING SIZE	[illegible]	BOT HOLE TEMP.	
CASING SIZE	[illegible]	TOOL #	[illegible]
BIT SIZE	[illegible]	LOGGED BY:	[illegible]
BIT SIZE	[illegible]	WITNESSED BY.	DONA DOWNS

REMARKS:

THANK YOU

COMPANY: MEVATEC
WELL: MPL-04



(MPL4.C10)

SOUTHWEST GEOPHYSICAL SERVICES

REPORT OF RESULTS
FIRST GROUNDWATER SAMPLING AND ANALYSIS EVENT
WSMR MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

Submitted to:

U.S. Army
White Sands Missile Range
Directorate of Environment and Safety
White Sands Missile Range, New Mexico 88002-5201

August 1996

Submitted by:

MEVATEC Corporation
Building S-146W
White Sands Missile Range, New Mexico 88002

REPORT OF RESULTS
FIRST GROUNDWATER SAMPLING AND ANALYSIS EVENT
WSMR MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

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6.	Conclusions	9

APPENDIX A Detailed Laboratory Report

REPORT OF RESULTS
FIRST GROUNDWATER SAMPLING AND ANALYSIS
MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

1. EXECUTIVE SUMMARY

In compliance with the New Mexico Solid Waste Management Regulations (Part VIII, Sections 801 through 811), this report presents the results of the first groundwater sampling event at the White Sands Missile Range (WSMR) Main Post Landfill. Groundwater samples were collected from the one upgradient and three downgradient monitoring wells, which were installed at the perimeter of the landfill during May and June, 1996. Groundwater samples were collected from each well during the week of 23 June 1996. The results of this initial analysis, plus the results from four additional samples to be collected during the next eight months, will be compiled and the mean concentration for each analyte will be calculated. The resulting mean value will represent the baseline concentration for each analyte. These values will determine if future groundwater monitoring will be conducted under the detection or assessment monitoring programs.

No volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls, phenols, radium 226 or radium 228 were detected during this initial sampling event. Detected constituents include various anions, cations and metals. These may be naturally occurring compounds in groundwater in the vicinity of the landfill, and may become part of the established background constituents. The interpretation and discussion of the presence of the detected groundwater constituents will be reserved until additional data is collected from each of the wells.

2. INTRODUCTION

Four groundwater monitoring wells (one upgradient and three downgradient) monitoring wells were installed at the perimeter of the WSMR Main Post Landfill during May and June, 1996. The detailed description of each well installation will be presented in the Main Post Landfill Monitoring Well Installation Report, TBD September 1996.) The purpose of the wells is to establish background physical and chemical parameters in groundwater, in the vicinity of the landfill. This report presents the results of the first of five groundwater sampling events at the Main Post Landfill monitoring wells.

Background monitoring is the initial stage of the overall groundwater monitoring program and is used to 1.) characterize the baseline conditions of the upgradient and downgradient groundwater quality at the site and 2.) to establish assessment monitoring levels (AMLs).

Background groundwater monitoring will be conducted during the first twelve months of the overall groundwater monitoring program. The program involves the collection and analysis of five independent groundwater samples from each well. The first four samples will be collected within the first six months following well installation. The fifth sample will be collected about midway during the second sixth month time period. The results of these samples are used as the basis for determining whether subsequent groundwater monitoring will be conducted under the Detection or Assessment Monitoring Programs.

3. LOCATION AND DESCRIPTION OF SAMPLING AREA

The Main Post Landfill, located approximately 3 miles east of the WSMR Main Post Headquarters (Figure 3-1), occupies approximately 25 acres. The landfill accepts nonhazardous waste generated from all of the 850 residential units, as well as facilities located at the Post Headquarters. This includes residential, yard, and commercial waste. The landfill has been in operation since 1983.

The WSMR Main Post derives its water supply from a water table aquifer in the upper bolson Tertiary/Quaternary unconsolidated alluvial deposits. This aquifer contains water derived from mountain water sheds forming a wedge-shaped belt of potable water over 30 miles long. Good quality groundwater occurs near recharge areas, but becomes progressively more mineralized downgradient toward the interior of the Tularosa Basin. This is attributed to the slow migration rate of groundwater from recharge to discharge areas and the presence of readily soluble minerals in the bolson sediments.

One upgradient (MPL-MW-01) and three downgradient (MPL-MW-02, MPL-MW-03, and MPL-MW-04) monitoring wells were installed from 15 - 31 May 1996, using mud-rotary drilling techniques (Figure 3-2). The detailed description of each well installation will be presented in the Monitoring Well Installation Report (TBD September 1996). The following table summarizes monitoring well construction and water level information for the wells at the Main Post Landfill. Water level measurements were made just prior to purging activities for sampling.

Table 3-1 Well Construction and Water Level Data for Monitoring Wells at the Main Post Landfill

Well Number	Total Depth of Well (feet)	Elevation (ft.) (MP - Brass survey marker) NAVD-1988	Depth to water (feet below MP) 6/27/96	Elevation Groundwater (6/27/96)
MPL-MW-01	220.58	4012.56	200.47	3812.09
MPL-MW-02	220.50	4004.55	194.79	3809.76
MPL-MW-03	228.50	3997.75	188.77	3808.98
MPL-MW-04	225.0	3993.50	184.82	3808.68

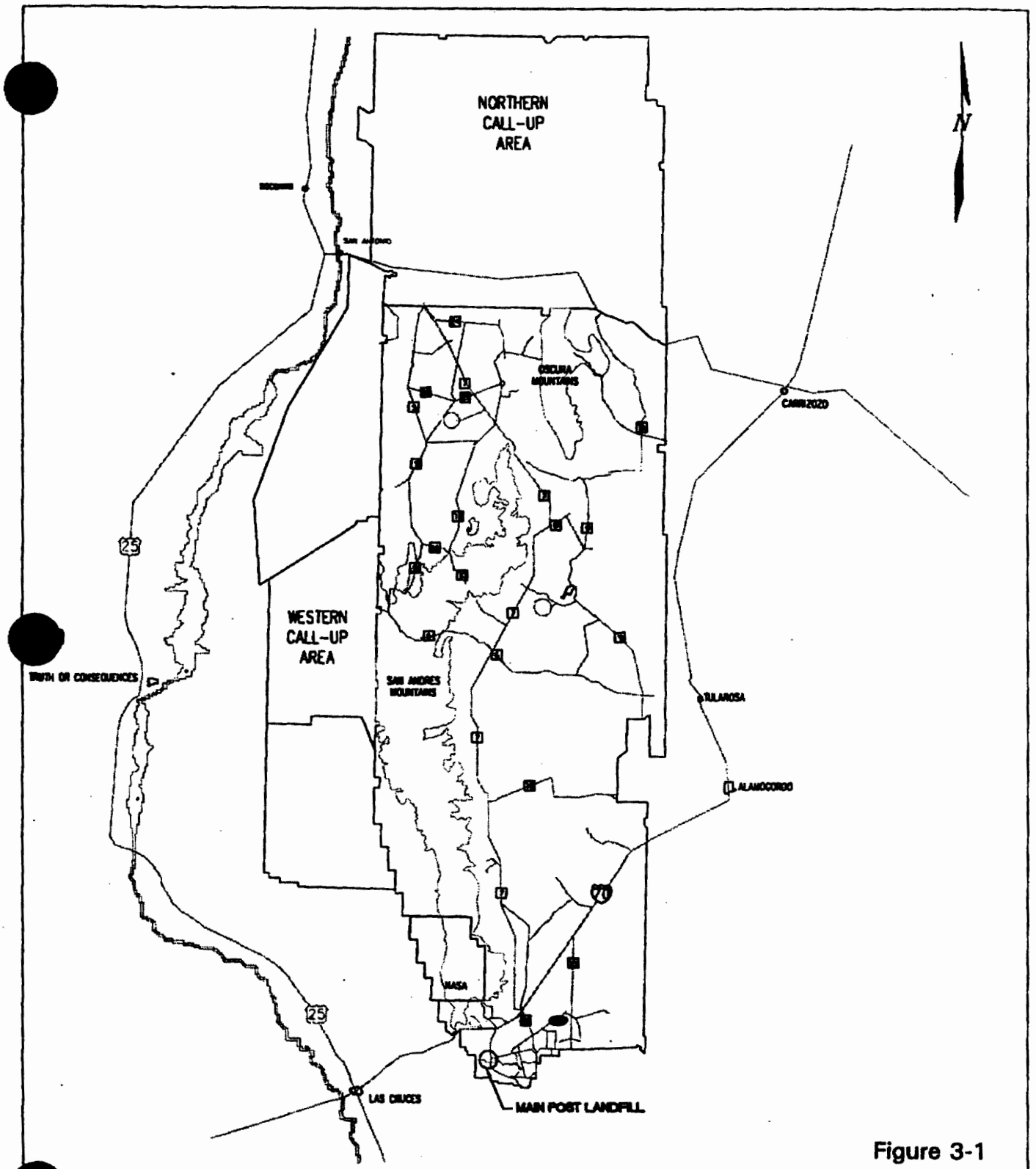
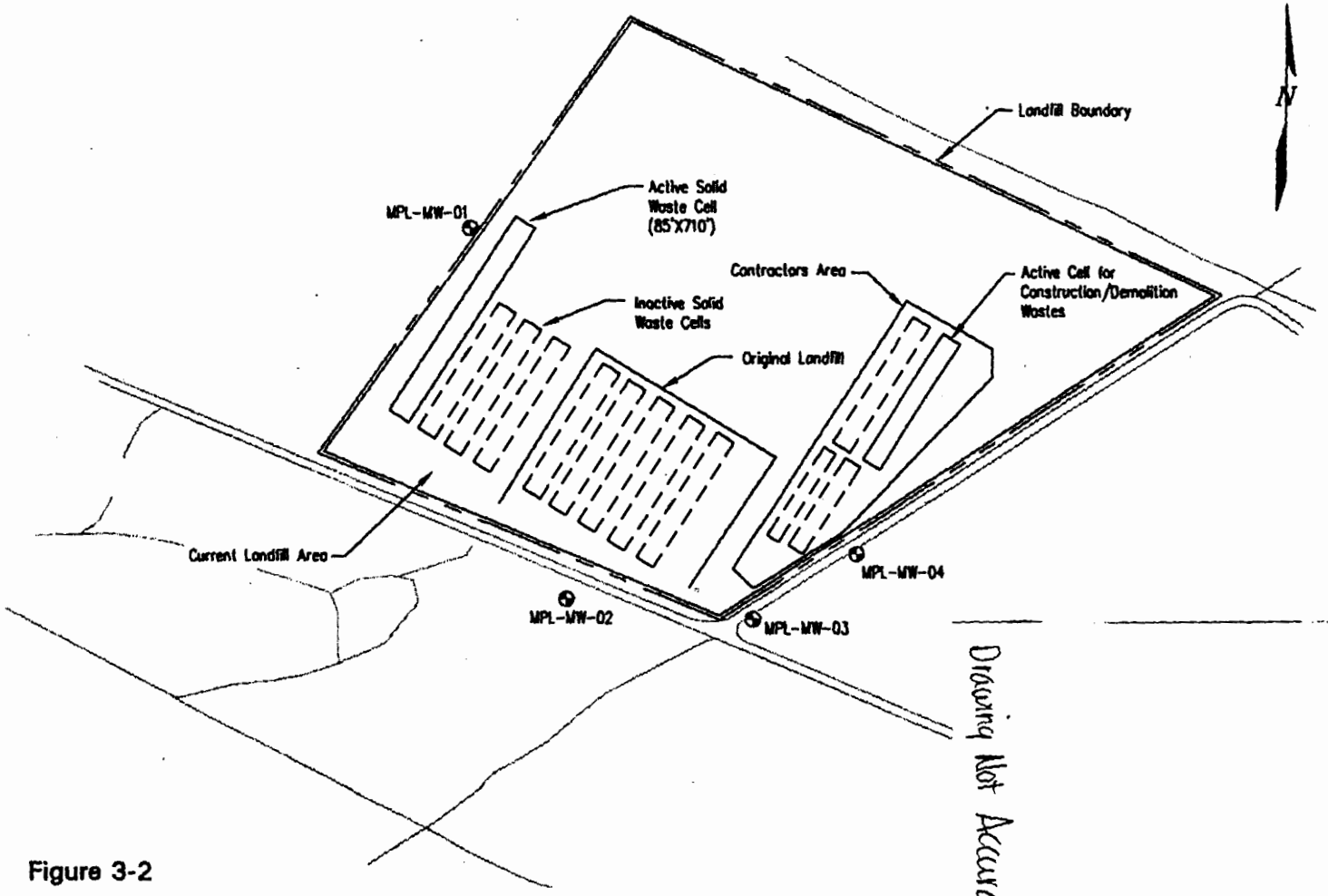


Figure 3-1

NEVATEC CORPORATION	SITE LOCATION MAP	Background Groundwater Monitoring Main Post Landfill White Sands Missile Range



Drawing Not Accurate

Figure 3-2

DRAWING NOT TO SCALE

Location of Monitoring Wells at the Main Post Landfill

WHITE SANDS MISSILE RANGE

4. DESCRIPTION OF WORK

The first groundwater sampling event took place on 27-28 June 1996. Prior to sampling, three well volumes of groundwater were purged from each well to obtain a representative groundwater sample. Groundwater was purged and sampled using a portable 2-inch diameter submersible pump. The submersible pump and sampling equipment were thoroughly decontaminated before and after purging and prior to sampling each well. Water quality measurements collected during each sample collection are provided as Table 3-2.

Table 4-1. Field Water Quality Measurements from Monitoring Wells at the Main Post Landfill

Well No.-Sample	Date	Temperature (°C)	Conductivity (microsiemens/cm)	pH
MPL-MW01-GW1	6/27/96	23.0	600	7.00
MPL-MW02-GW1	6/27/96	25.1	640	7.41
MPL-MW03-GW1	6/28/96	25.6	1300	7.28
MPL-MW04-GW1	6/28/96	25.3	1180	7.25

The sample for volatile organic compounds was collected first, followed by the samples for semivolatile organic compounds and phenols, followed by the collection of samples for all other analytes. Preservatives (if necessary) were added to the full sample bottle until the desired pH was reached. Each sample container was labeled with sample name and number, sealed in a plastic bag, and packed in an ice chest so as not to exceed a temperature of 4 degrees Celsius during transport to the laboratory. Chain-of-custody forms were completed and placed inside each sample ice chest. The sample coolers were sealed with chain-of-custody tape and submitted to the analytical laboratory via overnight delivery service.

The samples were submitted for analysis for the following New Mexico Solid Waste Management Regulations (NMSWMR) Subpart XI, Table I parameters.

↑ NO

Table 4-2. Summary of Groundwater Analysis Requirements for the Main Post Landfill

Analyte	Analytical Method	Maximum Holding Time (days)
Organic Compounds		
Polychlorinated Biphenyls	SW846-8080A	40
Volatile Organic Compounds	SW846-8260A	14
Semivolatile Organic Compounds	SW846-8260A	40
Phenols	SW846-9066	28
Water Quality Parameters		
Specific Conductance	EPA 120.1	NA
Carbonate and Bicarbonate	EPA 310.1	28
Total Dissolved Solids	EPA 160.2	7
Chloride	EPA 325.1	28
Fluoride	EPA 340.2	28
Sulfate	EPA 375.1	28
Ammonia	EPA 350.1	28
Total Kjeldahl Nitrogen	EPA 351.1	28
Nitrate/Nitrite as Nitrogen	EPA 352.1	28
Total Cyanide	SW846-9012	14
Laboratory pH	SW846-9040	2
Total Organic Carbon	SW846-9060B	28
Radium 226	EPA 903.1	180
Radium 228	EPA 904.0	180
Total Metals		
Al, Sb, As, Ba, Be, B, Cd, Ca, Cr Co, Cu, Fe, Mg,	SW846-6010A*	180
Mn, Mo, Ni, K Se Ag, Na, Th, V, Zn*	SW846-6010A	180
Hg	SW846-7470A	28
U	EPA 908.1	180

* ICPES was used for metals analysis, in lieu of GFAA. Near identical quantitation limits were reached using the ICPES method.

Primary analytical services for the groundwater samples from the Main Post Landfill were provided by:

PDP Analytical Services
1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Telephone: 713/363-2233

Check to see if this is correct?

The sample containers for Total Kjeldahl Nitrogen were forwarded to the following lab by PDP for analysis:

Inchcape/NDRC Laboratories
1089 East Collins
Richardson, Texas 75081
Telephone: 214/238-5591

The samples for analysis for uranium, radium 226 and radium 228 were submitted to the following laboratory for analysis.

Controls for Environmental Pollution, Inc.
Post Office Box 5351
Santa Fe, New Mexico 87502
Telephone: 505/982-9841

Quality Assurance laboratory services were provided by:

Westech of Texas, Inc.
4725 Ripley Drive, Suite A
El Paso, Texas 79922-1028
Telephone: 915/585-3443

5. SUMMARY OF ANALYTICAL RESULTS

With the exception of one broken trip blank, associated with sample MPL-MW01-GW1, all remaining samples collected from the Main Post Landfill arrived at the laboratories in good condition, within temperature requirements. All samples were extracted and analyzed within EPA maximum holding times for each analyte. Table 5-1 summarizes the analytical results for detected analytes only. The detailed laboratory reports containing analytical results, quality control data and matrix spike and matrix spike duplicated analyses are provided as Appendix A.

No volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls, phenols, radium 226 or radium 228 were detected during this initial groundwater sampling event. The remaining constituents may be naturally occurring materials in groundwater in the vicinity of the landfill. A discussion of the presence and pervasiveness of non-anthropogenic (not introduced by outside source) compounds will be reserved until additional groundwater data is collected from each of the wells. New Mexico Solid Waste Management Regulation groundwater protection standards and practical quantitation limits (PQLs) are listed on Table 5-2. Practical quantitation limits are the lowest concentration of analytes in groundwater that can be reliably determined within specified limits of precision and accuracy under routine laboratory operating conditions. Actual laboratory quantitation limits are matrix specific and may vary due to nature of the sample or sample dilutions.

µg 10^-6 .000001
mg 10^-3 .001
ng 01

TABLE 5-1
GROUNDWATER ANALYTICAL DATA (DETECTED ANALYTES ONLY)
WSMR MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE, NEW MEXICO
FIRST GROUNDWATER SAMPLING EVENT 27-28 JUNE, 1996

Water Quality Parameters						
Alkalinity as CaCO3	141 mg/L	116 mg/L	268 mg/L	200 mg/L	198 mg/L	
Total Dissolved Solids	490 mg/L	490 mg/L	1230 mg/L	1200 mg/L	880 mg/L	1000
Laboratory pH	7.63	7.39	7.53	7.4	7.32	2
Fluoride	0.25 mg/L	0.21 mg/L	0.17 mg/L	0.89 mg/L	0.15 mg/L	
Nitrate/Nitrite as Nitrogen	3.6 mg/L	4.2 mg/L	6.4 mg/L	8.0 mg/L	7.6 mg/L	10 close
Total Metals						
Arsenic	0.007 mg/L	ND	0.0055 mg/L	ND	ND	5
Boron	ND	ND	0.10 mg/L	ND	0.066 mg/L	
Chromium	0.022 mg/L	ND	0.019 mg/L	ND	ND	
Lead	ND	ND	0.0094 mg/L	ND	ND	1
Manganese	0.085 mg/L	0.089 mg/L	0.174 mg/L	0.10 mg/L	0.095 mg/L	
Selenium	ND	ND	0.013 mg/L	ND	0.011 mg/L	
Uranium	ND	ND	0.026 mg/L	ND	ND	
Zinc	0.062	0.044 mg/L	0.08 mg/L	ND	0.058 mg/L	

ND - Not detected

Results

TABLE 5-2
SUMMARY OF GROUNDWATER PROTECTION STANDARDS
AND
PRACTICAL QUANTITATION LIMITS
FOR BACKGROUND GROUNDWATER MONITORING PARAMETERS

WATER QUALITY PARAMETERS		
Alkalinity (mg/L CaCO3)	N/A	N/A
Ammonia (mg/L NH3, as N)	N/A	N/A
Bicarbonate (HCO3)	N/A	N/A
Chloride (mg/L)	250	5
Cyanide (mg/L)	0.2	0.1
Fluoride (mg/L)	1.6	0.4
Nitrate (mg/L)	10	1
Nitrogen, Total	10	1
Nitrogen, Total Kjeldahl (mg/L)	N/A	0.01
pH	6.5-8.5	0.1
Specific Conductance (umhos/cm)	N/A	N/A
Sulfate (mg/L)	250	5
TDS (mg/L)	500	5
Temperature	N/A	N/A
Total Organic Carbon (mg/L)	N/A	N/A
Water Elevation (ft)	N/A	N/A
METALS (mg/L)		
Aluminum	5	3
Antimony	0.006	0.003
Arsenic	0.05	0.01
Barium	1	0.02
Beryllium	0.004	0.002
Boron	0.75	0.5
Cadmium	0.005	0.002
Calcium	N/A	N/A
Chromium	0.05	0.01
Cobalt	0.05	0.03
Copper	1	0.06
Iron	0.3	0.1
Lead	0.05	0.01
Magnesium	N/A	N/A
Manganese	0.05	0.03
Mercury	0.002	0.001
Molybdenum	1	0.75
Nickel	0.1	0.05
Potassium	N/A	N/A
Selenium	0.01	0.005
Silver	0.05	0.01
Sodium	N/A	N/A
Thallium	0.002	0.001
Uranium	5	2.5
Vanadium	N/A	0.08
Zinc	5	0.05

Parameters

TABLE 5-2 (cont.)
SUMMARY OF GROUNDWATER PROTECTION STANDARDS
AND
PRACTICAL QUANTITATION LIMITS
FOR BACKGROUND GROUNDWATER MONITORING PARAMETERS

PCBs (ug/L)		
PCB-1016	0.001	0.5
PCB-1221	0.001	0.5
PCB-1223	0.001	0.5
PCB-1242	0.001	0.5
PCB-1248	0.001	0.5
PCB-1254	0.001	0.5
PCB-1260	0.001	0.5
PHENOLICS (mg/L)		
Total Phenolics	N/A	N/A
VOLATILE ORGANICS (ug/L)		
Acetone	N/A	0.1
Acrylonitrile	N/A	0.2
Benzene	0.005	1.0
Bromochloromethane	N/A	2.0
Bromodichloromethane	N/A	5.0
Bromoform (tribromomethane)	N/A	15.0
Carbon disulfide	N/A	100
Carbon tetrachloride	0.005	2.0
Cholorobenzene	0.1	5.0
Chloroethane	N/A	10.0
Chloroform	0.1	5.0
Dibromochloromethane	N/A	5.0
1,2-Dibromo-3-chloropropane	0.0002	0.1
1,2-Dichloroethane	0.005	1.0
1,1-Dichloroethane	0.025	5.0
1,1-Dichloroethylene	0.005	1.0
1,2-Dichloropropane	0.005	0.5
cis-1,3-Dichloropropene	N/A	20.0
trans-1,3-Dichloropropene	N/A	10.0
trans-1,4-Dichloro-2-butene	N/A	100
Ethylbenzene	0.07	5.0
Ethylene Dibromide	0.00005	0.025
2-Hexanone	N/A	50.0
Methyl bromide	N/A	20.0
Methyl chloride	0.005	1.0
Methyl ethyl ketone (2-Butanone)	N/A	10.0
Methyl iodide	N/A	40.0
Methylene bromide	N/A	20.0
Methylene chloride	0.005	1.0
4-Methyl-2-pentanone (MIBK)	N/A	15.0

TABLE 5-2 (cont.)
SUMMARY OF GROUNDWATER PROTECTION STANDARDS
AND
PRACTICAL QUANTITATION LIMITS
FOR BACKGROUND GROUNDWATER MONITORING PARAMETERS

VOLATILE ORGANICS (ug/L) (cont.)		
Styrene	0.1	10.0
1,1,1,2-Tetrachloroethane	N/A	5.0
1,1,2,2-Tetrachloroethane	0.01	5.0
Tetrachloroethylene	0.005	0.5
Toluene	0.75	5.0
1,1,1-Trichloroethane	0.06	5.0
1,1,2-Trichloroethane	0.005	2.0
Trichloroethylene	0.005	1.0
Trichlorofluoromethane	N/A	10.0
1,2,3 Trichloropropane	N/A	10.0
Vinyl acetate	N/A	50.0
Vinyl chloride	0.001	0.4
Total Xylenes	0.62	5.0
SEMIVOLATILE ORGANICS (mg/kg)		
1,2-Dichlorobenzene	0.06	0.01
1,4-Dichlorobenzene	0.075	0.015
Benzo(a)pyrene	0.002	0.0001
Total Naphthalene plus monomethylnaphthalenes	0.03	0.01
RADIONUCLIDES (pCi/L)		
Radium 226 and Radium 228 (pCi/L)	5.000	2.5

Notes: CVAA=Cold vapor atomic absorption, GC/MS=Gas chromatography/mass spectrometry.
GFAA=Graphite furnace atomic absorption. HPLC=High proformacnce liquid chromatography.
IC=Ion chromatography, ICPES=Inductively coupled plasma emission spectroscopy. IR=Infrared spectrometry . NA=Not Applicable.

aReporting limit is the minumum conentration of a substance that can be measured and reported for multiple instruments.
Reporting limits are highly matrix dependent and may not always be achievable.
bN-Nitrosodiphenylamine decomposes to diphenylamine. Laboratory quantitates as diphenylamine.

5. CONCLUSIONS

Four additional groundwater samples will be collected from each of the monitoring wells, and analyzed for the NMSWMR Subpart XI, Table 1 constituents. The results of these analyses will then be complied and a mean concentration calculated for each constituent, at each sample location. The resulting mean values will be used to represent the upgradient and downgradient quality of groundwater at the site, as well as for establishing levels for future detection or assessment monitoring.

APPENDIX A

DETAILED LABORATORY REPORT

LABORATORY ANALYTICAL REPORT

GROUNDWATER SAMPLES

MPL-MW01-GW1 & MPL-MW02-GW1

PDP
Analytical Services

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

July 24, 1996

Ms. Dana Downs
Mevatec Corporation
P.O. Box 399
White Sands Missile Range
New Mexico 88002

Episode: 3436
Project ID: White Sands Missile Range
Project #: 300 II J27

Dear Ms. Downs:

Enclosed are the analytical results for the samples received in our laboratory on June 28, 1996. The samples were analyzed for the parameters indicated on the chain of custody.

Please be advised that unused portions of your samples, sample extracts and digestates will be stored for 30 days from the date of this report. Unless prior arrangements were made, at the end of this period your samples will either be disposed of, or returned to you if your samples were determined to be hazardous.

We appreciate your business. Should you have any questions or need assistance with this report, please feel free to call me or Homai Madisetty, Data Review Officer, at (713) 292-7090.

Sincerely,

Bruce D. Howbert

Bruce D. Howbert
Program Manager

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

DATA PACKAGE DOCUMENT INVENTORY

EPISODE NUMBER: *3436*

Section	Document Type	Pages
1.	*Case Narrative & Data Qualifiers*	1-4
2.	*Chain-of-Custody Forms*	5-10
3.	*Sample Data*	
	Volatiles	12-15
	Semivolatiles	16-18
	Metals	19-21
	Pesticides/PCBs	22-24
	General Chemistry	25-37
	Sub-Contract	38-39
4.	*Quality Control Data*	
	Volatiles	41-44
	Semivolatiles	45-50
	Metals	51-56
	PesticidesPCBs	57-60
	General Chemistry	61-62
	Sub-Contract	63-64
5.	*End of Report*	65

CASE NARRATIVE & DATA QUALIFIERS

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec **Episode No.: 3436**	**Project Name: White Sands Missile Range** **Project No.: 300 II J27**

CASE NARRATIVE

Four water samples were received for analysis on 06/28/96. All regulatory holding times were met by the laboratory.

All batch quality control (QC) results (Duplicates, Matrix Spikes, Matrix Spike Duplicates) are included in this data package. Batch QC may or may not have been performed on your samples. If it was, the QC reports will reference our internal sample identification.

The data qualifiers are presented following the narrative remarks. For CLP data forms, consult the CLP Qualifiers sheet. For standard PDP data spreadsheets, consult the Data Flags and Abbreviations sheet.

SAMPLE RECEIPT AND LOG-IN:

The volatiles vial, "trip blank", (3436.02), that was received with sample "MPL-MW01-GW1" was received broken.

VOLATILES:

Sample "trip blank", (3436.02) was not analyzed due to broken vial.

Three RPDs were outside the control limits.

SEMIVOLATILES:

No problems were encountered.

METALS:

The matrix spike recoveries for aluminum were outside the QC limits. The laboratory control sample was acceptable, suggesting matrix effects.

High analyte concentration prevented accurate determination of the matrix spike recoveries for iron.

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec **Episode No.: 3436**	**Project Name: White Sands Missile Range** **Project No.: 300 II J27**

CASE NARRATIVE Continued

PESTICIDES/PCBs:

The samples and matrix spike each had one of two surrogates outside the control limits.

The matrix spike recoveries were outside the control limits on several compounds. Since the laboratory control sample was acceptable, matrix effects are suspected.

GENERAL CHEMISTRY:

No problems were encountered.

SUB-CONTRACT DATA:

The samples for total kjeldhal nitrogen were sub-contracted to Inchcape Testing Services in Dallas, Texas.

The samples for total uranium, R-226 and R-228 were sub-contracted to CEP laboratory. This data will follow under a separate cover.

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B The Woodlands, Texas 77380

DATA FLAGS AND ABBREVIATIONS

B — This flag is used when the analyte is found in the associated blank as well as in the sample.

D — Indicates that the compound could not be detected because it was diluted out.

DL — This flag identifies an analysis at a secondary dilution factor.

E — This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. A more accurate quantitation is obtained from a diluted sample analysis.

I — This flag is used to indicate the presence of interference which resulted in not determining the value.

J — This flag is used when the data indicates the presence of a compound below the quantitation limit as determined by the identification criteria.

NA — Not applicable.

NC — Not calculated.

ND — Indicates a compound was analyzed for but not detected at the quantitation level.

P — This flag is used for a pesticide/aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.

RE — This flag is used when the sample is re-extracted and re-analyzed.

RA — This flag is used when the sample is re-analyzed.

U — This flag indicates that the compound was analyzed for but not detected.

* — Indicates that the compound is out of the Quality Control limits.

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: JS | DATE OF PHYSICAL LOG-IN: 6/28/96 | PAGE 1 OF 1

Episode #: 3436
Client Name: MEVATEC
Project ID: WHITE SANDS MISSLE RANGE
Project #: 300 II J27
PO Number: NA
Courier/No.: FED-EX#0317062314

DATE OF COMPUTER LOG-IN: 6/28/96 14:09
COMPUTER LOG-IN BY: JS
DATE RECEIVED: 6/28/96
TIME RECEIVED: 1000

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3436.01	MPL-MW01-GW1	VOA-8260A SVOA-8270 PEST/PCB-8080 PHENOLS-420.1 TAL METALS +B,Mo ALL ICP CVAA-Hg Sp. CONDUCTANCE120.1 TOTAL ALK.-310.1 TDS-~~160.1~~ 160.1 CHLORIDE-~~300.0~~ 325.3 FLUORIDE-~~300.0~~ 340.2 SULFATE-~~300.0~~ 375.4 AMMONIA350.3 TKN-351.1 NITRATE/NITRITE-~~300.0~~ 352.1/354.1 CYANIDE-9010 PH-9040 TOC-415.1 ~~UR226~~ TOTAL URANIUM R228 /R226	16	WATER	6/26/96	1130	3436A	7/12/96 HC	
3436.02	TRIP BLANK	VOA-8260A	1	WATER	NA	NA	3436A		NO TESTING
3436.03	MPL-MW02-GW1	SAME LIST AS #1	16	WATER	6/26/96	0930	3436A		
3436.04	TRIP BLANK	VOA-8260A	1	WATER	NA	NA	3436A		

REMARKS: TKN SUBBED TO NDRC, DALLAS
TRIP BLANK 3436.02 WAS RECIEVED BROKEN
U-R226 &R228 SUBBED TO CEP

Weight basis: X wet ___ dry
Deliverables: X norm ___ CLP-like ___ CLP
___ raw data X electronic

APPROVED BY/DATE: MBB 6/28/96

SEND REPORT TO: DANA DOWNS

Chain of Custody Record

PDP Analytical Services
1680 Lake Front Circle, Suite B ▪ The Woodlands, Texas 77380 ▪ Phone (713) 363-2233 ▪ Fax (713) 298-5784

Client Name / Address:	Send Report to:
MEVATE / White Sands Missile Range	Dana Dunas

Project Number:	Project Name
300 II 527	Main Post Landfill Wells

Samplers (Signature)	P.O. Number
[signature]	

Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix	Remarks
1	9/24/96	11:30		X	MPL-MW01-GW1	16	water	Analyses per enclosed sheet
2	—	—			Trip Blank	1		RECEIVED PRIOR

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time	Remarks:
[signature]	9/26/96 15:00			
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time	
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time	
		Jerri Bamfield	9/28/96 1000	

Method of Shipment: FEDEX

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

000007

Chain of Custody Record

PDP Analytical Services
1680 Lake Front Circle, Suite B ▪ The Woodlands, Texas 77380 ▪ Phone (713) 363-2233 ▪ Fax (713) 298-5784

Client Name / Address: MEVATEC / White Sands Missile Range

Send Report to: Dana Downs

Project Number: 300 II - J27

Project Name: Main Post Landfill Wells

Samplers (Signature): [signature]

P.O. Number:

	Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix							Remarks
3		9/26/96	09:30		X	MPL-MW02-GW1	16	water							Analysis as per enclosed sheet
4		—	—		X	Trip Blank	1								

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[signature]	9/26/96 15:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for laboratory by (Signature)	Date / Time
		Jori Bonfield	9/28/96 1100

Remarks:

Method of Shipment: FEDEX

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

PDP ANALYTICAL SERVICES 1680 Lake Front Circle, Suite B, The Woodlands, TX 77380

SAMPLE L -IN CHECKLIST/DISCREP CY REPORT

FID: SLCDR01.96

EPISODE # 34316 DATE/ REC'D: 6/28/96 1000 TIME TEMP & ID: 1) 0.8°C # COOLER #1

CLIENT NAME: Mountac 2) 0.8°C # COOLER #2

PROJECT NAME: White Sands Middle Range 3) ____ # ____

PROJECT NUMBER: 300-II-327 4) ____ # ____

4 AQUEOUS, # 0 SOIL SAMPLES 5) ____ # ____

COURIER/AIRBILL # Fedex #0317062314 6) ____ # ____

SAMPLE CONTAINER SEALS: present (absent) intact broken

COOLER CUSTODY SEALS: (present) absent (intact) broken NAME & DATE: Custody tape

HOW MANY AND WHERE across front of cooler

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
Container Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :		✓
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:	✓	
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client? VOA VIAL ID 34316.02 was recieved broken that was reported with sample 01-1400 -SM.

Project Manager's recommendations?

Who was notified? By whom? Date:

Client's comments:

Corrective actions carried out?

COMMENTS:

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab?		

LOG-IN BY: Jari Banfield DATE: 6/28/96

000003

ANALYTICAL SERIVES

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

Page 1 of

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

PO# 964777

Sent to: NDRC

Contact: Jt

Phone: 214-238-5591

Sent by: Joe Bonfield

Date sent: 6/28/96

Date Results needed: 7/12/96

PDP Sample ID	No. of Containers	Anaylsis Request a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/ Wet
3436.01 6/27	1	X										water	7104 -1
3436 03 6/27	1	X										water	2

CUSTODY TRANSFERS

Relinquished by:	Recieved by:	Date/Time
1. Joe Bonfield	6/28/96	1300
2. M. Driskell	FTS	6/28/96 10:45

Courier:

ANALYTICAL PARAMETERS

A TKN - 351.1

B

C

D

E

F

G

H

I

COOLER TEMPERATURE WHEN RECEIVED 4 °C

Project Manager Approval:

Lab Manager Approval:

SCREENED FOR RADIOACTIVITY

ORIGINAL

000010

SAMPLE DATA

VOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW01-GW1	Date Sampled:	06/26/96
Project Name:	WHITE SANDS MISSLE RANGE	PDP Sample ID:	3436.01	Date Received:	06/28/96
Project No.:	300 II J27	Report No.:	88876	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88876
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
[illegible]-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
[illegible]-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000013

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	89
1,2-Dichloroethane-d4	10	(80-120)	81
Toluene-d8	10	(88-110)	101
4-Bromofluorobenzene	10	(86-115)	98

Method Blank ID: 8VBLKG02 LCS ID: 8VLCSG03 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW02-GW1	Date Sampled:	06/26/96
Project Name:	WHITE SANDS MISSLE RANGE	PDP Sample ID:	3436.03	Date Received:	06/28/96
Project No.:	300 II J27	Report No.:	88877	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88877
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
[illegible]-Dibromoethane	1	ND	Dibromomethane	1	ND
[illegible]Dichlorobenzene	1	ND	Ethylbenzene	1	ND
[illegible]-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000011

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	82 *
1,2-Dichloroethane-d4	10	(80-120)	89
Toluene-d8	10	(88-110)	90
4-Bromofluorobenzene	10	(86-115)	91

Method Blank ID: BVBLKG02 LCS ID: BVLCSG03 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	TRIP BLANK	Date Sampled:	NA
Project Name:	WHITE SANDS MISSLE RANGE	PDP Sample ID:	3436.04	Date Received:	06/28/96
Project No.:	300 II J27	Report No.:	88878	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88878
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000015

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	99
1,2-Dichloroethane-d4	10	(80-120)	95
Toluene-d8	10	(88-110)	102
4-Bromofluorobenzene	10	(86-115)	96

Method Blank ID: BVBLKG02 LCS ID: BVLCSG03 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

SEMIVOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW01-GW1	Date Sampled:	06/26/96
Project Name:	WHITE SANDS MISSLE RANGE	PDP Sample ID:	3436.01	Date Received:	06/28/96
Project No.:	300 II J27	Report No.:	D8715	Date Reported:	07/08/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-82708
Multiplying Factor:	1.00	Date Extracted:	06/28/96	GC/MS File ID:	D8715
Sample Volume:	1000 ml	Date Analyzed:	07/01/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000017

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	73	Phenol-d5	75	(10-94)	34
2-Fluorobiphenyl	50	(43-116)	81	2-Fluorophenol	75	(21-100)	48
Terphenyl-d14	50	(33-141)	48	2,4,6-Tribromophenol	75	(10-123)	97

Method Blank: 3436.MBLK1 LCS ID: 3436.MLCS1 MS ID: 3436.01MS MSD ID: 3436.01MSD

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW02-GW1	Date Sampled:	06/26/96
Project Name:	WHITE SANDS MISSLE RANGE	POP Sample ID:	3436.03	Date Received:	06/28/96
Project No.:	300 II J27	Report No.:	D8718	Date Reported:	07/08/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-82708
Multiplying Factor:	1.00	Date Extracted:	06/28/96	GC/MS File ID:	D8718
Sample Volume:	1000 ml	Date Analyzed:	07/01/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000018

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	70	Phenol-d5	75	(10-94)	36
2-Fluorobiphenyl	50	(43-116)	78	2-Fluorophenol	75	(21-100)	50
Terphenyl-d14	50	(33-141)	53	2,4,6-Tribromophenol	75	(10-123)	97

Method Blank: 3436.MBLK1 LCS ID: 3436.MLCS1 MS ID: 3436.01MS MSD ID: 3436.01MSD

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project Number: 300 II J27

Client Sample ID: MPL-MW01-GW1
PDP Sample ID: 3436.01
Report Number: I43601

Date Sampled: 06/26/96
Date Received: 06/28/96
Date Reported: 07/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	0.10	6.15	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	0.06	ND	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.005	0.007	DOC
Barium	SW846-6010A	07-09-96	07-10-96	0.01	0.048	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.05	ND	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	1.0	21	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.01	0.022	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Copper	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.10	4.65	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	1.0	6.8	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	0.01	0.085	DOC
Mercury	SW846-7470A	07-02-96	07-03-96	0.0002	ND	KN
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.02	ND	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	0.04	ND	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	5.0	13	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	1.0	135	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	0.01	0.019	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	0.02	0.062	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL290
GFAA LCS ID: NA
CVAA LCS ID: HGL244

ICP MS ID: 3440.03MS
GFAA MS ID: NA
CVAA MS ID: 3440.03MS

ICP Method Blank ID: ICPB290
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB244

ICP LCSD ID: ICPL290D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL244D

ICP MSD ID: 3440.03MSD
GFAA MSD ID: NA
CVAA MSD ID: 3440.03MSD

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project Number: 300 II J27

Client Sample ID: MPL-MW02-GW1
PDP Sample ID: 3436.03
Report Number: I43603

Date Sampled: 06/26/96
Date Received: 06/28/96
Date Reported: 07/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	0.10	3.63	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	0.06	ND	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Barium	SW846-6010A	07-09-96	07-10-96	0.01	0.033	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.05	ND	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	1.0	40.3	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Copper	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.10	2.85	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	1.0	10.1	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	0.01	0.089	DOC
Mercury	SW846-7470A	07-02-96	07-03-96	0.0002	ND	KW
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.02	ND	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	0.04	ND	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	5.0	9	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	1.0	99.7	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	0.01	0.014	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	0.02	0.044	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL290
GFAA LCS ID: NA
CVAA LCS ID: HGL244

ICP MS ID: 3440.03MS
GFAA MS ID: NA
CVAA MS ID: 3440.03MS

ICP Method Blank ID: ICPB290
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB244

ICP LCSD ID: ICPL290D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL244D

ICP MSD ID: 3440.03MSD
GFAA MSD ID: NA
CVAA MSD ID: 3440.03MSD

PESTICIDES/PCBs

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NEVATEC	Client Sample ID:	MPL-MW01-GW1	Date Sampled:	06/26/96
Project Name:	WHITE SANDS MISSLE RANGE	PDP Sample ID:	3436.01	Date Received:	06/28/96
Project No.:	300 II J27	Report No.:	E01548	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01548
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.10	ND	Endrin aldehyde	0.10	ND
4,4'-DDE	0.10	ND	Endrin ketone	0.10	ND
4,4'-DDT	0.10	ND	gamma-BHC (Lindane)	0.05	ND
Aldrin	0.05	ND	Heptachlor	0.05	ND
alpha-BHC	0.05	ND	Heptachlor epoxide	0.05	ND
beta-BHC	0.05	ND	Methoxychlor	0.50	ND
Chlordane (Technical)	1.00	ND	Toxaphene	5	ND
delta-BHC	0.05	ND	Aroclor-1016	1	ND
Dieldrin	0.10	ND	Aroclor-1221	2	ND
Endosulfan I	0.05	ND	Aroclor-1232	1	ND
Endosulfan II	0.10	ND	Aroclor-1242	1	ND
Endosulfan sulfate	0.10	ND	Aroclor-1248	1	ND
Endrin	0.10	ND	Aroclor-1254	1	ND
			Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	143
Decachlorobiphenyl	0.2	(30-150)	71

Method Blank ID: 3436.WBLK1 LCS ID: 3436.WLCS1 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW02-GW1	Date Sampled:	06/26/96
Project Name:	WHITE SANDS MISSLE RANGE	PDP Sample ID:	3436.03	Date Received:	06/28/96
Project No.:	300 II J27	Report No.:	E01549	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01549
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.10	ND	Endrin aldehyde	0.10	ND
4,4'-DDE	0.10	ND	Endrin ketone	0.10	ND
4,4'-DDT	0.10	ND	gamma-BHC (Lindane)	0.05	ND
Aldrin	0.05	ND	Heptachlor	0.05	ND
alpha-BHC	0.05	ND	Heptachlor epoxide	0.05	ND
beta-BHC	0.05	ND	Methoxychlor	0.50	ND
Chlordane (Technical)	1.00	ND	Toxaphene	5	ND
delta-BHC	0.05	ND	Aroclor-1016	1	ND
Dieldrin	0.10	ND	Aroclor-1221	2	ND
Endosulfan I	0.05	ND	Aroclor-1232	1	ND
Endosulfan II	0.10	ND	Aroclor-1242	1	ND
Endosulfan sulfate	0.10	ND	Aroclor-1248	1	ND
Endrin	0.10	ND	Aroclor-1254	1	ND
			Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	128
Decachlorobiphenyl	0.2	(30-150)	49

Method Blank ID: 3436.MBLK1 LCS ID: 3436.MLCS1 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

GENERAL CHEMISTRY

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/10/96
Report No: I436PH
Analyst: KW

WET CHEMISTRY PARAMETER: pH

Method Reference: SW-846 9040 UNITS: NA

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	06-28-96	NA	7.63			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	06-28-96	NA	7.39			

QUALITY ASSURANCE/QUALITY CONTROL

3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	06-28-96	NA	9.05	9.05		100
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	06-28-96	NA	9.06	9.05	0.1	100
3436.01D	DUPLICATE	WATER	NA	NA	NA	06-28-96	NA	7.64		0.1	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/10/96
Report No: I436TOC
Analyst: KW

WET CHEMISTRY PARAMETER: Total Organic Carbon

Method Reference: EPA 415.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-01-96	1.0	ND			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-01-96	1.0	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3438.PBW1	METHOD BLANK	WATER	NA	NA	NA	07-01-96	1.0	ND			
3438.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2.0	44	49.2		89
3438.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2.0	44	49.2	0.0	89
3438.01	SAMPLE	WATER	NA	NA	NA	07-01-96	1.0	ND			
3438.01MS	MATRIX SPIKE	WATER	NA	NA	NA	07-01-96	1.0	24	25		96
3438.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-01-96	1.0	25	25	4.1	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/10/96
Report No: I436ALK
Analyst: KW

WET CHEMISTRY PARAMETER: Alkalinity as CaCO3

Method Reference: EPA 310.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-01-96	2.0	141			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-01-96	2.0	116			

QUALITY ASSURANCE/QUALITY CONTROL

3438.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2.0	476	500		95
3438.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2.0	474	500	0.4	95
3433.04	SAMPLE	WATER	NA	NA	NA	07-01-96	2.0	295			
3433.04D	DUPLICATE	WATER	NA	NA	NA	07-01-96	2.0	296		0.3	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/10/96
Report No: I436CON
Analyst: KW

WET CHEMISTRY PARAMETER: Conductivity

Method Reference: EPA 120.1 UNITS: umhos/cm

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-08-96	NA	640			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-08-96	NA	680			

QUALITY ASSURANCE/QUALITY CONTROL

3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	NA	1118	1100		102
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	NA	1120	1100	0.2	102
3440.03	SAMPLE	WATER	NA	NA	NA	07-08-96	NA	1240			
3440.03D	DUPLICATE	WATER	NA	NA	NA	07-08-96	NA	1260		1.6	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/11/96
Report No: I436AMM
Analyst: KW

WET CHEMISTRY PARAMETER: Ammonia as N

Method Reference: EPA 350.3 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-08-96	0.25	ND			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-08-96	0.25	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	0.25	5.23	5.0		105
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	0.25	5.16	5.0	1.3	103
3440.03	SAMPLE	WATER	NA	NA	NA	07-08-96	0.25	ND			
3440.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-08-96	0.25	5.03	5.0		101
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-08-96	0.25	5.18	5.0	2.9	104

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/11/96
Report No: I436TDS
Analyst: KW

WET CHEMISTRY PARAMETER: Total Dissolved Solids (TDS)

Method Reference: EPA 160.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-01-96	10	490			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-01-96	10	490			

QUALITY ASSURANCE/QUALITY CONTROL

3436.BLK1	METHOD BLANK	WATER	NA	NA	NA	07-01-96	10	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	10	500	500		100
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	10	500	500	0.0	100
3436.01D	DUPLICATE	WATER	NA	NA	NA	07-01-96	10	470		4.2	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/16/96
Report No: I436TCN
Analyst: KW

WET CHEMISTRY PARAMETER: Total Cyanide

Method Reference: SW-846 9010

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	07-10-96	07-10-96	0.01	0.296			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	07-10-96	07-10-96	0.02	0.448			

QUALITY ASSURANCE/QUALITY CONTROL

3436.BLK1	METHOD BLANK	WATER	NA	NA	07-10-96	07-10-96	0.01	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	07-10-96	07-10-96	0.01	0.097	0.100		97
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	07-10-96	07-10-96	0.01	0.099	0.100	2.0	99
3440.04	SAMPLE	WATER	NA	NA	07-10-96	07-10-96	0.02	0.590			
3440.04MS	MATRIX SPIKE	WATER	NA	NA	07-10-96	07-10-96	0.02	0.682	0.100		92
3436.04MSD	MATRIX SPIKE DUP	WATER	NA	NA	07-10-96	07-10-96	0.02	0.686	0.100	0.6	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/16/96
Report No: I436PHL
Analyst: KN

WET CHEMISTRY PARAMETER: Phenols

Method Reference: EPA 420.1

UNITS: ug/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	07-11-96	07-12-96	0.05	ND			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	07-11-96	07-12-96	0.05	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3436.BLK1	METHOD BLANK	WATER	NA	NA	07-11-96	07-12-96	0.05	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	07-11-96	07-12-96	0.05	0.48	0.500		96
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	07-11-96	07-12-96	0.05	0.48	0.500	0.0	96
3440.03	SAMPLE	WATER	NA	NA	07-11-96	07-12-96	0.05	ND			
3440.03MS	MATRIX SPIKE	WATER	NA	NA	07-11-96	07-12-96	0.05	0.511	0.500		102
3436.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	07-11-96	07-12-96	0.05	0.502	0.500	1.8	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: WHITE SANDS MISSLE RANGE
Project No: 300-II J27

Date Reported: 07/22/96
Report No: I436CHL
Analyst: KW

WET CHEMISTRY PARAMETER: Chloride

Method Reference: EPA 325.3 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-17-96	4.0	39			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-17-96	4.0	53			

QUALITY ASSURANCE/QUALITY CONTROL

3433.WBLK1	METHOD BLANK	WATER	NA	NA	NA	07-17-96	4.0	ND			
3433.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	4.0	206	200		103
3433.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	4.0	199	200	3.5	100
3441.04	SAMPLE	WATER	NA	NA	NA	07-17-96	4.0	152			
3441.04MS	MATRIX SPIKE	WATER	NA	NA	NA	07-17-96	4.0	351	200		100
3441.04MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-17-96	4.0	345	200	1.7	97

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: WHITE SANDS MISSLE RANGE
Project No: 300-II J27

Date Reported: 07/24/96
Report No: I436FLO
Analyst: KM

WET CHEMISTRY PARAMETER: Fluoride

Method Reference: EPA 340.2 UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-21-96	0.1	0.25			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-21-96	0.1	0.21			

QUALITY ASSURANCE/QUALITY CONTROL

3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-21-96	0.1	5.12	5.0		102
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-21-96	0.1	5.18	5.0	1.2	104
3440.03	SAMPLE	WATER	NA	NA	NA	07-21-96	0.1	0.15			
3440.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-21-96	0.1	5.06	5.0		98
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-21-96	0.1	5.27	5.0	4.1	102

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: WHITE SANDS MISSLE RANGE
Project No: 300-II J27

Date Reported: 07/24/96
Report No: I436SUL
Analyst: KW

WET CHEMISTRY PARAMETER: Sulfate

Method Reference: EPA 375.4 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-17-96	125	40			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-17-96	25	101			

QUALITY ASSURANCE/QUALITY CONTROL

3433.PBW1	METHOD BLANK	WATER	NA	NA	NA	07-17-96	5.0	ND			
3433.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	5.0	18	20		90
3433.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	5.0	18	20	0.0	90
3441.04	SAMPLE	WATER	NA	NA	NA	07-17-96	25	65			
3441.04MS	MATRIX SPIKE	WATER	NA	NA	NA	07-17-96	25	163	100		98
3441.04MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-17-96	25	165	100	1.2	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: WHITE SANDS MISSLE RANGE
Project No: 300-II J27

Date Reported: 07/24/96
Report No: I436NIMA
Analyst: KW

WET CHEMISTRY PARAMETER: Nitrate/Nitrite as N

Method Reference: EPA 352.1/354.1

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-19-96	0.51	3.6			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-19-96	0.51	4.2			

QUALITY ASSURANCE/QUALITY CONTROL

3436.PBW1	METHOD BLANK	WATER	NA	NA	NA	07-19-96	0.11	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-19-96	0.11	1.11	1.10		101
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-19-96	0.11	1.11	1.10	0.1	101
3440.03	SAMPLE	WATER	NA	NA	NA	07-19-96	0.51	7.6			
3440.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-19-96	1.01	12.2	5.10		90
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-19-96	1.01	12.5	5.10	2.4	96

SUB-CONTRACT DATA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: WHITE SANDS MISSILE RANGE
Project No: 300 II J27

Date Reported: 07/10/96
Report No: I436TKN
Analyst: SUB

WET CHEMISTRY PARAMETER: Total Kjeldahl Nitrogen

Method Reference: EPA 351.3

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3436.01	MPL-MW01-GW1	WATER	06-26-96	06-28-96	NA	07-02-96	1.00	ND			
3436.03	MPL-MW02-GW1	WATER	06-26-96	06-28-96	NA	07-02-96	1.00	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3436.WBLK1	METHOD BLANK	WATER	NA	NA	NA	07-02-96	1.00	ND			
3436.WLCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-02-96	1.00	5.38	5.11		105
3436.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-02-96	1.00	22.4	20		112
3436.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-02-96	1.00	22.2	20	0.9	111

QUALITY CONTROL DATA

VOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	BVBLK002 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	88874	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88874
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

0000042

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	100
1,2-Dichloroethane-d4	10	(80-120)	94
Toluene-d8	10	(88-110)	98
4-Bromofluorobenzene	10	(86-115)	95

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	BVLCSG03 (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	B8875	Date Reported:	07/08/96

GC/MS-VOLATILES ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	B8875
Sample Volume:	20.0 ml			Analyst:	LI

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,1-Dichloroethane	10	11	110	(61-145)
Benzene	10	11	110	(76-127)
Chlorobenzene	10	11	110	(75-130)
Toluene	10	10	100	(76-125)
Trichloroethene	10	11	110	(71-120)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dichloroethane-d4	10	(80-120)	101
Dibromofluoromethane	10	(86-118)	100
Toluene-d8	10	(88-110)	103
4-Bromofluorobenzene	10	(86-115)	103

Method Blank: BVBLKG02 LCS ID: NA MS ID: NA MSD ID: NA DUP ID:NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID: MPL-MW04-GW1		Date Received:	NA
Project Name:	NA			Date Reported:	07/08/96
Project No.:	NA			Report No.:	3440V03Q

GC/MS-VOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8260A	Sample Matrix:	WATER	Analyst:	LI

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3440.03	MS Sample ID:	3440.03MS	MSD Sample ID:	3440.03MSD
Client Sample ID:	MPL-MW04-GW1	Client Sample ID:	MPL-MW04-GW1MS	Client Sample ID:	MPL-MW04-GW1MSD
Sample Volume:	20.0 ml	Sample Volume:	20.0 ml	Sample Volume:	20.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	07/02/96	Date Analyzed:	07/02/96	Date Analyzed:	07/03/96
GC/MS File ID:	88906	GC/MS File ID:	88907	GC/MS File ID:	88908

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	10	100	(61-145)
Benzene	10	ND	11	110	(76-127)
Chlorobenzene	10	ND	11	110	(75-130)
Toluene	10	ND	11	110	(76-125)
Trichloroethene	10	ND	10	100	(71-120)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	9	90	10.5	14	(61-145)
Benzene	10	ND	9	90	20.0 *	11	(76-127)
Chlorobenzene	10	ND	9	90	20.0 *	13	(75-130)
Toluene	10	ND	9	90	20.0 *	13	(76-125)
Trichloroethene	10	ND	9	90	10.5	14	(71-120)

*Values outside of QC limits

RPD: 3 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

SEMIVOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3436.MBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	D8690	Date Reported:	07/01/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	06/28/96	GC/MS File ID:	D8690
Sample Volume:	1000 ml	Date Analyzed:	06/30/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000046

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	61	Phenol-d5	75	(10-94)	33
2-Fluorobiphenyl	50	(43-116)	60	2-Fluorophenol	75	(21-100)	45
Terphenyl-d14	50	(33-141)	44	2,4,6-Tribromophenol	75	(10-123)	71

Method Blank: NA LCS ID: NA MS ID: NA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3436.WLCS1 (LAB CONT. SAMP.)	Date Received:	NA
Project No.:	NA	Report No.:	08691	Date Reported:	07/01/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.0	Date Extracted:	06/28/96	GC/MS File ID:	08691
Sample Volume:	1000 ml	Date Analyzed:	06/30/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,2,4-Trichlorobenzene	50	21	42	(39-98)
1,4-Dichlorobenzene	50	19	38	(36-97)
2,4-Dinitrotoluene	50	32	64	(24-96)
2-Chlorophenol	75	39	52	(27-123)
4-Chloro-3-methylphenol	75	41	55	(23-97)
4-Nitrophenol	75	15	20	(10-80)
Acenaphthene	50	28	56	(46-118)
N-Nitroso-di-N-propylamine	50	28	56	(41-116)
Pentachlorophenol	75	13	17	(9-103)
Phenol	75	22	29	(12-110)
Pyrene	50	25	50	(26-127)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	51	Phenol-d5	75	(10-94)	27
2-Fluorobiphenyl	50	(43-116)	50	2-Fluorophenol	75	(21-100)	38
Terphenyl-d14	50	(33-141)	41	2,4,6-Tribromophenol	75	(10-123)	62

Method Blank: 3436.WBLK1 LCS ID:NA MS ID:NA MSD ID:NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW01-GW1MS	Date Sampled:	06/26/96
Project Name:	NA	PDP Sample ID:	3436.01MS (MATRIX SPIKE)	Date Received:	06/28/96
Project No.:	NA	Report No.:	D8716	Date Reported:	07/08/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-82708
Multiplying Factor:	2.00	Date Extracted:	06/28/96	GC/MS File ID:	D8716
Sample Volume:	500 ml	Date Analyzed:	07/01/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	20	55	Benzo(a)pyrene	20	ND
1,2-Dichlorobenzene	20	ND	Benzo(b)fluoranthene	20	ND
1,3-Dichlorobenzene	20	ND	Benzo(g,h,i)perylene	20	ND
1,4-Dichlorobenzene	20	48	Benzo(k)fluoranthene	20	ND
2,2'-oxybis (1-Chloropropane)	20	ND	Benzyl Alcohol	40	ND
2,4,5-Trichlorophenol	50	ND	Bis(2-chloroethoxy)methane	20	ND
2,4,6-Trichlorophenol	20	ND	Bis(2-chloroethyl)ether	20	ND
2,4-Dichlorophenol	20	ND	Bis(2-ethylhexyl)phthalate	20	ND
2,4-Dimethylphenol	20	ND	Butylbenzylphthalate	20	ND
2,4-Dinitrophenol	50	ND	Carbazole	20	ND
2,4-Dinitrotoluene	20	71	Chrysene	20	ND
2,6-Dinitrotoluene	20	ND	Dibenzofuran	20	ND
2-Chloronaphthalene	20	ND	Dibenz(a,h)anthracene	20	ND
2-Chlorophenol	20	89	Diethyl phthalate	20	ND
2-Methylnaphthalene	20	ND	Dimethyl phthalate	20	ND
2-Methylphenol	20	ND	Di-n-Butylphthalate	20	ND
2-Nitroaniline	50	ND	Di-n-Octylphthalate	20	ND
2-Nitrophenol	20	ND	Fluoranthene	20	ND
3,3-Dichlorobenzidine	40	ND	Fluorene	20	ND
3-Nitroaniline	50	ND	Hexachlorobenzene	20	ND
4,6-Dinitro-2-methylphenol	50	ND	Hexachlorobutadiene	20	ND
4-Bromophenyl-phenylether	20	ND	Hexachlorocyclopentadiene	20	ND
4-Chloroaniline	40	ND	Hexachloroethane	20	ND
4-Chlorophenyl-phenylether	20	ND	Indeno(1,2,3-cd)pyrene	20	ND
4-Chloro-3-methylphenol	40	95	Isophorone	20	ND
4-Methylphenol	20	ND	Naphthalene	20	ND
4-Nitroaniline	50	ND	Nitrobenzene	20	ND
4-Nitrophenol	50	39	N-Nitrosodimethylamine	20	ND
Acenaphthene	20	64	N-Nitrosodiphenylamine	20	ND
Acenaphthylene	20	ND	N-Nitroso-di-N-propylamine	20	60
Anthracene	20	ND	Pentachlorophenol	50	80
Benzidine	50	ND	Phenanthrene	20	ND
Benzoic Acid	100	ND	Phenol	20	49
Benzo(a)anthracene	20	ND	Pyrene	20	57

QUALITY ASSURANCE/QUALITY CONTROL

000048

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	54	Phenol-d5	75	(10-94)	30
2-Fluorobiphenyl	50	(43-116)	59	2-Fluorophenol	75	(21-100)	41
Terphenyl-d14	50	(33-141)	40	2,4,6-Tribromophenol	75	(10-123)	80

Method Blank: 3436.MBLK1 LCS ID: 3436.MLCS1 MS ID: NA MSD ID: NA

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW01-GW1MSD	Date Sampled:	06/26/96
Project Name:	NA	POP Sample ID:	3436.01MSD (MATRIX SPIKE DUPLICATE)	Date Received:	06/28/96
Project No.:	NA	Report No.:	D8717	Date Reported:	07/08/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	2.00	Date Extracted:	06/28/96	GC/MS File ID:	D8717
Sample Volume:	500 ml	Date Analyzed:	07/01/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	20	50	Benzo(a)pyrene	20	ND
1,2-Dichlorobenzene	20	ND	Benzo(b)fluoranthene	20	ND
1,3-Dichlorobenzene	20	ND	Benzo(g,h,i)perylene	20	ND
1,4-Dichlorobenzene	20	46	Benzo(k)fluoranthene	20	ND
2,2'-oxybis (1-Chloropropane)	20	ND	Benzyl Alcohol	40	ND
2,4,5-Trichlorophenol	50	ND	Bis(2-chloroethoxy)methane	20	ND
2,4,6-Trichlorophenol	20	ND	Bis(2-chloroethyl)ether	20	ND
2,4-Dichlorophenol	20	ND	Bis(2-ethylhexyl)phthalate	20	ND
2,4-Dimethylphenol	20	ND	Butylbenzylphthalate	20	ND
2,4-Dinitrophenol	50	ND	Carbazole	20	ND
2,4-Dinitrotoluene	20	68	Chrysene	20	ND
2,6-Dinitrotoluene	20	ND	Dibenzofuran	20	ND
2-Chloronaphthalene	20	ND	Dibenz(a,h)anthracene	20	ND
2-Chlorophenol	20	90	Diethyl phthalate	20	ND
2-Methylnaphthalene	20	ND	Dimethyl phthalate	20	ND
2-Methylphenol	20	ND	Di-n-Butylphthalate	20	ND
2-Nitroaniline	50	ND	Di-n-Octylphthalate	20	ND
2-Nitrophenol	20	ND	Fluoranthene	20	ND
3,3-Dichlorobenzidine	40	ND	Fluorene	20	ND
3-Nitroaniline	50	ND	Hexachlorobenzene	20	ND
4,6-Dinitro-2-methylphenol	50	ND	Hexachlorobutadiene	20	ND
4-Bromophenyl-phenylether	20	ND	Hexachlorocyclopentadiene	20	ND
4-Chloroaniline	40	ND	Hexachloroethane	20	ND
4-Chlorophenyl-phenylether	20	ND	Indeno(1,2,3-cd)pyrene	20	ND
4-Chloro-3-methylphenol	40	91	Isophorone	20	ND
4-Methylphenol	20	ND	Naphthalene	20	ND
4-Nitroaniline	50	ND	Nitrobenzene	20	ND
4-Nitrophenol	50	31	N-Nitrosodimethylamine	20	ND
Acenaphthene	20	59	N-Nitrosodiphenylamine	20	ND
Acenaphthylene	20	ND	N-Nitroso-di-N-propylamine	20	62
Anthracene	20	ND	Pentachlorophenol	50	64
Benzidine	50	ND	Phenanthrene	20	ND
Benzoic Acid	100	ND	Phenol	20	46
Benzo(a)anthracene	20	ND	Pyrene	20	53

QUALITY ASSURANCE/QUALITY CONTROL

000049

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	53	Phenol-d5	75	(10-94)	28
2-Fluorobiphenyl	50	(43-116)	57	2-Fluorophenol	75	(21-100)	40
Terphenyl-d14	50	(33-141)	45	2,4,6-Tribromophenol	75	(10-123)	72

Method Blank: 3436.WBLK1 LCS ID: 3436.WLCS1 MS ID: NA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Date Received:	NA
Project Name:	NA	Date Reported:	07/08/96
Project No.:	NA	Report No.:	3436S01Q

GC/MS-SEMIVOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8270B	Sample Matrix:	WATER	Analyst:	RP

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3436.01	MS Sample ID:	3436.01MS	MSD Sample ID:	3436.01MSD
Client Sample ID:	MPL-MW01-GW1	Client Sample ID:	MPL-MW01-GW1MS	Client Sample ID:	MPL-MW01-GW1MSD
Sample Volume:	1000 ml	Sample Volume:	500 ml	Sample Volume:	500 ml
Extract Volume:	1.0 ml	Extract Volume:	1.0 ml	Extract Volume:	1.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	07/01/96	Date Analyzed:	07/01/96	Date Analyzed:	07/01/96
GC/MS File ID:	D8715	GC/MS File ID:	D8716	GC/MS File ID:	D8717

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,2,4-Trichlorobenzene	100	ND	55	55	(39-98)
1,4-Dichlorobenzene	100	ND	48	48	(36-97)
2,4-Dinitrotoluene	100	ND	71	71	(24-96)
2-Chlorophenol	150	ND	89	59	(27-123)
4-Chloro-3-methylphenol	150	ND	95	63	(23-97)
4-Nitrophenol	150	ND	39	26	(10-80)
Acenaphthene	100	ND	64	64	(46-118)
N-Nitroso-di-N-propylamine	100	ND	60	60	(41-116)
Pentachlorophenol	150	ND	80	53	(9-103)
Phenol	150	ND	49	33	(12-110)
Pyrene	100	ND	57	57	(26-127)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
1,2,4-Trichlorobenzene	100	ND	50	50	9.5	42	(39-98)
1,4-Dichlorobenzene	100	ND	46	46	4.3	28	(36-97)
2,4-Dinitrotoluene	100	ND	68	68	4.3	28	(24-96)
2-Chlorophenol	150	ND	90	60	1.1	40	(27-123)
4-Chloro-3-methylphenol	150	ND	91	61	4.3	28	(23-97)
4-Nitrophenol	150	ND	31	21	22.9	42	(10-80)
Acenaphthene	100	ND	59	59	8.1	31	(46-118)
N-Nitroso-di-N-propylamine	100	ND	62	62	3.3	50	(41-116)
Pentachlorophenol	150	ND	64	43	22.2	38	(9-103)
Phenol	150	ND	46	31	6.3	42	(12-110)
Pyrene	100	ND	53	53	7.3	31	(26-127)

* : Values outside of QC limits
RPD: 0 out of 11 outside limits
Spike Recovery: 0 out of 22 outside limits

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
PDP Sample ID: ICPB290 (METHOD BLANK)
Report Number: ICPB290

Date Sampled: NA
Date Received: NA
Date Reported: 07/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	0.10	ND	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	0.06	ND	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Barium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.05	ND	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	1.0	ND	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Copper	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.10	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	1.0	ND	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.02	ND	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	0.04	ND	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	5.0	ND	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	1.0	ND	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
PDP Sample ID: MGB244 (METHOD BLANK)
Report Number: MGB244

Date Sampled: NA
Date Received: NA
Date Reported: 07/08/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Mercury	SW846-7470A	07-02-96	07-03-96	0.00020	ND	XW

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: ICPL290
LCSD ID: ICPL290D

Date Reported: 07/12/96
Report Number: ICPL290

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	5.0	5.22	104	5.44	109	4.1	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	1.25	1.31	105	1.33	106	1.5	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.25	0.261	104	0.266	106	1.9	DOC
Barium	SW846-6010A	07-09-96	07-10-96	5.0	5.17	103	5.27	105	1.9	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.125	0.134	107	0.136	109	1.5	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.25	0.30	120	0.30	120	0.0	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.125	0.123	98	0.125	100	1.6	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	62.5	61.80	99	63.2	101	2.2	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.50	0.523	105	0.532	106	1.7	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	1.25	1.29	103	1.32	106	2.3	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.625	0.643	103	0.668	107	3.8	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	2.5	2.55	102	2.63	105	3.1	DOC
Lead	SW846-6010A	07-09-96	07-10-96	0.25	0.247	99	0.251	100	1.6	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	62.5	62.3	100	63.3	101	1.6	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	1.25	1.31	105	1.33	106	1.5	DOC
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.25	0.26	104	0.26	104	0.0	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	1.25	1.27	102	1.3	104	2.3	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	62.5	66.9	107	71.3	114	6.4	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.25	0.254	102	0.253	101	0.4	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.625	0.65	104	0.666	107	2.4	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	62.5	61.9	99	64.8	104	4.6	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.25	0.242	97	0.25	100	3.3	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	1.25	1.28	102	1.31	105	2.3	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	1.25	1.31	105	1.32	106	0.8	DOC

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: ICPB290

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: HGL244
LCSD ID: HGL244D

Date Reported: 07/08/96
Report Number: HGL244

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Mercury	SW846-7470A	07-02-96	07-03-96	0.0020	0.0020	100	0.0020	100	0.0	KN

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: HGB244

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

PDP MS ID: 3440.03MS
PDP MSD ID: 3440.03MSD
Report Number: I440MS03

Date Sampled: NA
Date Received: NA
Date Reported: 07/12/96

TOTAL METALS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	SAMPLE VALUE	MATRIX SPIKE ADDED	MATRIX SPIKE VALUE	PERCENT RECOVERY (75-125)	MATRIX SPIKE DUP VALUE	PERCENT RECOVERY (75-125)	RPD (20)
Aluminum	SW846-6010A	07-09-96	07-10-96	5.76	2.0	8.53	138*	9.18	171*	7.3
Antimony	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.51	102	0.50	100	2.0
Arsenic	SW846-6010A	07-09-96	07-10-96	ND	2.0	1.97	99	1.94	97	1.5
Barium	SW846-6010A	07-09-96	07-10-96	0.035	2.0	2.1	103	2.07	102	1.4
Beryllium	SW846-6010A	07-09-96	07-10-96	ND	0.05	0.0545	109	0.0536	107	1.7
Boron	SW846-6010A	07-09-96	07-10-96	0.066	0.25	0.35	114	0.373	123	6.4
Cadmium	SW846-6010A	07-09-96	07-10-96	ND	0.05	0.047	94	0.046	92	2.2
Calcium	SW846-6010A	07-09-96	07-10-96	26.5	NA	74.7	NA	73.9	NA	1.1
Chromium	SW846-6010A	07-09-96	07-10-96	ND	0.20	0.205	102	0.203	102	1.0
Cobalt	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.503	101	0.495	99	1.6
[illegible]r	SW846-6010A	07-09-96	07-10-96	ND	0.25	0.274	110	0.269	108	1.8
[illegible]	SW846-6010A	07-09-96	07-10-96	4.02	1.0	5.08	**	5.29	**	4.1
Lead	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.481	96	0.47	94	2.3
Magnesium	SW846-6010A	07-09-96	07-10-96	9.2	NA	57.8	NA	57.1	NA	1.2
Manganese	SW846-6010A	07-09-96	07-10-96	0.095	0.50	0.601	101	0.594	100	1.2
Mercury	SW846-7470A	07-02-96	07-03-96	ND	0.001	0.0012	120	0.0012	120	0.0
Molybdenum	SW846-6010A	07-09-96	07-10-96	ND	0.25	0.25	100	0.25	100	0.0
Nickel	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.5	104	0.511	102	1.7
Potassium	SW846-6010A	07-09-96	07-10-96	21	NA	87.1	NA	86	NA	1.3
Selenium	SW846-6010A	07-09-96	07-10-96	0.011	2.0	1.98	98	1.96	97	1.0
Silver	SW846-6010A	07-09-96	07-10-96	ND	0.05	0.047	94	0.047	94	0.0
Sodium	SW846-6010A	07-09-96	07-10-96	241	NA	344	NA	342	NA	0.6
Thallium	SW846-6010A	07-09-96	07-10-96	ND	2.0	1.92	96	1.89	95	1.6
Vanadium	SW846-6010A	07-09-96	07-10-96	0.016	0.50	0.517	100	0.512	99	1.0
Zinc	SW846-6010A	07-09-96	07-10-96	0.058	0.50	0.545	97	0.529	94	3.0

ICP Batch ID: ICPB290
GFAA Batch ID: NA
CVAA Batch ID: HGB244

* : Indicates the value is outside control limits.
** : High analyte concentration prevented accurate determination of the matrix spike recovery.
[illegible] The sample required a post-digest (instrument) dilution resulting in a dilution of the matrix spike added.

PESTICIDES/PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3436.WBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	E01546	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01546
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.10	ND	Endrin aldehyde	0.10	ND
4,4'-DDE	0.10	ND	Endrin ketone	0.10	ND
4,4'-DDT	0.10	ND	gamma-BHC (Lindane)	0.05	ND
Aldrin	0.05	ND	Heptachlor	0.05	ND
alpha-BHC	0.05	ND	Heptachlor epoxide	0.05	ND
beta-BHC	0.05	ND	Methoxychlor	0.50	ND
Chlordane (Technical)	1.00	ND	Toxaphene	5	ND
delta-BHC	0.05	ND	Aroclor-1016	1	ND
Dieldrin	0.10	ND	Aroclor-1221	2	ND
Endosulfan I	0.05	ND	Aroclor-1232	1	ND
Endosulfan II	0.10	ND	Aroclor-1242	1	ND
Endosulfan sulfate	0.10	ND	Aroclor-1248	1	ND
Endrin	0.10	ND	Aroclor-1254	1	ND
			Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	76
Decachlorobiphenyl	0.2	(30-150)	86

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8: The Woodlands, Texas 77380: Phone(713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3436.WLCS1 (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	E01547	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01547
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
4,4'-DDT	1.0	1.16	116	(38-127)
Aldrin	0.5	0.330	66	(40-120)
Dieldrin	1.0	1.08	108	(52-126)
Endrin	1.0	1.14	114	(56-121)
gamma-BHC (Lindane)	0.5	0.566	113	(56-123)
Heptachlor	0.5	0.338	68	(40-131)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	81
Decachlorobiphenyl	0.2	(30-150)	80

Method Blank: 3436.WBLK1 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

000059

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Date Received:	NA
Project Name:	NA	Date Reported:	07/15/96
Project No.:	NA	Report No.:	3440P03Q

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.: SW846-8080A Sample Matrix: WATER Analyst: SM

SAMPLE	MATRIX SPIKE	MATRIX SPIKE DUPLICATE
PDP Sample ID: 3440.03	MS Sample ID: 3440.03MS	MSD Sample ID: 3440.03MSD
Client Sample ID: MPL-MW04-GW1	Client Sample ID: MPL-MW04-GW1MS	Client Sample ID: MPL-MW04-GW1MSD
Sample Volume: 1000 ml	Sample Volume: 500 ml	Sample Volume: 500 ml
Extract Volume: 10.0 ml	Extract Volume: 10.0 ml	Extract Volume: 10.0 ml
Dilution: 1.0	Dilution: 1.0	Dilution: 1.0
Date Analyzed: 07/02/96	Date Analyzed: 07/02/96	Date Analyzed: 07/02/96
GC File ID: E01551	GC File ID: E01552	GC File ID: E01553

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE CONC. (ug/L)	MS % REC.	QC LIMITS REC.
4, 4' - DDT	2.0	ND	3.35	168 *	38-127
Aldrin	1.0	ND	1.79	179 *	40-120
Dieldrin	2.0	ND	3.17	159 *	52-126
Endrin	2.0	ND	3.39	170 *	56-121
gamma - BHC (Lindane)	1.0	ND	1.63	163 *	56-123
Heptachlor	1.0	ND	1.32	132 *	40-131

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE DUPLICATE CONC. (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
4, 4' - DDT	2.0	ND	2.54	127	27.5 *	27	38-127
Aldrin	1.0	ND	1.04	104	53.0 *	22	40-120
Dieldrin	2.0	ND	2.39	120	28.1 *	18	52-126
Endrin	2.0	ND	2.62	131 *	25.6 *	21	56-121
gamma - BHC (Lindane)	1.0	ND	1.18	118	32.0 *	15	56-123
Heptachlor	1.0	ND	0.897	90	38.2 *	20	40-131

* Values outside of QC limits

RPD: 6 out of 6 outside limits
Spike Recovery 7 out of 12 outside limits

GENERAL CHEMISTRY

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

SUB-CONTRACT DATA

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

END OF REPORT

LABORATORY ANALYTICAL REPORT

GROUNDWATER SAMPLES

MPL-MW03-GW1 & MPL-MW04-GW1

PDP
Analytical Services

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

July 24, 1996

Ms. Dana Downs
Mevatec Corporation
P.O. Box 399
White Sands Missile Range
New Mexico 88002

Episode: 3440
Project ID: Main Post Landfill Wells
Project #: 300 II J27

Dear Ms. Downs:

Enclosed are the analytical results for the samples received in our laboratory on June 29, 1996. The samples were analyzed for the parameters indicated on the chain of custody.

Please be advised that unused portions of your samples, sample extracts and digestates will be stored for 30 days from the date of this report. Unless prior arrangements were made, at the end of this period your samples will either be disposed of, or returned to you if your samples were determined to be hazardous.

We appreciate your business. Should you have any questions or need assistance with this report, please feel free to call me or Homai Madisetty, Data Review Officer, at (713) 292-7090.

Sincerely,

Bruce D. Howbert
Program Manager

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

DATA PACKAGE DOCUMENT INVENTORY

***EPISODE NUMBER:** 3440*

Section	Document Type	Pages
1.	*Case Narrative & Data Qualifiers*	1-4
2.	*Chain-of-Custody Forms*	5-12
3.	*Sample Data*	
	Volatiles	14-18
	Semivolatiles	19-22
	Metals	23-25
	Pesticides/PCBs	26-28
	General Chemistry	29-41
	Sub-Contract	42-43
4.	*Quality Control Data*	
	Volatiles	45-52
	Semivolatiles	53-60
	Metals	61-66
	PesticidesPCBs	67-72
	General Chemistry	73-74
	Sub-Contract	75-76
5.	*End of Report*	77

CASE NARRATIVE & DATA QUALIFIERS

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec **Episode No.: 3440**	**Project Name: Main Post Landfill Wells** **Project No.: 300 II J27**

CASE NARRATIVE

Four water samples were received for analysis on 06/29/96. All regulatory holding times were met by the laboratory.

All batch quality control (QC) results (Duplicates, Matrix Spikes, Matrix Spike Duplicates) are included in this data package. Batch QC may or may not have been performed on your samples. If it was, the QC reports will reference our internal sample identification.

The data qualifiers are presented following the narrative remarks. For CLP data forms, consult the CLP Qualifiers sheet. For standard PDP data spreadsheets, consult the Data Flags and Abbreviations sheet.

SAMPLE RECEIPT AND LOG-IN:

No problems were encountered.

VOLATILES:

No problems were encountered.

SEMIVOLATILES:

The entire batch was re-extracted and re-analyzed due to high surrogate recoveries in the method blank and surrogate failure for sample "MPL-MW04-GW1". However, the matrix spike and matrix spike duplicate samples could not be re-extracted due to insufficient volume. The results of the re-extracts are submitted.

The matrix spike had one surrogate and one spike recovery outside the control limits. The laboratory control sample was acceptable. Therefore, no corrective action was taken.

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec	**Project Name: Main Post Landfill Wells**
Episode No.: 3440	**Project No.: 300 II J27**

CASE NARRATIVE Continued

METALS:

The matrix spike recoveries for aluminum were outside the QC limits. The laboratory control sample was acceptable, suggesting matrix effects.

High analyte concentration prevented accurate determination of the matrix spike recoveries for iron.

PESTICIDES/PCBs:

The samples and matrix spike each had one of two surrogates outside the control limits.

The matrix spike recoveries were outside the control limits on several compounds. Since the laboratory control sample was acceptable, matrix effects are suspected.

GENERAL CHEMISTRY:

No problems were encountered.

SUB-CONTRACT DATA:

The samples for total kjeldhal nitrogen were sub-contracted to Inchcape Testing Services in Dallas, Texas.

The samples for total uranium, R-226 and R-228 were sub-contracted to CEP laboratory. This data will follow under a separate cover.

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B The Woodlands, Texas 77380

DATA FLAGS AND ABBREVIATIONS

B This flag is used when the analyte is found in the associated blank as well as in the sample.

D Indicates that the compound could not be detected because it was diluted out.

DL This flag identifies an analysis at a secondary dilution factor.

E This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. A more accurate quantitation is obtained from a diluted sample analysis.

I This flag is used to indicate the presence of interference which resulted in not determining the value.

J This flag is used when the data indicates the presence of a compound below the quantitation limit as determined by the identification criteria.

NA Not applicable.

NC Not calculated.

ND Indicates a compound was analyzed for but not detected at the quantitation level.

P This flag is used for a pesticide/aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.

RE This flag is used when the sample is re-extracted and re-analyzed.

RA This flag is used when the sample is re-analyzed.

U This flag indicates that the compound was analyzed for but not detected.

* Indicates that the compound is out of the Quality Control limits.

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: JS | DATE OF PHYSICAL LOG-IN: 7/1/96 | PAGE 1 OF 1

Episode #: 3440
Client Name: MEVATEC CORPORATION
Project ID: MAIN POST LANDFILL WELLS
Project #: 300-II J27
PO Number: NA
Courier/No.: FED-EX#0317209491

DATE OF COMPUTER LOG-IN: 7/1/96 10:27
COMPUTER LOG-IN BY: JS
DATE RECEIVED: 6/29/96
TIME RECEIVED: 930

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3440.01	MPL-MW03-GW1	VOA-8260 SVOA-8270 PEST/PCB-8080 PHENOLS-420.1 TAL METALS +B,Mo ALL ICP CVAA-Hg SP. CONDUCTANCE-120.1 TOTAL ALK.-310.1 TDS-~~160.2~~ 160.1 CHLORIDE-~~300.0~~ 325.3 FLUORIDE-~~300.0~~ 340.2 SULFATE-~~300.0~~ 375.4 AMMONIA-350.3 TKN-351.1 NITRATE/NITRITE-~~300.0~~ 352.1/354.1 CYANIDE-9010 PH-9040 TOC-415.1 R226 R228 TOTAL URANIUM	16	WATER	6/28/96	1020	3440A	7-15-96 HC	
3440.02	TRIP BLANK	VOA-8260	1	WATER	NA	NA	3440A		
3440.03	MPL-MW04-GW1	SAME LIST AS #1	32	WATER	6/28/96	1415	3440A		****MS/MSD
3440.04	TRIP BLANK	VOA-8260	2	WATER	NA	NA	3440A		

REMARKS: MS/MSD PER CLIENT REQUEST
SUBBED OUT R-226 & R-228 & TOTAL URANIUM

Weight basis: X wet ___ dry
Deliverables: X norm ___ CLP-like ___ CLP
___ raw data X electronic

APPROVED BY/DATE: [illegible] 7-1-96

SEND REPORT TO: ~~W. STICH~~ DANA DOWNS

000006

Chain of Custody Record

PDP Analytical Services
1680 Lake Front Circle, Suite B ▪ The Woodlands, Texas 77380 ▪ Phone (713) 363-2233 ▪ Fax (713) 298-5784

Client Name / Address: MEVATEC / WSMR

Send Report to: Dana Downs

Project Number: 300-II J27

Project Name: Main Post Landfill wells

Sampler (Signature): [illegible]

P.O. Number:

Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix								Remarks
1	10/28/96	10:20		X	MPL-MW03-GW1	16									See enclosed analysis list
2					TRIP Blank	1									

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[illegible]	10/28/96 16:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
		[illegible]	10/29/96 1930

Remarks:

Method of Shipment:

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

000002

Chain of Custody Record

PDP Analytical Services
1680 Lake Front Circle; Suite B ▪ The Woodlands, Texas 77380 ▪ Phone (713) 363-2233 ▪ Fax (713) 298-5784

Client Name / Address: NEVATEL / WSMR

Send Report to: Dana Downs

Project Number: 300-II J27

Project Name: Main Post Landfill Wells

Samplers (Signature): [illegible]

P.O. Number:

	Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix							Remarks
3		10/28/96	14:15		X	MPL-MW04-GW1	16								see enclosed analysis list
4						TRIP BLANK	1								

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[illegible]	10/28/96 16:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
		Gri Stanfield	10/29/96 930

Remarks:

Method of Shipment:

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

000008

Chain of Custody Record

PDP Analytical Services
1680 Lake Front Circle, Suite B ▪ The Woodlands, Texas 77380 ▪ Phone (713) 363-2233 ▪ Fax (713) 298-5784

Client Name / Address: MEVATEC / WSMR

Send Report to: Doug Downs

Project Number: 300-II J27

Project Name: Main Post Landfill Wells

Samplers (Signature): George Esquivel

P.O. Number:

Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix							Remarks
3	10/28/96	14:15		X	MPL-MW04-GW1-MS	16								see enclosed analysis list
4					TRIP BLANK	71								

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[signature]	10/28/96 16:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
		[signature]	10/29/96 9:30

Remarks:

Method of Shipment:

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

PDP ANALYTICAL SERVICES 1680 Lake Front Circle, Suite B, The Woodlands, TX 77380

SAMPLE L(-IN CHECKLIST/DISCREPA Y REPORT

FID: SLCDR01.96

CODE #: 3440 DATE/ REC'D: 6/29/96 930 TIME

CLIENT NAME: Meritec Corporation

PROJECT NAME: Main Post Landfill Wells

PROJECT NUMBER: 300-II-527

4 AQUEOUS, # 0 SOIL SAMPLES

COURIER/AIRBILL # Fedex #031720949 1

TEMP & ID: 1) 1.0°C # COOCP #1

2) 1.0°C # #2

3) 1.0°C # #3

4) ____ # ____

5) ____ # ____

6) ____ # ____

SAMPLE CONTAINER SEALS: present (absent) intact broken

COOLER CUSTODY SEALS: (present) absent (intact) broken NAME & DATE: custody tape

HOW MANY AND WHERE Both sides of cooler

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
Container Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :	✓	
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:	✓	
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client? TRIP Blanks were shipped but were not on COC. they were added on by Lab

Project Manager's recommendations?

Who was notified? By whom? Date:

Client's comments:

Corrective actions carried out?

COMMENTS:

000010

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab?		

LOG-IN BY: Jeri Armfield DATE: 6/29/96

PDP ANALYTICAL SERIVES

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

ORIGINAL

Page 1 of

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

PO# 96506

Sent to: NDRC

Contact: Jt

Phone: 214-238-5591

ORIGINAL

Sent by: Jerri Stanfield

Date sent: 7/9/96

Date Results needed: 7/18/96

PDP Sample ID	Date Collected	No. of Containers	a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight Dry/ (Wet)
3440.01	6/28/96	1	X										water	7466-1
3440.03	6/28/96	1	X										water	2

CUSTODY TRANSFERS

Relinquished by:	Recieved by:	Date/Time
Jerri Stanfield		7/9/96 1300
2 Collie McNair		7/10/96 10:18

Courier: Fedex

ANALYTICAL PARAMETERS

A TKN 351.1
B
C
D
E
F
G
H
I
J

CONFIRMED FOR RADIOACTIVITY

COOLER TEMPERATURE WHEN RECEIVED 3 °C

Project Manager Approval: BM

Lab Manager Approval:

000011

PDP ANALYTICAL SERIVES

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363 7233
Fax (713) 298 5784

Page 1 of 1

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

PO# 96483

Sent to: C.E.P

Contact: Edie Rangzo Phone: 505-982-9841

Sent by: Jeri Banfield

Date sent: 6/29/96 Date Results needed: / /

PDP Sample ID	Date Collected	No. of Containers	a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight Dry/Wet
3440.01	6/28/96	1	X	X									water	
3440.03	MS/MSD 6/28/96	2	X	X									water	

CUSTODY TRANSFERS

Relinquished by:	Received by:	Date/Time
1. Jeri Banfield		6/29/96 1100
2.		

Courier: Fedex

ANALYTICAL PARAMETERS

A R-226 & R-228
B TOTAL URANIUM
C
D
E
F
G
H
I
J

Project Manager Approval:

Lab Manager Approval:

000012

SAMPLE DATA

VOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC CORPORATION	Client Sample ID:	MPL-MW03-GW1	Date Sampled:	06/28/96
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.01	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	88884	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88884
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000015

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	92
1,2-Dichloroethane-d4	10	(80-120)	87
Toluene-d8	10	(88-110)	90
4-Bromofluorobenzene	10	(86-115)	87

Method Blank ID: BVBLKG02 LCS ID: BVLCSG03 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC CORPORATION	Client Sample ID:	TRIP BLANK	Date Sampled:	NA
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.02	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	88879	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88879
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000016

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	102
1,2-Dichloroethane-d4	10	(80-120)	92
Toluene-d8	10	(88-110)	100
4-Bromofluorobenzene	10	(86-115)	96

Method Blank ID: 8VBLKG02 LCS ID: 8VLCSG03 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC CORPORATION	Client Sample ID:	MPL-MW04-GW1	Date Sampled:	06/28/96
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.03	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	88906	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88906
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000017

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	92
1,2-Dichloroethane-d4	10	(80-120)	81
Toluene-d8	10	(88-110)	98
4-Bromofluorobenzene	10	(86-115)	96

Method Blank ID: BVBLKG04 LCS ID: BVLCSG05 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC CORPORATION	Client Sample ID:	TRIP BLANK	Date Sampled:	NA
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.04	Date Received:	06/29/96
Project No.:	300-I1 J27	Report No.:	88905	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88905
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
[illegible]-Dibromoethane	1	ND	Dibromomethane	1	ND
[illegible]Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000018

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	94
1,2-Dichloroethane-d4	10	(80-120)	83
Toluene-d8	10	(88-110)	96
4-Bromofluorobenzene	10	(86-115)	90

Method Blank ID: BV8LKG04 LCS ID: BVLCSG05 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

SEMIVOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW03-GW1	Date Sampled:	06/28/96
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.01	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	D8817	Date Reported:	07/15/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	07/02/96	GC/MS File ID:	D8817
Sample Volume:	1000 ml	Date Analyzed:	07/08/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000020

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	76	Phenol-d5	75	(10-94)	29
2-Fluorobiphenyl	50	(43-116)	65	2-Fluorophenol	75	(21-100)	38
Terphenyl-d14	50	(33-141)	134	2,4,6-Tribromophenol	75	(10-123)	57

Method Blank: 3440.WBLK2 LCS ID: 3440.WLCS2 MS ID: 3440.03MS MSD ID: 3440.03MSD

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW04-SW1	Date Sampled:	06/28/96
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.03	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	08863	Date Reported:	07/15/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	07/01/96	GC/MS File ID:	08863
Sample Volume:	1000 ml	Date Analyzed:	07/11/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
[illegible]lorophenol	10	ND	Diethyl phthalate	10	ND
[illegible]ethylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	6 J
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000021

[illegible]ogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	52	Phenol-d5	75	(10-94)	16
2-Fluorobiphenyl	50	(43-116)	52	2-Fluorophenol	75	(21-100)	18 *
Terphenyl-d14	50	(33-141)	47	2,4,6-Tribromophenol	75	(10-123)	27

Method Blank: 3440.WBLK2 LCS ID: 3440.WLCS2 MS ID: 3440.03MS MSD ID: 3440.03MSD

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW04-GWIRE	Date Sampled:	06/28/96
Project Name:	MAIN POST LANDFILL WELLS	POP Sample ID:	3440.03RE	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	08818	Date Reported:	07/15/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-82708
Multiplying Factor:	1.00	Date Extracted:	07/02/96	GC/MS File ID:	08818
Sample Volume:	1000 ml	Date Analyzed:	07/08/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
[illegible]orophenol	10	ND	Diethyl phthalate	10	ND
[illegible]thylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000022

[illegible]gate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	61	Phenol-d5	75	(10-94)	31
2-Fluorobiphenyl	50	(43-116)	53	2-Fluorophenol	75	(21-100)	41
Terphenyl-d14	50	(33-141)	47	2,4,6-Tribromophenol	75	(10-123)	56

Method Blank: 3440.MBLX2 LCS ID: 3440.MLCS2 MS ID: 3440.03MS MSD ID: 3440.03MSD

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: MAIN POST LANDFILL WELLS
Project Number: 300 II J27

Client Sample ID: MPL-MW03-GW1
PDP Sample ID: 3440.01
Report Number: I44001

Date Sampled: 06/28/96
Date Received: 06/29/96
Date Reported: 07/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	0.10	13.1	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	0.06	ND	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.005	0.0055	DOC
Barium	SW846-6010A	07-09-96	07-10-96	0.01	0.071	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.05	0.10	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	1.0	35.2	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.01	0.019	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Copper	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.10	8.68	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.005	0.0094	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	1.0	12.3	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	0.01	0.174	DOC
Mercury	SW846-7470A	07-02-96	07-03-96	0.0002	ND	KW
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.02	ND	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	0.04	ND	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	5.0	27	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.005	0.013	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	2.0	315	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	0.01	0.027	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	0.02	0.08	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL290
GFAA LCS ID: NA
CVAA LCS ID: HGL244

ICP MS ID: 3440.03MS
GFAA MS ID: NA
CVAA MS ID: 3440.03MS

ICP Method Blank ID: ICPB290
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB244

ICP LCSD ID: ICPL290D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL244D

ICP MSD ID: 3440.03MSD
GFAA MSD ID: NA
CVAA MSD ID: 3440.03MSD

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: MAIN POST LANDFILL WELLS
Project Number: 300 II J27

Client Sample ID: MPL-MW04-GW1
PDP Sample ID: 3440.03
Report Number: I44003

Date Sampled: 06/28/96
Date Received: 06/29/96
Date Reported: 07/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	0.10	5.76	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	0.06	ND	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Barium	SW846-6010A	07-09-96	07-10-96	0.01	0.035	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.05	0.066	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	1.0	26.5	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Copper	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.10	4.02	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	1.0	9.2	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	0.01	0.095	DOC
Mercury	SW846-7470A	07-02-96	07-03-96	0.0002	ND	XW
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.02	ND	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	0.04	ND	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	5.0	21	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.005	0.011	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	2.0	241	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	0.01	0.016	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	0.02	0.058	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL290
GFAA LCS ID: NA
CVAA LCS ID: HGL244

ICP MS ID: 3440.03MS
GFAA MS ID: NA
CVAA MS ID: 3440.03MS

ICP Method Blank ID: ICPB290
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB244

ICP LCSD ID: ICPL290D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL244D

ICP MSD ID: 3440.03MSD
GFAA MSD ID: NA
CVAA MSD ID: 3440.03MSD

PESTICIDES/PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC CORPORATION	Client Sample ID:	MPL-MW03-GW1	Date Sampled:	06/28/96
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.01	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	E01550	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01550
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.10	ND	Endrin aldehyde	0.10	ND
4,4'-DDE	0.10	ND	Endrin ketone	0.10	ND
4,4'-DDT	0.10	ND	gamma-BHC (Lindane)	0.05	ND
Aldrin	0.05	ND	Heptachlor	0.05	ND
alpha-BHC	0.05	ND	Heptachlor epoxide	0.05	ND
beta-BHC	0.05	ND	Methoxychlor	0.50	ND
Chlordane (Technical)	1.00	ND	Toxaphene	5	ND
delta-BHC	0.05	ND	Aroclor-1016	1	ND
Dieldrin	0.10	ND	Aroclor-1221	2	ND
Endosulfan I	0.05	ND	Aroclor-1232	1	ND
Endosulfan II	0.10	ND	Aroclor-1242	1	ND
Endosulfan sulfate	0.10	ND	Aroclor-1248	1	ND
Endrin	0.10	ND	Aroclor-1254	1	ND
			Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	248 *
Decachlorobiphenyl	0.2	(30-150)	134

Method Blank ID: 3436.WBLX1 LCS ID: 3436.WLCS1 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

000027

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC CORPORATION	Client Sample ID:	MPL-MW04-GW1	Date Sampled:	06/28/96
Project Name:	MAIN POST LANDFILL WELLS	PDP Sample ID:	3440.03	Date Received:	06/29/96
Project No.:	300-II J27	Report No.:	E01551	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01551
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.10	ND	Endrin aldehyde	0.10	ND
4,4'-DDE	0.10	ND	Endrin ketone	0.10	ND
4,4'-DDT	0.10	ND	gamma-BHC (Lindane)	0.05	ND
Aldrin	0.05	ND	Heptachlor	0.05	ND
alpha-BHC	0.05	ND	Heptachlor epoxide	0.05	ND
beta-BHC	0.05	ND	Methoxychlor	0.50	ND
Chlordane (Technical)	1.00	ND	Toxaphene	5	ND
[illegible]a-BHC	0.05	ND	Aroclor-1016	1	ND
[illegible]drin	0.10	ND	Aroclor-1221	2	ND
Endosulfan I	0.05	ND	Aroclor-1232	1	ND
Endosulfan II	0.10	ND	Aroclor-1242	1	ND
Endosulfan sulfate	0.10	ND	Aroclor-1248	1	ND
Endrin	0.10	ND	Aroclor-1254	1	ND
			Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	171 *
Decachlorobiphenyl	0.2	(30-150)	74

Method Blank ID: 3436.WBLK1 LCS ID: 3436.WLCS1 MS ID: 3440.03MS MSD ID: 3440.03MSD DUP ID: NA

GENERAL CHEMISTRY

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/16/96
Report No: I440TDS
Analyst: KW

WET CHEMISTRY PARAMETER: Total Dissolved Solids (TDS)

Method Reference: EPA 160.1

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-01-96	10	1230			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-01-96	10	880			

QUALITY ASSURANCE/QUALITY CONTROL

3436.PB1	METHOD BLANK	WATER	NA	NA	NA	07-01-96	10	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	10	500	500		100
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	10	500	500	0.0	100
3436.01	SAMPLE	WATER	NA	NA	NA	07-01-96	10	490			
3436.01D	DUPLICATE	WATER	NA	NA	NA	07-01-96	10	470		4.2	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/16/96
Report No: I440ALK
Analyst: KN

WET CHEMISTRY PARAMETER: Alkalinity as CaCO3

Method Reference: EPA 310.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-01-96	2	268			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-01-96	2	198			

QUALITY ASSURANCE/QUALITY CONTROL

3433.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2	476	500		95
3433.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2	474	500	0.4	95
3440.03D	DUPLICATE	WATER	NA	NA	NA	07-01-96	2	196		1.0	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/16/96
Report No: I440TOC
Analyst: KW

WET CHEMISTRY PARAMETER: Total Organic Carbon

Method Reference: EPA 415.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-01-96	1	ND			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-01-96	1	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3438.PBW1	METHOD BLANK	WATER	NA	NA	NA	07-01-96	1	ND			
3438.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2	44	49.2		89
3438.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-01-96	2	44	49.2	0.0	89
3440.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-01-96	2	25	25		100
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-01-96	2	25	25	0.0	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/16/96
Report No: I440AMM
Analyst: KW

WET CHEMISTRY PARAMETER: Ammonia as N

Method Reference: EPA 350.3

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-08-96	0.25	ND			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-08-96	0.25	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	0.25	5.25	5.0		105
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	0.25	5.16	5.0	1.7	103
3440.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-08-96	0.25	5.03	5.0		101
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-08-96	0.25	5.18	5.0	2.9	104

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/16/96
Report No: I440CON
Analyst: KW

WET CHEMISTRY PARAMETER: Conductivity

Method Reference: EPA 120.1 UNITS: umhos/cm

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-08-96	NA	1440			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-08-96	NA	1240			

QUALITY ASSURANCE/QUALITY CONTROL

[illegible].LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	NA	1118	1100		102
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-08-96	NA	1120	1100	0.2	102
3440.03D	DUPLICATE	WATER	NA	NA	NA	07-08-96	NA	1260		1.6	

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/16/96
Report No: I440PHL
Analyst: KN

WET CHEMISTRY PARAMETER: Phenols

Method Reference: EPA 420.1

UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	07-11-96	07-12-96	0.05	ND			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	07-11-96	07-12-96	0.05	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3436.PBW1	METHOD BLANK	WATER	NA	NA	07-11-96	07-12-96	0.05	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	07-11-96	07-12-96	0.05	0.48	0.500		96
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	07-11-96	07-12-96	0.05	0.48	0.500	0.0	96
3440.03MS	MATRIX SPIKE	WATER	NA	NA	07-11-96	07-12-96	0.05	0.511	0.500		102
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	07-11-96	07-12-96	0.05	0.502	0.500	1.8	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/16/96
Report No: I440TCN
Analyst: KW

WET CHEMISTRY PARAMETER: Total Cyanide

Method Reference: SW-846 9010

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	07-10-96	07-10-96	0.02	0.448			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	07-10-96	07-10-96	0.02	0.590			

QUALITY ASSURANCE/QUALITY CONTROL

3436.PBW1	METHOD BLANK	WATER	NA	NA	07-10-96	07-10-96	0.01	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	07-10-96	07-10-96	0.01	0.097	0.100		97
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	07-10-96	07-10-96	0.01	0.099	0.100	2.0	99
3440.03MS	MATRIX SPIKE	WATER	NA	NA	07-10-96	07-10-96	0.02	0.682	0.100		92
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	07-10-96	07-10-96	0.02	0.686	0.100	0.6	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle. Ste. 8: The Woodlands. TX 77380: Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/22/96
Report No: I440CHL
Analyst: XW

WET CHEMISTRY PARAMETER: Chloride

Method Reference: EPA 325.3 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-17-96	4.0	60			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-17-96	4.0	60			

QUALITY ASSURANCE/QUALITY CONTROL

3433.WBLK1	METHOD BLANK	WATER	NA	NA	NA	07-17-96	4.0	ND			
3433.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	4.0	206	200		103
3433.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	4.0	199	200	3.5	100
3441.04	SAMPLE	WATER	NA	NA	NA	07-17-96	4.0	152			
3441.04MS	MATRIX SPIKE	WATER	NA	NA	NA	07-17-96	4.0	351	200		100
3441.04MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-17-96	4.0	345	200	1.7	97

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/23/96
Report No: I440PH
Analyst: KW

WET CHEMISTRY PARAMETER: pH

Method Reference: SW-846 9040 UNITS: NA

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	06-29-96	NA	7.53			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	06-29-96	NA	7.32			

QUALITY ASSURANCE/QUALITY CONTROL

3440.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	06-29-96	NA	8.98	9.05		99
3440.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	06-29-96	NA	9.03	9.05	0.6	100
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	06-29-96	NA	7.51		2.6	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/23/96
Report No: I440SUL
Analyst: KN

WET CHEMISTRY PARAMETER: Sulfate

Method Reference: EPA 375.4 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-17-96	50	143			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-17-96	50	120			

QUALITY ASSURANCE/QUALITY CONTROL

3433.PBW1	METHOD BLANK	WATER	NA	NA	NA	07-17-96	5.0	ND			
3433.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	5.0	18	20		90
3433.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-17-96	5.0	18	20	0.0	90
3441.04	SAMPLE	WATER	NA	NA	NA	07-17-96	25	65			
3441.04MS	MATRIX SPIKE	WATER	NA	NA	NA	07-17-96	25	163	100		98
3441.04MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-17-96	25	165	100	1.2	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/23/96
Report No: I440FLO
Analyst: KN

WET CHEMISTRY PARAMETER: Fluoride

Method Reference: EPA 340.2

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-21-96	0.1	0.17			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-21-96	0.1	0.15			

QUALITY ASSURANCE/QUALITY CONTROL

3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-21-96	0.1	5.12	5.0		102
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-21-96	0.1	5.18	5.0	1.2	104
3440.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-21-96	0.1	5.06	5.0		98
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-21-96	0.1	5.27	5.0	4.1	102

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/23/96
Report No: I440NINA
Analyst: KW

WET CHEMISTRY PARAMETER: Nitrate/Nitrite as N

Method Reference: EPA 352.1/354.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-19-96	0.51	6.4			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-19-96	0.51	7.6			

QUALITY ASSURANCE/QUALITY CONTROL

3436.PBW1	METHOD BLANK	WATER	NA	NA	NA	07-19-96	0.11	ND			
3436.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-19-96	0.11	1.11	1.10		101
3436.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-19-96	0.11	1.11	1.10	0.1	101
3440.03MS	MATRIX SPIKE	WATER	NA	NA	NA	07-19-96	1.01	12.2	5.10		90
3440.03MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-19-96	1.01	12.5	5.10	2.4	96

SUB-CONTRACT DATA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC CORPORATION
Project Name: MAIN POST LANDFILL WELLS
Project No: 300-II J27

Date Reported: 07/24/96
Report No: I440TKN
Analyst: SUB

WET CHEMISTRY PARAMETER: Total Kjeldahl Nitrogen (TKN)

Method Reference: EPA 351.3

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3440.01	MPL-MW03-GW1	WATER	06-28-96	06-29-96	NA	07-18-96	1.0	ND			
3440.03	MPL-MW04-GW1	WATER	06-28-96	06-29-96	NA	07-18-96	1.0	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3440.MBLK1	METHOD BLANK	WATER	NA	NA	NA	07-18-96	1.0	ND			
3440.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	07-18-96	1.0	8.4	7.0		120
7635.01	SAMPLE	WATER	NA	NA	NA	07-18-96	1.0	2.35			
7635.01MS	MATRIX SPIKE	WATER	NA	NA	NA	07-18-96	1.0	21.8	20.0		97.3
7635.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	07-18-96	1.0	20.9	20.0	4.2	92.7

QUALITY CONTROL DATA

VOLATILES

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	POP Sample ID:	BVBLXG02 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	88874	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88874
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
[illegible]-Dibromoethane	1	ND	Dibromomethane	1	ND
[illegible]-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000046

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	100
1,2-Dichloroethane-d4	10	(80-120)	94
Toluene-d8	10	(88-110)	98
4-Bromofluorobenzene	10	(86-115)	95

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	BV8LKG04 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	88903	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88903
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000047

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	101
1,2-Dichloroethane-d4	10	(80-120)	97
Toluene-d8	10	(88-110)	99
4-Bromofluorobenzene	10	(86-115)	97

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	BVLCSG03 (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	88875	Date Reported:	07/08/96

GC/MS-VOLATILES ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88875
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,1-Dichloroethene	10	11	110	(61-145)
Benzene	10	11	110	(76-127)
Chlorobenzene	10	11	110	(75-130)
Toluene	10	10	100	(76-125)
Trichloroethene	10	11	110	(71-120)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dichloroethane-d4	10	(80-120)	101
Dibromofluoromethane	10	(86-118)	100
Toluene-d8	10	(88-110)	103
4-Bromofluorobenzene	10	(86-115)	103

Method Blank: BVBLKG02 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	BVLCSG05 (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	B8904	Date Reported:	07/08/96

GC/MS-VOLATILES ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	B8904
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,1-Dichloroethene	10	11	110	(61-145)
Benzene	10	10	100	(76-127)
Chlorobenzene	10	10	100	(75-130)
Toluene	10	10	100	(76-125)
Trichloroethene	10	10	100	(71-120)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dichloroethane-d4	10	(80-120)	95
Dibromofluoromethane	10	(86-118)	92
Toluene-d8	10	(88-110)	97
4-Bromofluorobenzene	10	(86-115)	94

Method Blank: BVBLKG04 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW04-GWIMS	Date Sampled:	06/28/96
Project Name:	NA	PDP Sample ID:	3440.03MS (MATRIX SPIKE)	Date Received:	06/29/96
Project No.:	NA	Report No.:	88907	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/02/96	GC/MS File ID:	88907
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	11
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	10	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
[illegible]-Dibromoethane	1	ND	Dibromomethane	1	ND
[illegible]-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	11	Toluene	1	11
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	10
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000050

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	97
1,2-Dichloroethane-d4	10	(80-120)	96
Toluene-d8	10	(88-110)	97
4-Bromofluorobenzene	10	(86-115)	103

Method Blank ID: BVBLKG04 LCS ID: BVLCSG05 MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW04-GW1MSD	Date Sampled:	06/28/96
Project Name:	NA	PDP Sample ID:	3440.03MSD (MATRIX SPIKE DUPLICATE)	Date Received:	06/29/96
Project No.:	NA	Report No.:	88908	Date Reported:	07/08/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	07/03/96	GC/MS File ID:	88908
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	9
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	9	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	9	Toluene	1	9
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	9
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND	Acetone	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

000051

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	94
1,2-Dichloroethane-d4	10	(80-120)	93
Toluene-d8	10	(88-110)	100
4-Bromofluorobenzene	10	(86-115)	103

Method Blank ID: BVBLKG04 LCS ID: BVLCSG05 MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID: MPL-MW04-GW1		Date Received:	NA
Project Name:	NA			Date Reported:	07/08/96
Project No.:	NA			Report No.:	3440V03Q

GC/MS-VOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8260A	Sample Matrix:	WATER	Analyst:	LZ

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3440.03	MS Sample ID:	3440.03MS	MSD Sample ID:	3440.03MSD
Client Sample ID:	MPL-MW04-GW1	Client Sample ID:	MPL-MW04-GW1MS	Client Sample ID:	MPL-MW04-GW1MSD
Sample Volume:	20.0 ml	Sample Volume:	20.0 ml	Sample Volume:	20.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	07/02/96	Date Analyzed:	07/02/96	Date Analyzed:	07/03/96
GC/MS File ID:	88906	GC/MS File ID:	88907	GC/MS File ID:	88908

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	10	100	(61-145)
Benzene	10	ND	11	110	(76-127)
Chlorobenzene	10	ND	11	110	(75-130)
Toluene	10	ND	11	110	(76-125)
Trichloroethene	10	ND	10	100	(71-120)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	9	90	10.5	14	(61-145)
Benzene	10	ND	9	90	20.0 *	11	(76-127)
Chlorobenzene	10	ND	9	90	20.0 *	13	(75-130)
Toluene	10	ND	9	90	20.0 *	13	(76-125)
Trichloroethene	10	ND	9	90	10.5	14	(71-120)

*Values outside of QC limits

RPD: 3 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

SEMIVOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380: (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3440.WBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	D8723	Date Reported:	07/08/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-82708
Multiplying Factor:	1.00	Date Extracted:	07/01/96	GC/MS File ID:	D8723
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000054

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	95	Phenol-d5	75	(10-94)	97
2-Fluorobiphenyl	50	(43-116)	102	2-Fluorophenol	75	(21-100)	95
Terphenyl-d14	50	(33-141)	159 *	2,4,6-Tribromophenol	75	(10-123)	150 *

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3440.W8LK2 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	D8815	Date Reported:	07/15/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-82708
Multiplying Factor:	1.00	Date Extracted:	07/02/96	GC/MS File ID:	D8815
Sample Volume:	1000 ml	Date Analyzed:	07/08/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

000055

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	73	Phenol-d5	75	(10-94)	39
2-Fluorobiphenyl	50	(43-116)	62	2-Fluorophenol	75	(21-100)	54
Terphenyl-d14	50	(33-141)	105	2,4,6-Tribromophenol	75	(10-123)	69

Method Blank: NA LCS ID: NA MS ID: NA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 3, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3440.WLCS1 (LAB CONT. SAMP.)	Date Received:	NA
Project No.:	NA	Report No.:	08727	Date Reported:	07/08/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.0	Date Extracted:	07/01/96	GC/MS File ID:	08727
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,2,4-Trichlorobenzene	50	22	44	(39-98)
1,4-Dichlorobenzene	50	19	38	(36-97)
2,4-Dinitrotoluene	50	33	66	(24-96)
2-Chlorophenol	75	44	59	(27-123)
4-Chloro-3-methylphenol	75	45	60	(23-97)
4-Nitrophenol	75	14	19	(10-80)
Acenaphthene	50	29	58	(46-118)
N-Nitroso-di-N-propylamine	50	30	60	(41-116)
Pentachlorophenol	75	34	45	(9-103)
Phenol	75	23	31	(12-110)
Pyrene	50	27	54	(26-127)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	48	Phenol-d5	75	(10-94)	25
2-Fluorobiphenyl	50	(43-116)	48	2-Fluorophenol	75	(21-100)	36
Terphenyl-d14	50	(33-141)	39	2,4,6-Tribromophenol	75	(10-123)	69

Method Blank: 3440.WBLK1 LCS ID:NA MS ID:NA MSD ID:NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8, The Woodlands, TX 77380: (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3440.WLCS2 (LAB CONT. SAMP.)	Date Received:	NA
Project No.:	NA	Report No.:	D8816	Date Reported:	07/15/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.0	Date Extracted:	07/02/96	GC/MS File ID:	D8816
Sample Volume:	1000 ml	Date Analyzed:	07/08/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,2,4-Trichlorobenzene	50	26	52	(39-98)
1,4-Dichlorobenzene	50	26	52	(36-97)
2,4-Dinitrotoluene	50	39	78	(24-96)
2-Chlorophenol	75	57	76	(27-123)
4-Chloro-3-methylphenol	75	58	77	(23-97)
4-Nitrophenol	75	20	27	(10-80)
Acenaphthene	50	34	68	(46-118)
N-Nitroso-di-N-propylamine	50	45	90	(41-116)
Pentachlorophenol	75	48	64	(9-103)
Phenol	75	32	43	(12-110)
Pyrene	50	36	72	(26-127)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	64	Phenol-d5	75	(10-94)	35
2-Fluorobiphenyl	50	(43-116)	58	2-Fluorophenol	75	(21-100)	48
Terphenyl-d14	50	(33-141)	119	2,4,6-Tribromophenol	75	(10-123)	68

Method Blank: 3440.WBLK2 LCS ID:NA MS ID:NA MSD ID:NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW04-GW1MS	Date Sampled:	06/28/96
Project Name:	NA	PDP Sample ID:	3440.03MS (MATRIX SPIKE)	Date Received:	06/29/96
Project No.:	NA	Report No.:	D8864	Date Reported:	07/15/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	07/01/96	GC/MS File ID:	D8864
Sample Volume:	1000 ml	Date Analyzed:	07/11/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	48	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	52	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	37	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	86	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	64	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	51	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	41	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	55
Anthracene	10	ND	Pentachlorophenol	25	46
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	80
Benzo(a)anthracene	10	ND	Pyrene	10	36

QUALITY ASSURANCE/QUALITY CONTROL

000058

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	85	Phenol-d5	75	(10-94)	100
2-Fluorobiphenyl	50	(43-116)	81	2-Fluorophenol	75	(21-100)	101 *
Terphenyl-d14	50	(33-141)	69	2,4,6-Tribromophenol	75	(10-123)	79

Method Blank: 3440.WBLK1 LCS ID: 3440.WLCS1 MS ID: NA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW04-GW1MSD	Date Sampled:	06/28/96
Project Name:	NA	PDP Sample ID:	3440.03MSD (MATRIX SPIKE DUPLICATE)	Date Received:	06/29/96
Project No.:	NA	Report No.:	D8865	Date Reported:	07/15/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	07/01/96	GC/MS File ID:	D8865
Sample Volume:	1000 ml	Date Analyzed:	07/11/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	41	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	42	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	36	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
[illegible]orophenol	10	68	Diethyl phthalate	10	ND
[illegible]thylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	54	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	48	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	39	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	47
Anthracene	10	ND	Pentachlorophenol	25	43
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	65
Benzo(a)anthracene	10	ND	Pyrene	10	35

QUALITY ASSURANCE/QUALITY CONTROL

000059

[illegible]gate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	73	Phenol-d5	75	(10-94)	79
2-Fluorobiphenyl	50	(43-116)	74	2-Fluorophenol	75	(21-100)	82
Terphenyl-d14	50	(33-141)	42	2,4,6-Tribromophenol	75	(10-123)	75

Method Blank: 3440.WBLK1 LCS ID: 3440.WLCS1 MS ID: NA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Date Received:	NA
Project Name:	NA	Date Reported:	07/15/96
Project No.:	NA	Report No.:	3440S03Q

GC/MS-SEMIVOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8270B	Sample Matrix:	WATER	Analyst:	RP

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3440.03	MS Sample ID:	3440.03MS	MSD Sample ID:	3440.03MSD
Client Sample ID:	MPL-MW04-GW1	Client Sample ID:	MPL-MW04-GW1MS	Client Sample ID:	MPL-MW04-GW1MSD
Sample Volume:	1000 ml	Sample Volume:	1000 ml	Sample Volume:	1000 ml
Extract Volume:	1.0 ml	Extract Volume:	1.0 ml	Extract Volume:	1.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	07/11/96	Date Analyzed:	07/11/96	Date Analyzed:	07/11/96
GC/MS File ID:	D8863	GC/MS File ID:	D8864	GC/MS File ID:	D8865

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,2,4-Trichlorobenzene	50	ND	48	96	(39-98)
1,4-Dichlorobenzene	50	ND	52	104 *	(36-97)
2,4-Dinitrotoluene	50	ND	37	74	(24-96)
2-Chlorophenol	75	ND	86	115	(27-123)
4-Chloro-3-methylphenol	75	ND	64	85	(23-97)
4-Nitrophenol	75	ND	51	68	(10-80)
Acenaphthene	50	ND	41	82	(46-118)
N-Nitroso-di-N-propylamine	50	6	55	98	(41-116)
Pentachlorophenol	75	ND	46	61	(9-103)
Phenol	75	ND	80	107	(12-110)
Pyrene	50	ND	36	72	(26-127)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
1,2,4-Trichlorobenzene	50	ND	41	82	15.7	42	(39-98)
1,4-Dichlorobenzene	50	ND	42	84	21.3	28	(36-97)
2,4-Dinitrotoluene	50	ND	36	72	2.7	28	(24-96)
2-Chlorophenol	75	ND	68	91	23.4	40	(27-123)
4-Chloro-3-methylphenol	75	ND	54	72	16.9	28	(23-97)
4-Nitrophenol	75	ND	48	64	6.1	42	(10-80)
Acenaphthene	50	ND	39	78	5.0	31	(46-118)
N-Nitroso-di-N-propylamine	50	6	47	82	17.8	50	(41-116)
Pentachlorophenol	75	ND	43	57	6.7	38	(9-103)
Phenol	75	ND	65	87	20.7	42	(12-110)
Pyrene	50	ND	35	70	2.8	31	(26-127)

* = Values outside of QC limits
RPD: 0 out of 11 outside limits
Spike Recovery: 1 out of 22 outside limits

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
PDP Sample ID: ICPB290 (METHOD BLANK)
Report Number: ICPB290

Date Sampled: NA
Date Received: NA
Date Reported: 07/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	0.10	ND	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	0.06	ND	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Barium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.05	ND	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	1.0	ND	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Copper	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.10	ND	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	1.0	ND	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.02	ND	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	0.04	ND	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	5.0	ND	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	1.0	ND	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.005	ND	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	0.01	ND	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	HGB244 (METHOD BLANK)	Date Received:	NA
Project Number:	NA	Report Number:	HGB244	Date Reported:	07/08/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER — Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Mercury	SW846-7470A	07-02-96	07-03-96	0.00020	ND	KN

QUALITY ASSURANCE/QUALITY CONTROL

		ICP LCS ID: NA	ICP MS ID: NA
		GFAA LCS ID: NA	GFAA MS ID: NA
ICP Method Blank ID:	NA	CVAA LCS ID: NA	CVAA MS ID: NA
GFAA Method Blank ID:	NA		
CVAA Method Blank ID:	NA	ICP LCSD ID: NA	ICP MSD ID: NA
		GFAA LCSD ID: NA	GFAA MSD ID: NA
		CVAA LCSD ID: NA	CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: ICPL290
LCSD ID: ICPL290D

Date Reported: 07/12/96
Report Number: ICPL290

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Aluminum	SW846-6010A	07-09-96	07-10-96	5.0	5.22	104	5.44	109	4.1	DOC
Antimony	SW846-6010A	07-09-96	07-10-96	1.25	1.31	105	1.33	106	1.5	DOC
Arsenic	SW846-6010A	07-09-96	07-10-96	0.25	0.261	104	0.266	106	1.9	DOC
Barium	SW846-6010A	07-09-96	07-10-96	5.0	5.17	103	5.27	105	1.9	DOC
Beryllium	SW846-6010A	07-09-96	07-10-96	0.125	0.134	107	0.136	109	1.5	DOC
Boron	SW846-6010A	07-09-96	07-11-96	0.25	0.30	120	0.30	120	0.0	DOC
Cadmium	SW846-6010A	07-09-96	07-10-96	0.125	0.123	98	0.125	100	1.6	DOC
Calcium	SW846-6010A	07-09-96	07-10-96	62.5	61.80	99	63.2	101	2.2	DOC
Chromium	SW846-6010A	07-09-96	07-10-96	0.50	0.523	105	0.532	106	1.7	DOC
Cobalt	SW846-6010A	07-09-96	07-10-96	1.25	1.29	103	1.32	106	2.3	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	0.625	0.643	103	0.668	107	3.8	DOC
[illegible]	SW846-6010A	07-09-96	07-10-96	2.5	2.55	102	2.63	105	3.1	DOC
Lead	SW846-6010A	07-09-96	07-10-96	0.25	0.247	99	0.251	100	1.6	DOC
Magnesium	SW846-6010A	07-09-96	07-10-96	62.5	62.3	100	63.3	101	1.6	DOC
Manganese	SW846-6010A	07-09-96	07-10-96	1.25	1.31	105	1.33	106	1.5	DOC
Molybdenum	SW846-6010A	07-09-96	07-11-96	0.25	0.26	104	0.26	104	0.0	DOC
Nickel	SW846-6010A	07-09-96	07-10-96	1.25	1.27	102	1.3	104	2.3	DOC
Potassium	SW846-6010A	07-09-96	07-10-96	62.5	66.9	107	71.3	114	6.4	DOC
Selenium	SW846-6010A	07-09-96	07-10-96	0.25	0.254	102	0.253	101	0.4	DOC
Silver	SW846-6010A	07-09-96	07-10-96	0.625	0.65	104	0.666	107	2.4	DOC
Sodium	SW846-6010A	07-09-96	07-10-96	62.5	61.9	99	64.8	104	4.6	DOC
Thallium	SW846-6010A	07-09-96	07-10-96	0.25	0.242	97	0.25	100	3.3	DOC
Vanadium	SW846-6010A	07-09-96	07-10-96	1.25	1.28	102	1.31	105	2.3	DOC
Zinc	SW846-6010A	07-09-96	07-10-96	1.25	1.31	105	1.32	106	0.8	DOC

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: ICPB290

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: HGL244
LCSD ID: HGL244D

Date Reported: 07/08/96
Report Number: HGL244

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Mercury	SW846-7470A	07-02-96	07-03-96	0.0020	0.0020	100	0.0020	100	0.0	KW

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: HGB244

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

PDP MS ID: 3440.03MS
PDP MSD ID: 3440.03MSD
Report Number: I440MS03

Date Sampled: NA
Date Received: NA
Date Reported: 07/12/96

TOTAL METALS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE)

Sample Matrix: WATER — Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	SAMPLE VALUE	MATRIX SPIKE ADDED	MATRIX SPIKE VALUE	PERCENT RECOVERY (75-125)	MATRIX SPIKE DUP VALUE	PERCENT RECOVERY (75-125)	RPD (20)
Aluminum	SW846-6010A	07-09-96	07-10-96	5.76	2.0	8.53	138*	9.18	171*	7.3
Antimony	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.51	102	0.50	100	2.0
Arsenic	SW846-6010A	07-09-96	07-10-96	ND	2.0	1.97	99	1.94	97	1.5
Barium	SW846-6010A	07-09-96	07-10-96	0.035	2.0	2.1	103	2.07	102	1.4
Beryllium	SW846-6010A	07-09-96	07-10-96	ND	0.05	0.0545	109	0.0536	107	1.7
Boron	SW846-6010A	07-09-96	07-11-96	0.066	0.25	0.35	114	0.373	123	6.4
Cadmium	SW846-6010A	07-09-96	07-10-96	ND	0.05	0.047	94	0.046	92	2.2
Calcium	SW846-6010A	07-09-96	07-10-96	26.5	NA	74.7	NA	73.9	NA	1.1
Chromium	SW846-6010A	07-09-96	07-10-96	ND	0.20	0.205	102	0.203	102	1.0
Cobalt	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.503	101	0.495	99	1.6
[illegible]r	SW846-6010A	07-09-96	07-10-96	ND	0.25	0.274	110	0.269	108	1.8
[illegible]	SW846-6010A	07-09-96	07-10-96	4.02	1.0	5.08	**	5.29	**	4.1
Lead	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.481	96	0.47	94	2.3
Magnesium	SW846-6010A	07-09-96	07-10-96	9.2	NA	57.8	NA	57.1	NA	1.2
Manganese	SW846-6010A	07-09-96	07-10-96	0.095	0.50	0.601	101	0.594	100	1.2
Mercury	SW846-7470A	07-02-96	07-03-96	ND	0.001	0.0012	120	0.0012	120	0.0
Molybdenum	SW846-6010A	07-09-96	07-11-96	ND	0.25	0.25	100	0.25	100	0.0
Nickel	SW846-6010A	07-09-96	07-10-96	ND	0.50	0.5	104	0.511	102	1.7
Potassium	SW846-6010A	07-09-96	07-10-96	21	NA	87.1	NA	86	NA	1.3
Selenium	SW846-6010A	07-09-96	07-10-96	0.011	2.0	1.98	98	1.96	97	1.0
Silver	SW846-6010A	07-09-96	07-10-96	ND	0.05	0.047	94	0.047	94	0.0
Sodium	SW846-6010A	07-09-96	07-10-96	241	NA	344	NA	342	NA	0.6
Thallium	SW846-6010A	07-09-96	07-10-96	ND	2.0	1.92	96	1.89	95	1.6
Vanadium	SW846-6010A	07-09-96	07-10-96	0.016	0.50	0.517	100	0.512	99	1.0
Zinc	SW846-6010A	07-09-96	07-10-96	0.058	0.50	0.545	97	0.529	94	3.0

ICP Batch ID: ICP8290
GFAA Batch ID: NA
CVAA Batch ID: MGB244

* = Indicates the value is outside control limits.
** = High analyte concentration prevented accurate determination of the matrix spike recovery.
D = The sample required a post-digest (instrument) dilution resulting in a dilution of the matrix spike added.

PESTICIDES/PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3436.WBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	E01546	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01546
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.10	ND	Endrin aldehyde	0.10	ND
4,4'-DDE	0.10	ND	Endrin ketone	0.10	ND
4,4'-DDT	0.10	ND	gamma-BHC (Lindane)	0.05	ND
Aldrin	0.05	ND	Heptachlor	0.05	ND
alpha-BHC	0.05	ND	Heptachlor epoxide	0.05	ND
beta-BHC	0.05	ND	Methoxychlor	0.50	ND
Chlordane (Technical)	1.00	ND	Toxaphene	5	ND
delta-BHC	0.05	ND	Aroclor-1016	1	ND
[illegible]drin	0.10	ND	Aroclor-1221	2	ND
[illegible]sulfan I	0.05	ND	Aroclor-1232	1	ND
Endosulfan II	0.10	ND	Aroclor-1242	1	ND
Endosulfan sulfate	0.10	ND	Aroclor-1248	1	ND
Endrin	0.10	ND	Aroclor-1254	1	ND
			Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	76
Decachlorobiphenyl	0.2	(30-150)	86

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

000068

PDP ANALYTICAL SERVICES
1680 Lake Front Circle. Ste. B: The Woodlands,Texas 77380:Phone(713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3436.WLCS1 (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	E01547	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	07/01/96	GC File ID:	E01547
Sample Volume:	1000 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
4,4'-DDT	1.0	1.16	116	(38-127)
Aldrin	0.5	0.330	66	(40-120)
Dieldrin	1.0	1.08	108	(52-126)
Endrin	1.0	1.14	114	(56-121)
gamma-BHC (Lindane)	0.5	0.566	113	(56-123)
Heptachlor	0.5	0.338	68	(40-131)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	81
Decachlorobiphenyl	0.2	(30-150)	80

Method Blank: 3436.WBLK1 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

000069

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW04-GWIMS	Date Sampled:	06/28/96
Project Name:	NA	PDP Sample ID:	3440.03MS (MATRIX SPIKE)	Date Received:	06/29/96
Project No.:	NA	Report No.:	E01552	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.020	Date Extracted:	07/01/96	GC File ID:	E01552
Sample Volume:	500 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.20	ND	Endrin aldehyde	0.20	ND
4,4'-DDE	0.20	ND	Endrin ketone	0.20	ND
4,4'-DDT	0.20	3.35	gamma-BHC (Lindane)	0.10	1.63
Aldrin	0.10	1.79	Heptachlor	0.10	1.32
alpha-BHC	0.10	ND	Heptachlor epoxide	0.10	ND
beta-BHC	0.10	ND	Methoxychlor	1.00	ND
Chlordane (Technical)	2.00	ND	Toxaphene	10	ND
delta-BHC	0.10	ND	Aroclor-1016	2	ND
Dieldrin	0.20	3.17	Aroclor-1221	4	ND
Endosulfan I	0.10	ND	Aroclor-1232	2	ND
Endosulfan II	0.20	ND	Aroclor-1242	2	ND
Endosulfan sulfate	0.20	ND	Aroclor-1248	2	ND
Endrin	0.20	3.39	Aroclor-1254	2	ND
			Aroclor-1260	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.4	(30-150)	198 *
Decachlorobiphenyl	0.4	(30-150)	112

Method Blank ID: 3436.WBLK1 LCS ID: 3436.WLCS1 MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW04-GWMSD	Date Sampled:	06/28/96
Project Name:	NA	PDP Sample ID:	3440.03MSD (MATRIX SPIKE DUPLICATE)	Date Received:	06/29/96
Project No.:	NA	Report No.:	E01553	Date Reported:	07/15/96

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.020	Date Extracted:	07/01/96	GC File ID:	E01553
Sample Volume:	500 ml	Date Analyzed:	07/02/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
4,4'-DDD	0.20	ND	Endrin aldehyde	0.20	ND
4,4'-DDE	0.20	ND	Endrin ketone	0.20	ND
4,4'-DDT	0.20	2.54	gamma-BHC (Lindane)	0.10	1.18
Aldrin	0.10	1.04	Heptachlor	0.10	0.897
alpha-BHC	0.10	ND	Heptachlor epoxide	0.10	ND
beta-BHC	0.10	ND	Methoxychlor	1.00	ND
Chlordane (Technical)	2.00	ND	Toxaphene	10	ND
delta-BHC	0.10	ND	Aroclor-1016	2	ND
Dieldrin	0.20	2.39	Aroclor-1221	4	ND
Endosulfan I	0.10	ND	Aroclor-1232	2	ND
Endosulfan II	0.20	ND	Aroclor-1242	2	ND
Endosulfan sulfate	0.20	ND	Aroclor-1248	2	ND
Endrin	0.20	2.62	Aroclor-1254	2	ND
			Aroclor-1260	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.4	(30-150)	134
Decachlorobiphenyl	0.4	(30-150)	56

Method Blank ID: 3436.MBLK1 LCS ID: 3436.MLCS1 MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands,Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Date Received:	NA
Project Name:	NA	Date Reported:	07/15/96
Project No.:	NA	Report No.:	3440P03Q

GC-ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.: SW846-8080A Sample Matrix: WATER Analyst: SM

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3440.03	MS Sample ID:	3440.03MS	MSD Sample ID:	3440.03MSD
Client Sample ID:	MPL-MW04-GW1	Client Sample ID:	MPL-MW04-GW1MS	Client Sample ID:	MPL-MW04-GW1MSD
Sample Volume:	1000 ml	Sample Volume:	500 ml	Sample Volume:	500 ml
Extract Volume:	10.0 ml	Extract Volume:	10.0 ml	Extract Volume:	10.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	07/02/96	Date Analyzed:	07/02/96	Date Analyzed:	07/02/96
GC File ID:	E01551	GC File ID:	E01552	GC File ID:	E01553

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE CONC. (ug/L)	MS % REC.	QC LIMITS REC.
4, 4' - DDT	2.0	ND	3.35	168 *	38-127
Aldrin	1.0	ND	1.79	179 *	40-120
Dieldrin	2.0	ND	3.17	159 *	52-126
Endrin	2.0	ND	3.39	170 *	56-121
gamma - BHC (Lindane)	1.0	ND	1.63	163 *	56-123
Heptachlor	1.0	ND	1.32	132 *	40-131

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE DUPLICATE CONC. (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
4, 4' - DDT	2.0	ND	2.54	127	27.5 *	27	38-127
Aldrin	1.0	ND	1.04	104	53.0 *	22	40-120
Dieldrin	2.0	ND	2.39	120	28.1 *	18	52-126
Endrin	2.0	ND	2.62	131 *	25.6 *	21	56-121
gamma - BHC (Lindane)	1.0	ND	1.18	118	32.0 *	15	56-123
Heptachlor	1.0	ND	0.897	90	38.2 *	20	40-131

* - Values outside of QC limits

RPD: 6 out of 6 outside limits
Spike Recovery 7 out of 12 outside limits

GENERAL CHEMISTRY

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

SUB-CONTRACT DATA

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

END OF REPORT

LABORATORY ANALYTICAL REPORT

ANALYSES FOR URANIUM, RADIUM 226 AND RADIUM 228

PDP
Analytical Services

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

July 31, 1996

Ms. Dana Downs
Mevatec Corporation
P.O. Box 399
White Sands Missile Range
New Mexico 88002

Episode: 3436 & 3440
Project ID: White Sands Missile Range
Project #: 300 II J27

Dear Ms. Downs:

Enclosed are the sub-contract data results for the samples received in our laboratory on June 28 and 29, 1996. The samples were sent for analysis to CEP Laboratory in Santa Fe, New Mexico and were analyzed for the Uranium and R226 and R228 as indicated on the chain of custody.

We appreciate your business. Should you have any questions or need assistance with this report, please feel free to call me or Homai Madisetty, Data Review Officer, at (713) 292-7090.

Sincerely,

Homai Madisetty for.

Bruce D. Howbert
Program Manager

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: JS | DATE OF PHYSICAL LOG-IN: 6/28/96 | PAGE 1 OF 1

Episode #: 3436
Client Name: MEVATEC
Project ID: WHITE SANDS MISSLE RANGE
Project #: 300 II J27
PO Number: NA
Courier/No.: FED-EX#0317082314

DATE OF COMPUTER LOG-IN: 6/28/96 14:09
COMPUTER LOG-IN BY: JS
DATE RECEIVED: 6/28/96
TIME RECEIVED: 1000

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3436.01	MPL-MW01-GW1	VOA-8260A SVOA-8270 PEST/PCB-8080 PHENOLS-420.1 TAL METALS +B,Mo ALL ICP CVAA-Hg Sp. CONDUCTANCE120.1 TOTAL ALK.-310.1 TDS-~~160.1~~ 160.1 CHLORIDE-~~300.0~~ 325.3 FLUORIDE-~~300.0~~ 340.2 SULFATE-~~300.0~~ 375.4 AMMONIA350.3 TKN-351.1 NITRATE/NITRITE-~~300.0~~ 352.1/353.1 CYANIDE-9010 PH-9040 TOC-415.1 ~~UR228~~ TOTAL URANIUM R228 /R226	16	WATER	6/26/96	1130	3436A	7/12/96 HC	
3436.02	TRIP BLANK	VOA-8260A	1	WATER	NA	NA	3436A		NO TESTING
3436.03	MPL-MW02-GW1	SAME LIST AS #1	16	WATER	6/26/96	0930	3436A		
3436.04	TRIP BLANK	VOA-8260A	1	WATER	NA	NA	3436A		

REMARKS: TKN SUBBED TO NDRC, DALLAS
TRIP BLANK 3436.02 WAS RECIEVED BROKEN
U-R228 &R228 SUBBED TO CEP

Weight basis: X wet ___ dry
Deliverables: X norm ___ CLP-like ___ CLP
___ raw data X electronic

APPROVED BY/DATE: MBB 6/28/96

SEND REPORT TO: DANA DOWNS

000002

000006

Chain of Custody Record

PDP Analytical Services
1660 Lake Front Circle, Suite B ▪ The Woodlands, Texas 77380 ▪ Phone (713) 363-2233 ▪ Fax (713) 298-5784

Client Name / Address: MEVATE / White Sands Missile Range

Send Report to: Dana Downs

Project Number: 300 II 527

Project Name: Main Post Landfill Wells

Samplers (Signature): [signature]

P.O. Number:

Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix	Remarks
1	9/26/96	11:30		X	MPL-MW01-GW1	16	water	Analyses per enclosed sheet
2	—	—			Trip Blank	1		RECEIVED FROZEN

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[signature]	9/26/96 15:00		
		Received for Laboratory by (Signature): Jeri Bamfield	9/28/96 11:00

Remarks:

Method of Shipment: FEDEX

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

000002

Chain of Custody Record

PDP Analytical Services
1680 Lake Front Circle, Suite B ▪ The Woodlands, Texas 77380 ▪ Phone (713) 363-2233 ▪ Fax (713) 298-5784

Client Name / Address: MEVATEC / White Sands Missile Range

Send Report to: Dana Downs

Project Number: 300 II - J27

Project Name: Main Post Landfill Wells

Samplers (Signature): [signature]

P.O. Number:

	Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix							Remarks
3		9/26/96	09:30		X	MPL-MW02-GW1	16	water							Analysis as per enclosed sheet
4		—	—		X	Trip Blank	1								

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[signature]	9/26/96 15:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
		Jori Bonfield	9/26/96 11:00

Remarks:

Method of Shipment: FEDEX

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

000001

PDP ANALYTICAL SERVICES 1680 Lake Front Circle, Suite B. The Woodlands, TX 77380

SAMPLE L -IN CHECKLIST/DISCREP CY REPORT

FID: SLCDR01.96

EPISODE # 3436 DATE/ REC'D: 6/28/96 1000 TEMP & ID: 1) 0.0°C # COOLER #1

TIME

ENT NAME: Mewatec 2) 0.0°C # COOLER #2

PROJECT NAME: White Sands Middle Range 3) ____ # ____

PROJECT NUMBER: 300-II-327 4) ____ # ____

4 AQUEOUS, # 6 SOIL SAMPLES 5) ____ # ____

COURIER/AIRBILL # Fedex #0317062314 6) ____ # ____

SAMPLE CONTAINER SEALS: present (absent) intact broken

COOLER CUSTODY SEALS: (present) absent (intact) broken NAME & DATE: custody tape

HOW MANY AND WHERE across front of cooler

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
Container Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :		✓
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:	✓	
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client? VOA vial ID 3436.02 was received broken that was repaired with sample tape-mud-gum.

Project Manager's recommendations?

Who was notified? By whom? Date:

Client's comments:

Corrective actions carried out?

COMMENTS:

000005

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab?

LOG-IN BY: Jari Bonfield DATE: 6/28/96

~~000003~~

ANALYTICAL SERIVES

PDP
1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363 7233
Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

PO# 96482

Sent to: CEP

Contact: Eddie Rozzino Phone: 505-982-9841

Sent by: Jori Bonfield

Date sent: 4/28/96 Date Results needed: 7/19/96

PDP Sample ID	Date collected	No. of Containers	a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/ Wet
3436.01	4/24/96	1	X	X									water	
3436.03	4/24/96	1	X	X									water	

CUSTODY TRANSFERS

Relinquished by:	Recieved by:	Date/Time
1. Jori Bonfield	4/28/96	1300
2.	Cecilia Rodriguez	4/29/96 10:00

Courier: FEDEX

ANALYTICAL PARAMETERS

A Radon & Radium
B TOTAL URANIUM
C
D
E
F
G
H
I
J

Project Manager Approval: _____

Lab Manager Approval: _____

000006

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: JS | DATE OF PHYSICAL LOG-IN: 7/1/96 | PAGE 1 OF 1

Episode #: 3440
Client Name: MEVATEC CORPORATION
Project ID: MAIN POST LANDFILL WELLS
Project #: 300-II J27
PO Number: NA
Courier/No.: FED-EX#0317209491

DATE OF COMPUTER LOG-IN: 7/1/96 10:27
COMPUTER LOG-IN BY: JS
DATE RECEIVED: 6/29/96
TIME RECEIVED: 930

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3440.01	MPL-MW03-GW1	VOA-8260 SVOA-8270 PEST/PCB-8080 PHENOLS-420.1 TAL METALS +B,Mo ALL ICP CVAA-Hg SP. CONDUCTANCE-120.1 TOTAL ALK.-310.1 TDS-~~160.2~~ 160.1 CHLORIDE-~~300.0~~ 325.3 FLUORIDE-~~300.0~~ 340.2 SULFATE-~~300.0~~ 375.4 AMMONIA-350.3 TKN-351.1 NITRATE/NITRITE-~~300.0~~ 352.1/354.1 CYANIDE-9010 PH-9040 TOC-415.1 R226 R228 TOTAL URANIUM	16	WATER	6/28/96	1020	3440A	7-15-96 HC	
3440.02	TRIP BLANK	VOA-8260	1	WATER	NA	NA	3440A		
3440.03	MPL-MW04-GW1	SAME LIST AS #1	32	WATER	6/28/96	1415	3440A		----MS/MSD
3440.04	TRIP BLANK	VOA-8260	2	WATER	NA	NA	3440A		

REMARKS: MS/MSD PER CLIENT REQUEST
SUBBED OUT R-226 & R-228 & TOTAL URANIUM

Weight basis: X wet ___ dry
Deliverables: X norm ___ CLP-like ___ CLP
___ raw data X electronic

APPROVED BY/DATE: ~~DAH~~ 7-1-96

SEND REPORT TO: ~~W.BYRGH~~ DANA DOWNS

000007
~~000006~~

Chain of Custody Record

PDP Analytical Services
1680 Lake Front Circle, Suite B • The Woodlands, Texas 77380 • Phone (713) 363-2233 • Fax (713) 298-5784

Client Name / Address: MEVATEC / WSMR

Send Report to: Dana Downs

Project Number: 300-II.J27

Project Name: Main Point Landfill wells

Sampler (Signature): [illegible]

P.O. Number:

Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix								Remarks
1	10/28/96	10:20		X	MPL-MW03-GW1	16									See enclosed analysis list
2					TRIP Blank	1									

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[illegible]	10/28/96 16:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
		[illegible]	10/29/96 9:30

Remarks:

Method of Shipment:

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

Chain of Custody Record

PDP Analytical Services
1660 Lake Front Circle, Suite B • The Woodlands, Texas 77380 • Phone (713) 363-2233 • Fax (713) 298-5784

Client Name / Address: NEVATEL / WSMR

Send Report to: Dana Downs

Project Number: 300-II J27

Project Name: Main Post Landfill Wells

Samplers (Signature): [illegible]

P.O. Number:

	Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix							Remarks
3		10/20/96	14:15		X	MPL-MW04-GW1	16								see enclosed analysis list
4						TRIP BLANK	1								

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
[illegible]	10/20/96 16:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
		Jeri Blanchfield	10/22/96 930

Remarks:

Method of Shipment:

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

Chain of Custody Record

PDP Analytical Services
1550 Lake Front Circle, Suite B • The Woodlands, Texas 77380 • Phone (713) 363-2233 • Fax (713) 298-5784

Client Name / Address: MEVATEC / WSMR

Send Report to: Doug Downs

Project Number: 300-II J27

Project Name: Main Post Landfill Wells

Samplers (Signature): George Esquivel

P.O. Number:

Sta. No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	Matrix							Remarks
3	10/28/96	14:15		X	MPL-MW04-GW1-MS	16								see enclosed analysis list
4					TRIP BLANK	71								

Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
	10/28/96 16:00		
Relinquished by (Signature)	Date / Time	Received by (Signature)	Date / Time
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
			10/29/96 9:30

Remarks:

Method of Shipment:

PDP Quote Number:

Distribution: Original accompanies shipment; Copy to coordinator and field files

PDP ANALYTICAL SERVICES 1680 Lake Front Circle, Suite B, The Woodlands, TX 77380

SAMPLE L: -IN CHECKLIST/DISCREPA Y REPORT

FID: SLCDR01.96

EPISODE #: 340 DATE/TIME REC'D: 6/29/96 930 TEMP & ID: 1) CCC # CCCCCP#1

NT NAME: Mentec Corporation 2) LCC # #2

PROJECT NAME: main Post Landfill Wells 3) LCC # #3

PROJECT NUMBER: 300-II-527 4) ____ #

4 AQUEOUS, # ~~0~~ SOIL SAMPLES 5) ____

COURIER/AIRBILL # Fedex #031720949 1 6) ____ #

SAMPLE CONTAINER SEALS: present (absent) intact broken

COOLER CUSTODY SEALS: (present) absent (intact) broken NAME & DATE: custody tape.

HOW MANY AND WHERE Both sides of cooler

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
ainer Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list:	✓	
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:	✓	
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client? TRIP BLANKS were shipped but were not on COC. they were added on by Lab

Project Manager's recommendations?

Who was notified? By whom? Date:

Client's comments:

Corrective actions carried out?

MMENTS:

~~000010~~

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab?		

LOG-IN BY: Jeri Armfield DATE: 6/29/96

000011

ANALYTICAL SERIVES

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

Page 1 of

PDP

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

PO# 96483

Sent to: C.E.P

Contact: Elaine Raggio Phone: 505-982-9841

Sent by: Jeri Banfield

Date sent: 6/29/96 Date Results needed: 7/20/96

PDP Sample ID / Date Collected	No. of Containers	a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight Dry/Wet
3440.01 6/28/96	1	X	X									water	
3440-03 MS/MSD 6/28/96	2	X	X									water	

CUSTODY TRANSFERS

	Relinquished by:	Recieved by:	Date/Time
1.	Jeri Banfield		6/29/96 1100
2.		Cecilia Rodriguez	7/1/96 10:00

Courier: Fed Ex

ANALYTICAL PARAMETERS

A R-226 & R228
B TOTAL URANIUM
C
D
E
F
G
H
I
J

Project Manager Approval: _____

Lab Manager Approval: _____

000012

SAMPLE DATA

SUB-CONTRACT DATA

Controls for Environmental
Pollution, Inc.
P.O. Box 5351
Santa Fe, NM 87502

Phone: (505) 982-9841/(800) 545-2188

PDP Analytical Services
1680 Lake Front Circle Ste B
The Woodland, TX 77380

Attn: Jeri Stanfield

Purchase Order: 96483
Invoice Number:

Order #: 96-07-003
Date: 07/22/96 15:14
Work ID: Water (NR)
Date Received: 07/01/96
Date Completed: 07/22/96

Client Code: PDP_ANALYT

* Spike Amount
Total Uranium 0.022 mg
Radium-226 24.0+/-1.3 pCi
Radium-228 22.4+/-0.5 pCi

SAMPLE IDENTIFICATION

Sample Number	Sample Description
01	3440.01 MPL-MW03-GW1
02	3440 03 MPL-MW04-GW1
03	3440.03 MS
04	3440.03 MSD
05	3436.01 MPL-MW01-GW1
06	3436.03 MPL-MW02-GW1

000015

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Remainder of sample(s) for routine analysis will be disposed of three weeks from final report date. Sample(s) for bacteria analysis only, will be disposed of immediately after analysis. This is not applicable if other arrangements have been made.

Certified By

TEST RESULTS BY SAMPLE

Sample: 01A 3440.01 MPL-MW03-GW1 Collected: 06/28/96

Test Description	Result	D.L.	Units	Analyzed	By
Radium-228	<1	1	pCi/liter	07/15/96	MM
Total Uranium	0.026	0.001	mg/liter	07/08/96	GF

Sample: 02A 3440.03 MPL-MW04-GW1 Collected: 06/28/96

Test Description	Result	D.L.	Units	Analyzed	By
Radium-228	<1	1	pCi/liter	07/15/96	MM
Total Uranium	<0.003	0.003	mg/liter	07/08/96	GF

Sample: 03A 3440.03 MS Collected: 06/28/96

Test Description	Result	D.L.	Units	Analyzed	By
Radium-228	41+/-3*	1	pCi/liter	07/15/96	MM
Total Uranium	0.021*	0.001	mg/liter	07/08/96	GF

Sample: 04A 3440.03 MSD Collected: 06/28/96

Test Description	Result	D.L.	Units	Analyzed	By
Radium-228	23+/-2*	1	pCi/liter	07/15/96	MM
Total Uranium	0.023*	0.001	mg/liter	07/08/96	GF

Sample: 05A 3436.01 MPL-MW01-GW1 Collected: 06/26/96

Test Description	Result	D.L.	Units	Analyzed	By
Radium-228	<1	1	pCi/liter	07/15/96	MM
Total Uranium	<0.003	0.003	mg/liter	07/08/96	GF

Sample: 06A 3436.03 MPL-MW02-GW1 Collected: 06/26/96

Test Description	Result	D.L.	Units	Analyzed	By
Radium-228	<2	2	pCi/liter	07/15/96	MM
Total Uranium	<0.003	0.003	mg/liter	07/08/96	GF

000017

Controls for Environmental

TEST RESULTS BY SAMPLE

Sample Description: 3440.01
Test Description: Radium-226
Collected: 06/28/96

Lab No: 01A
Method:
Category: WATER

Test Code: RA2261

Type of Analysis	Detection Limit	RESULT
Radium-226	0.6	<0.6

All results reported in:

UNITS pCi/liter
Analyzed 07/15/96
By MM

Sample Description: 3440.03 mpl-mw04-gw1
Test Description: Radium-226
Collected: 06/28/96

Lab No. 02A
Method:
Category: WATER

Test Code: RA2261

Type of Analysis	Detection Limit	RESULT
Radium-226	0.6	<0.6

All results reported in:

UNITS pCi/liter
Analyzed 07/15/96
By MM

TEST RESULTS BY SAMPLE

Sample Description: 3440.03 MS
Test Description: Radium-226
Collected: 06/28/96

Lab No: 03A
Method:
Category: WATER

Test Code: RA2261

Type of Analysis	Detection Limit	RESULT
Radium-226	0.6	38.6+/-1.5*

All results reported in:

UNITS pCi/liter
Analyzed 07/15/96
By MM

Sample Description: 3440.03 MSD
Test Description: Radium-226
Collected: 06/28/96

Lab No: 04A
Method:
Category: WATER

Test Code: RA2261

Type of Analysis	Detection Limit	RESULT
Radium-226	0.6	37.1+/-1.4*

All results reported in:

UNITS pCi/liter
Analyzed 07/15/96
By MM

Controls for Environmental

TEST RESULTS BY SAMPLE

Sample Description: 3436.01
Test Description: Radium-226
Collected: 06/26/96

Lab No: 05A
Method:
Category: WATER

Test Code: RA2261

Type of Analysis	Detection Limit	RESULT
Radium-226	0.6	<0.6

All results reported in:

UNITS pCi/liter
Analyzed 07/15/96
By MM

Sample Description: 3436.03 MPL-MW02-GW1
Test Description: Radium-226
Collected: 06/26/96

Lab No: 06A
Method:
Category: WATER

Test Code: RA2261

Type of Analysis	Detection Limit	RESULT
Radium-226	0.6	<0.6

All results reported in:

UNITS pCi/liter
Analyzed 07/15/96
By MM

000020

END OF REPORT

LABORATORY ANALYTICAL REPORT

QUALITY ASSURANCE SAMPLE

MPL-MW03-GW1

CHAIN OF CUSTODY RECORD

Westech of Texas, Inc.
The Quality People
Since 1955

4725 Ripley Drive, Suite A
El Paso, Texas 79922-1028
(915) 585-3443 • fax 585-4944

CLIENT: MEVATEC / WSMR	ADDRESS: WSMR
CONTACT PERSON: Dana Downs	
TELEPHONE: 678-0263	PROJECT:
FAX:	WESTECH QUOTE / CONTRACT NO.: / JOB / P.O. NO.:

• SEE FEE SCHEDULE •

SAMPLER (SIGNATURE): J. Kyle Williams
PRINT NAME: J. Kyle Williams

SAMPLE TYPE CODES: A WATER, S SOIL, O OIL, G SLUDGE, D DRINKING WATER, T TRAVEL BLANK, W WASTEWATER, F FIELD BLANK, X OTHER (SPECIFY)

REQUESTED ANALYSES: See enclosed list

SAMPLE / COOLER TEMPERATURE:

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE LOCATION	NO. CONTAINERS	COMPOSITE	GRAB	SAMPLE TYPE	UNPRESERVED	HNO_3	NaOH	H_2SO_4	HCl	ST	(DO NOT ANALYZE) HOLD	COMMENTS (DWR / PWS / ETC.)	LABORATORY IDENTIFICATION
MPL-MW08-GW1-04	6/28/96	10:20	MPL	16		X	A	3	2	1	3	3	4			7604601

Metals:
ICP - Ag, Al, Ba, B, Ca, Co, Cr, Cu, Fe, K, Mg, Mo, Mn, Na, Ni, V, Zn
Mn - As, Cd, Sb, Pb, Hg, Se, Tl

INORGANIC
Phenols - 9065
Conductivity
CARB, Bicarb
TDS, Cl, F
SO_4, NH_3, TKN
NO_3 NO_2 T-N
T-CYN, pH
TOC

EPA - PCB + Pest's
8260 - VOC
8270 Semi VOC's

Radium 226 - 903.1
Radium 227 - 904.0
Uranium - 908.1

RELINQUISHED BY (SIGNATURE)	PRINT NAME	RECEIVED BY (SIGNATURE)	PRINT NAME	DATE / TIME
J. Kyle Williams	J. Kyle Williams	[illegible]	R. Peck	14:00 6-28-96

REMARKS

☐ Fax Results ☐ Special Detection Limits / Requirements

SAMPLE PROCESS TURNAROUND TIME:
☐ Standard ☐ Other (specify)

WHITE - LABORATORY; YELLOW - WORK FILE; PINK - CLIENT

623 094 WTI
110395

Westech of Texas, Inc.
The Quality People
Since 1955

4725 Ripley Drive, Suite A
El Paso, Texas 79922-1028
(915) 585-3443 • fax 585-4944

ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WHITE SANDS MR, NM 88002

SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 08-05-96
REVIEWED BY:
PAGE : 1 OF 2

CLIENT SAMPLE ID : MPL-MW03-GW1-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: J.K. Williams
SUBMITTED BY ....: J.K. Williams
SAMPLE SOURCE ...: MPL

AUTHORIZED BY : D. Downs
CLIENT P.O. : --
SAMPLE DATE ...: 06-28-96
SUBMITTAL DATE : 06-28-96
EXTRACTION DATE: --

REMARKS -

Detection limit for Arsenic and Selenium was raised because sample was analyzed diluted to avoid matrix interference.
Spike recovery for Arsenic and Selenium was low possibly due to matrix interference.

Inorganic Chemistry - Total Metals

DATA TABLE

Parameter	Result	Unit	Detection Limit	Analysis Date	Test Method	Analyst
Total Aluminum .....:	3.3	mg/L	0.10	07-11-96	SW-846:6010A	NET
Total Antimony .....:	<0.005	mg/L	0.005	08-02-96	SW 846:6010A	NET Labs
Total Arsenic .....:	<0.025	mg/L	0.025	07-02-96	SW 846:7060A	N.Munir
Total Barium .....:	<0.10	mg/L	0.10	07-11-96	SW 846:6010A	NET
Total Beryllium .....:	<0.10	mg/L	0.10	07-11-96	SW 846:6010A	NET
Total Boron .....:	<0.10	mg/L	0.10	08-05-96	SW 846:6010A	NET Labs
Total Cadmium .....:	<0.001	mg/L	0.001	08-02-96	SW 846:6010A	NET Labs
Total Calcium .....:	240	mg/L	0.50	07-11-96	SW 846:6010A	NET

ANALYTICAL RESULTS REPORTED HEREIN APPLY ONLY TO THE SAMPLE(S) TESTED. FURTHERMORE, THIS REPORT CAN ONLY BE COPIED IN ITS ENTIRETY.

(1) Copy to Client

Testech of Texas, Inc.
The Quality People
Since 1955

4725 Ripley Drive, Suite A
El Paso, Texas 79922-1028
(915) 585-3443 • fax 585-4944

ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WHITE SANDS MR, NM 88002

SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 08-05-96
REVIEWED BY:

DATA TABLE (Continue)

Parameter	Result	Unit	Detection Limit	Analysis Date	Test Method	Analyst
Total Chromium .....:	<0.10	mg/L	0.10	07-11-96	SW 846:6010A	NET
Total Cobalt .....:	<0.10	mg/L	0.10	07-11-96	SW 846:6010	NET
Total Copper .....:	<0.10	mg/L	0.10	07-11-96	SW 846:6010A	NET
Total Iron .....:	2.15	mg/L	0.01	07-11-96	SW 846:6010A	NET
Total Lead .....:	<0.005	mg/L	0.005	07-30-96	SW 846:7421A	N.Munir
Total Magnesium .....:	8.8	mg/L	0.10	07-11-96	SW 846:6010A	NET
Total Manganese .....:	0.10	mg/L	0.01	07-11-96	SW 846:6010A	NET
Total Mercury .....:	<0.001	mg/L	0.001	07-02-96	SW 846:7470A	N.Munir
Total Molybdenum .....:	<0.10	mg/L	0.10	07-11-96	SW 846:6010A	NET
Total Nickel .....:	<0.30	mg/L	0.30	07-11-96	SW 846:6010A	NET
Total Potassium .....:	20	mg/L	0.50	07-11-96	SW 846:6010A	NET
Total Selenium .....:	<0.025	mg/L	0.025	07-02-96	SW 846:7740	N.Munir
Total Silver .....:	<0.10	mg/L	0.10	07-11-96	SW 846: 6010A	NET
Total Sodium .....:	290	mg/L	1.0	07-11-96	SW 846:6010A	NET
Total Thallium .....:	<0.01	mg/L	0.01	08-02-96	SW 846:6010A	NET Labs
Total Vanadium .....:	<0.10	mg/L	0.10	07-11-96	SW 846:6010A	NET
Total Zinc .....:	<0.30	mg/L	0.30	07-11-96	SW 846:6010A	NET
Total Uranium .....:	<0.002	mg/L	0.002	07-25-96	EPA 908.1	CEP

(1) Copy to Client

Westech of Texas, Inc.
The Quality People
Since 1955

4725 Ripley Drive, Suite A
El Paso, Texas 79922-1028
(915) 585-3443 • fax 585-4944

ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WHITE SANDS MR, NM 88002

SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 08-05-96
REVIEWED BY:
PAGE : 1 OF 1

CLIENT SAMPLE ID : MPL-MW03-GW1-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: J.K. Williams
SUBMITTED BY ....: J.K. Williams
SAMPLE SOURCE ...: MPL

AUTHORIZED BY : D. Downs
CLIENT P.O. : --
SAMPLE DATE ...: 06-28-96
SUBMITTAL DATE : 06-28-96
EXTRACTION DATE: --

Radionucleotides

DATA TABLE

Parameter	Result	Unit	Detection Limit	Analysis Date	Test Method	Analyst
Radium 226 .....:	<0.6	pCi/L	<0.6	07-25-96	EPA 903.1	CEP
Radium 228 .....:	<3.0	pCi/L	<3.0	07-25-96	EPA 904.0	CEP

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
Bldg. S-146 W
P.O. Box 399
White Sands MR, NM 88002

SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 07-17-96
REVIEWED BY:
PAGE : 1 OF 1

CLIENT SAMPLE ID : MPL-MW03-GW1-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: J.K. Williams
SUBMITTED BY ....: J.K. Williams
SAMPLE SOURCE ...: MPL

AUTHORIZED BY : D. Downs
CLIENT P.O. : --
SAMPLE DATE ...: 06-28-96
SUBMITTAL DATE : 06-28-96
EXTRACTION DATE: --

Inorganic Non-Metals

DATA TABLE

Parameter	Result	Unit	Detection Limit	Analysis Date	Test Method	Analyst
Ammonia Nitrogen .....:	0.14	mg/L	0.10	07-11-96	E-350.1	F. Armendariz
Bicarbonate .....:	200	mg/L	2.0	07-15-96	EPA 310.1	F. Armendariz
Carbonate .....:	<2.0	mg/L	2.0	07-15-96	EPA 310.1	F. Armendariz
Chloride .....:	65	mg/L	5.0	06-28-96	EPA 325.1	F. Armendariz
Cyanide, Total(Distillation) .....:	0.27	mg/L	0.01	07-11-96	SW-846:9012	NET
Electrical Conductivity .....:	1200	umhos/cm		06-28-96	EPA 120.1	F. Armendariz
Fluoride .....:	0.89	mg/L	0.50	06-28-96	EPA 340.2	F. Armendariz
Nitrate Nitrogen .....:	8.0	mg/L	0.50	06-28-96	EPA 352.1	F. Armendariz
Nitrite Nitrogen .....:	<0.50	mg/L	0.50	06-28-96	EPA 352.1	F. Armendariz
Nitrogen, Total Kjeldahl .....:	<0.50	mg/L	0.50	07-11-96	STD METH 4500 N-C	NET
pH .....:	7.4	S.U.		06-28-96	SW846:9040	F. Armendariz
Phenol, Total .....:	0.01	mg/L	0.01	07-11-96	SW-846:9066	NET
Sulfate .....:	72	mg/L	5.0	07-12-96	EPA 375.1	F. Armendariz
Total Dissolved Solids .....:	1200	mg/L	10	07-03-96	EPA 160.2	F. Armendariz
Total Organic Carbon .....:	1.6	mg/L	1.0	07-11-96	SW9060B	NET

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White Sands MR, NM 88002

SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 07-12-96
REVIEWED BY:
PAGE : 1 OF 1

CLIENT SAMPLE ID : MPL-MW03-GW1-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: J.K. Williams
SUBMITTED BY ....: J.K. Williams
SAMPLE SOURCE ...: MPL
ANALYST .....: A. Skornia

AUTHORIZED BY : D. Downs
CLIENT P.O. : --
SAMPLE DATE ...: 06-28-96
SUBMITTAL DATE : 06-28-96
EXTRACTION DATE: 07-01-96
ANALYSIS DATE .: 07-10-96

Method SW-846:8080 - Pesticides & PCB'S

DATA TABLE

Parameter	Result	Unit	Detection Limit
4,4'-DDD	<0.10	ug/L	0.10
4,4'-DDE	<0.10	ug/L	0.10
4,4'-DDT	<1.0	ug/L	1.0
Aldrin	<1.0	ug/L	1.0
alpha-BHC	<1.0	ug/L	1.0
beta-BHC	<1.0	ug/L	1.0
delta-BHC	<0.50	ug/L	0.5
Chlordane	<1.5	ug/L	1.5
Dieldrin	<0.5	ug/L	0.5
Endosulfan I	<0.5	ug/L	0.5
Endosulfan II	<1.0	ug/L	1.0
Endosulfan sulfate	<0.5	ug/L	0.5
Endrin	<1.0	ug/L	1.0
Endrin aldehyde	<1.0	ug/L	1.0
Heptachor	<0.5	ug/L	0.5
Hetachlor Epoxide	<1.0	ug/L	1.0
Lindane	<0.5	ug/L	0.5
Methoxychlor	<1.0	ug/L	1.0
Toxaphene	<1.0	ug/L	1.0
PCB 1016	<2.0	ug/L	2.0
PCB 1221	<50.	ug/L	50.
PCB 1232	<10.	ug/L	10.
PCB 1242	<6.0	ug/L	6.0
PCB 1248	<2.0	ug/L	2.0
PCB 1254	<100.	ug/L	100.
PCB 1260	<200.	ug/L	200.

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SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 07-16-96
REVIEWED BY:
PAGE : 1 OF 2

CLIENT SAMPLE ID : MPL-MW03-GW1-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: J.K. Williams
SUBMITTED BY ....: J.K. Williams
SAMPLE SOURCE ...: MPL
ANALYST .....: C. Warner

AUTHORIZED BY : D. Downs
CLIENT P.O. : --
SAMPLE DATE ...: 06-28-96
SUBMITTAL DATE : 06-28-96
EXTRACTION DATE: --
ANALYSIS DATE .: 07-12-96

Method SW-846:8260 - Volatile Organics

DATA TABLE

Parameter	Result	Unit	Detection Limit
1,1,1,2-Tetrachloroethane .....:	<2.5	ug/L	2.5
1,1,1-Trichloroethane .....:	<2.5	ug/L	2.5
1,1,2,2-Tetrachloroethane .....:	<2.5	ug/L	2.5
1,1,2,2-Tetrachloroethene .....:	<2.5	ug/L	2.5
1,1,2-Trichloroethane .....:	<2.5	ug/L	2.5
1,1-Dichloroethane .....:	<2.5	ug/L	2.5
1,1-Dichloroethene .....:	<2.5	ug/L	2.5
1,1-Dichloropropene .....:	<2.5	ug/L	2.5
1,2-Dibromoethane (EDB) .....:	<5.0	ug/L	5.0
1,2,3-Trichlorobenzene .....:	<2.5	ug/L	2.5
1,2,3-Trichloropropane .....:	<2.5	ug/L	2.5
1,2,4-Trichlorobenzene .....:	<2.5	ug/L	2.5
1,2,4-Trimethylbenzene .....:	<2.5	ug/L	2.5
1,2-Dichlorobenzene .....:	<5.0	ug/L	5.0
1,2-Dichloroethane .....:	<2.5	ug/L	2.5
1,2-Dichloropropane .....:	<2.5	ug/L	2.5
1,3,5-Trimethylbenzene .....:	<2.5	ug/L	2.5
1,3-Dichlorobenzene .....:	<5.0	ug/L	5.0
1,3-Dichloropropane .....:	<2.5	ug/L	2.5
1,4-Dichlorobenzene .....:	<5.0	ug/L	5.0
2,2-Dichloropropane .....:	<2.5	ug/L	2.5
2-Chlorotoluene .....:	<2.5	ug/L	2.5
4-Chlorotoluene .....:	<2.5	ug/L	2.5
4-Isopropyltoluene .....:	<2.5	ug/L	2.5
Benzene .....:	<5.0	ug/L	5.0
Bromobenzene .....:	<5.0	ug/L	5.0
Bromochloromethane .....:	<5.0	ug/L	5.0
Bromodichloromethane .....:	<5.0	ug/L	5.0
Bromoform .....:	<5.0	ug/L	5.0
Bromomethane .....:	<5.0	ug/L	5.0

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SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 07-16-96
REVIEWED BY:
PAGE : 2 OF 2

DATA TABLE (Cont.)

Parameter	Result	Unit	Detection Limit
Carbon tetrachloride	<2.5	ug/L	2.5
Chlorobenzene	<5.0	ug/L	5.0
Chloroethane	<5.0	ug/L	5.0
Chloroform	<2.5	ug/L	2.5
Chloromethane	<5.0	ug/L	5.0
cis 1,2-Dichloroethene	<2.5	ug/L	2.5
Dibromochloromethane	<5.0	ug/L	5.0
Dibromochloropropane (DBCP)	<10.	ug/L	10.
Dibromomethane	<5.0	ug/L	5.0
Dichlorodifluoromethane	<5.0	ug/L	5.0
Dichloromethane	<2.5	ug/L	2.5
Ethylbenzene	<5.0	ug/L	5.0
Hexachlorobutadiene	<2.5	ug/L	2.5
Isopropylbenzene	<2.5	ug/L	2.5
m,p - Xylene	<5.0	ug/L	5.0
Napthalene	<2.5	ug/L	2.5
n-Butylbenzene	<5.0	ug/L	5.0
o-Xylene	<5.0	ug/L	5.0
Propylbenzene	<2.5	ug/L	2.5
sec-Butylbenzene	<5.0	ug/L	5.0
Styrene	<2.5	ug/L	2.5
tert-Butylbenzene	<5.0	ug/L	5.0
Toluene	<5.0	ug/L	5.0
trans 1,2-Dichloroethene	<1.5	ug/L	1.5
Trichloroethene	<1.5	ug/L	1.5
Trichlorofluoromethane	<5.0	ug/L	5.0
Vinyl chloride	<5.0	ug/L	5.0

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SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 07-18-96
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PAGE : 1 OF 3

CLIENT SAMPLE ID : MPL-MW03-GW1-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: J.K. Williams
SUBMITTED BY ....: J.K. Williams
SAMPLE SOURCE ...: MPL
ANALYST .....: C. Warner

AUTHORIZED BY : D. Downs
CLIENT P.O. : --
SAMPLE DATE ...: 06-28-96
SUBMITTAL DATE : 06-28-96
EXTRACTION DATE: 07-03-96
ANALYSIS DATE .: 07-12-96

Method SW-846:8270-Semi Volatiles by Capillary Column GC/MS

DATA TABLE

Parameter	Result	Unit	Detection Limit
2,4,5-Trichlorophenol .....:	<10.	ug/L	10.
2,4,6-Trichlorophnol .....:	<10.	ug/L	10.
2,4-Dichlorophenol .....:	<10.	ug/L	10.
2,4-Dinitrophenol .....:	<50.	ug/L	50.
2-Chlorophenol .....:	<10.	ug/L	10.
2-Methylphenol .....:	<10.	ug/L	10.
2-Nitrophenol .....:	<10.	ug/L	10.
3-Methylphenol .....:	<20.	ug/L	20.
4-Chloro-3-methylphenol .....:	<20.	ug/L	20.
4-Methylphenol .....:	<10.	ug/L	10.
4-Nitrophenol .....:	<50.	ug/L	50.
Pentachlorophenol .....:	<50.	ug/L	50.
Phenol .....:	<10.	ug/L	10.
Bis(2-chloroethoxy)methane .....:	<10.	ug/L	10.
1,2,4-Trichlorobenzene .....:	<10.	ug/L	10.
Naphthalene .....:	<10.	ug/L	10.
4-Chloroaniline .....:	<20.	ug/L	20.
Hexachlorobutadiene .....:	<10.	ug/L	10.
2-Methylnaphthalene .....:	<10.	ug/L	10.
Hexachlorocyclopentadiene .....:	<10.	ug/L	10.
2-Chloronaphthalene .....:	<10.	ug/L	10.
2-Nitroaniline .....:	<50.	ug/L	50.
Dimethyl phthalate .....:	<10.	ug/L	10.
Acenaphthylene .....:	<10.	ug/L	10.
3-Nitroaniline .....:	<50.	ug/L	50.
Acenaphthene .....:	<10.	ug/L	10.
Dibenzofuran .....:	<10.	ug/L	10.
2,4-Dinitrotoluene .....:	<10	ug/L	10
2,6-Dinitrotoluene .....:	<10.	ug/L	10.
Diethyl phthalate .....:	<10.	ug/L	10.

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REPORT DATE: 07-18-96
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DATA TABLE (Cont.)

Parameter	Result	Unit	Detection Limit
4-Chlorophenyl phenyl ether .....:	<10.	ug/L	10.
Fluorene .....:	<10.	ug/L	10.
4-Nitroaniline .....:	<20.	ug/L	20.
2-Methyl-4,6-dinitrophenol .....:	<30.	ug/L	30.
N-Nitrosodiphenylamine .....:	<20.	ug/L	20.
4-Bromophenyl phenyl ether .....:	<10.	ug/L	10.
Hexachlorobenzene .....:	<10.	ug/L	10.
1,2-Dichlorobenzene .....:	<10.	ug/L	10.
1,3-Dichlorobenzene .....:	<10.	ug/L	10.
1,4-Dichlorobenzene .....:	<10.	ug/L	10.
Phenanthrene .....:	<10.	ug/L	10.
Anthracene .....:	<10.	ug/L	10.
Di-n-butyl phthalate .....:	<10.	ug/L	10.
Fluoranthene .....:	<10.	ug/L	10.
Pyrene .....:	<10.	ug/L	10.
Butyl benzyl phthalate .....:	<10.	ug/L	10.
3,3'-Dichlorobenzidine .....:	<20.	ug/L	20.
Benzo(a)anthracene .....:	<10.	ug/L	10.
Bis(2-ethylhexyl) phthalate .....:	<10.	ug/L	10.
Chrysene .....:	<10.	ug/L	10.
Di-n-octyl phthalate .....:	<10.	ug/L	10.
Benzo(b)fluoranthene .....:	<10.	ug/L	10.
Benzo(k)fluoranthene .....:	<10.	ug/L	10.
Benzo(a)pyrene .....:	<10.	ug/L	10.
Indeno(1,2,3-cd)pyrene .....:	<10.	ug/L	10.
Dibenzo(a,h)anthracene .....:	<10.	ug/L	10.
Benzo(ghi)perylene .....:	<10.	ug/L	10.
Benzidine .....:	<20.	ug/L	20.
Diphenylamine .....:	<10.	ug/L	10.
Benzoic acid .....:	<50.	ug/L	50.
Bis(2-Chloroethyl)ether .....:	<10.	ug/L	10.
Bis(2-Chloroisopropyl)ether .....:	<10.	ug/L	10.
2,4-Dimethylphenol .....:	<10.	ug/L	10.
Hexachloroethane .....:	<10.	ug/L	10.
Isophorone .....:	<10.	ug/L	10.
Nitrobenzene .....:	<10.	ug/L	10.
N-Nitrosodimethylamine .....:	<10.	ug/L	10.
Pyridine .....:	<50.	ug/L	50.

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SAMPLE NO. : 7604601
INVOICE NO.: 72160826
REPORT DATE: 07-18-96
REVIEWED BY:
PAGE : 3 OF 3

DATA TABLE (Cont.)

Parameter	Result	Unit	Detection Limit
Aniline .....:	<10	ug/L	10
Benzyl alcohol .....:	<10.	ug/L	10.

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REPORT OF RESULTS
SECOND GROUNDWATER SAMPLING AND ANALYSIS EVENT
WSMR MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

Submitted to:

U.S. Army
White Sands Missile Range
Directorate of Environment and Safety
White Sands Missile Range, New Mexico 88002-5201

September 1996

Submitted by:

MEVATEC Corporation
Building S-146W
White Sands Missile Range, New Mexico 88002

REPORT OF RESULTS
SECOND GROUNDWATER SAMPLING AND ANALYSIS EVENT
WSMR MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

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1.	Executive Summary	1
2.	Introduction	1
3.	Location and Description of Sampling Area	2
4.	Description of Work	2
5.	Summary of Analytical Results	7
6.	Conclusions	12

APPENDIX A Detailed Laboratory Report

REPORT OF RESULTS
SECOND GROUNDWATER SAMPLING AND ANALYSIS
MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE

1. EXECUTIVE SUMMARY

In compliance with the New Mexico Solid Waste Management Regulations (Part VIII, Sections 801 through 811), this report presents the results of the second groundwater sampling event at the White Sands Missile Range (WSMR) Main Post Landfill. Groundwater samples were collected from the one upgradient and three downgradient monitoring wells, which were installed at the perimeter of the landfill during May and June, 1996. Groundwater samples were collected from each well during the week of 12 August 1996. The results of this initial analysis, plus the results from three additional samples to be collected during the next six months, will be compiled and the mean concentration for each analyte will be calculated. The resulting mean value will represent the baseline concentration for each analyte. These values will determine the nature and frequency of future groundwater monitoring.

No volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls, phenols, or radium 228 were detected during this initial sampling event. Detected constituents include various anions, cations and metals. These may be naturally occurring compounds in groundwater in the vicinity of the landfill, and may become part of the established background constituents. The interpretation and discussion of detected groundwater constituents will be reserved until additional data is collected from each of the wells.

2. INTRODUCTION

Four groundwater monitoring wells (one upgradient and three downgradient) monitoring wells were installed at the perimeter of the WSMR Main Post Landfill during May and June, 1996. The detailed description of each well installation will be presented in the Main Post Landfill Monitoring Well Installation Report, TBD October 1996.) The purpose of the wells is to establish background physical and chemical parameters in groundwater, in the vicinity of the landfill. This report presents the results of the second of five groundwater sampling events at the Main Post Landfill monitoring wells.

Background monitoring is the initial stage of the overall groundwater monitoring program and is used to 1.) characterize the baseline conditions of the upgradient and downgradient groundwater quality at the site and 2.) to establish assessment monitoring levels (AMLs). The background groundwater monitoring is being conducted during the first twelve months of the overall groundwater monitoring program. The program involves the collection and analysis of five

independent groundwater samples from each well. Four samples will be collected within the first six months following well installation. The fifth sample will be collected about midway during the second sixth month time period. The results of each sampling event will be evaluated and the mean concentration used as the basis for determining whether subsequent groundwater monitoring will be conducted under the Detection or Assessment Monitoring Programs.

3. LOCATION AND DESCRIPTION OF SAMPLING AREA

The Main Post Landfill, located approximately 3 miles east of the WSMR Main Post Headquarters (Figure 3-1), occupies approximately 25 acres. The landfill accepts nonhazardous waste generated from all of the 850 residential units, as well as facilities located at the Post Headquarters. This includes residential, yard, and commercial waste. The landfill has been in operation since 1983.

The WSMR Main Post derives its water supply from a water table aquifer in the upper bolson Tertiary/Quaternary unconsolidated alluvial deposits. This aquifer contains water derived from mountain water sheds forming a wedge-shaped belt of potable water over 30 miles long. Good quality groundwater occurs near recharge areas, but becomes progressively more mineralized downgradient toward the interior of the Tularosa Basin. This is attributed to the slow migration rate of groundwater from recharge to discharge areas and the presence of readily soluble minerals in the bolson sediments.

One upgradient (MPL-MW-01) and three downgradient (MPL-MW-02, MPL-MW-03, and MPL-MW-04) monitoring wells (Figure 3-2) were installed from 15 - 31 May 1996, using mud-rotary drilling techniques. The detailed description of each well installation will be presented in the Monitoring Well Installation Report (TBD October 1996). The following table summarizes monitoring well construction and water level information for the wells at the Main Post Landfill. Water level measurements were made just prior to purging activities for sampling.

Table 3-1 Well Construction and Water Level Data for Monitoring Wells at the Main Post Landfill

Well Number	Total Depth of Well (feet)	Elevation (ft.) (MP - Brass survey marker) NAVD-1988	Depth to water (feet below MP) 8/14/96	Elevation Groundwater (8/14/96)
MPL-MW-01	220.58	4012.56	200.48	3812.08
MPL-MW-02	220.50	4004.55	194.82	3809.73
MPL-MW-03	228.50	3997.75	188.81	3808.94
MPL-MW-04	225.0	3993.50	184.85	3808.65

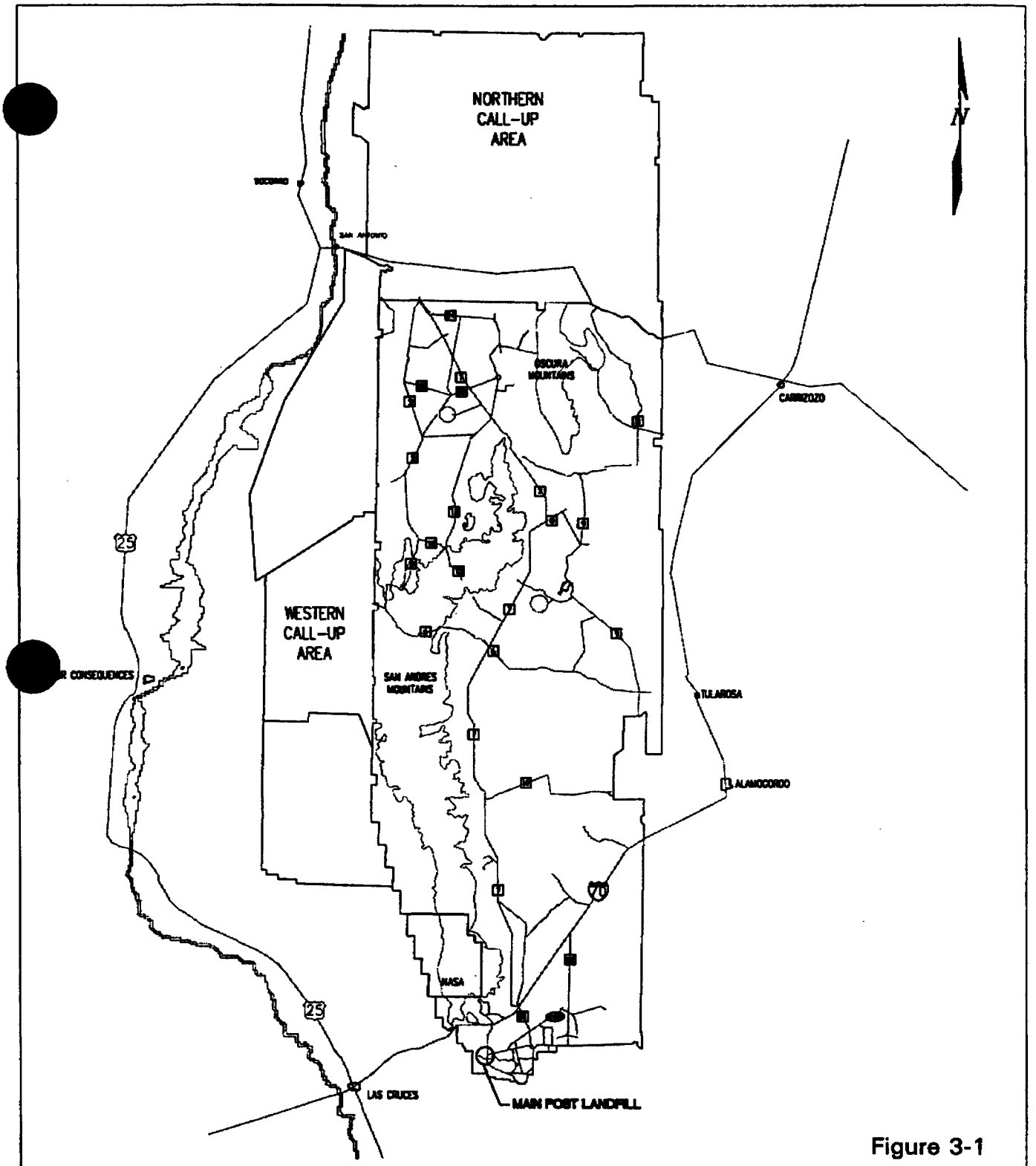

Figure 3-1

MEVATEC CORPORATION	SITE LOCATION MAP	Background Groundwater Monitoring Main Post Landfill White Sands Missile Range

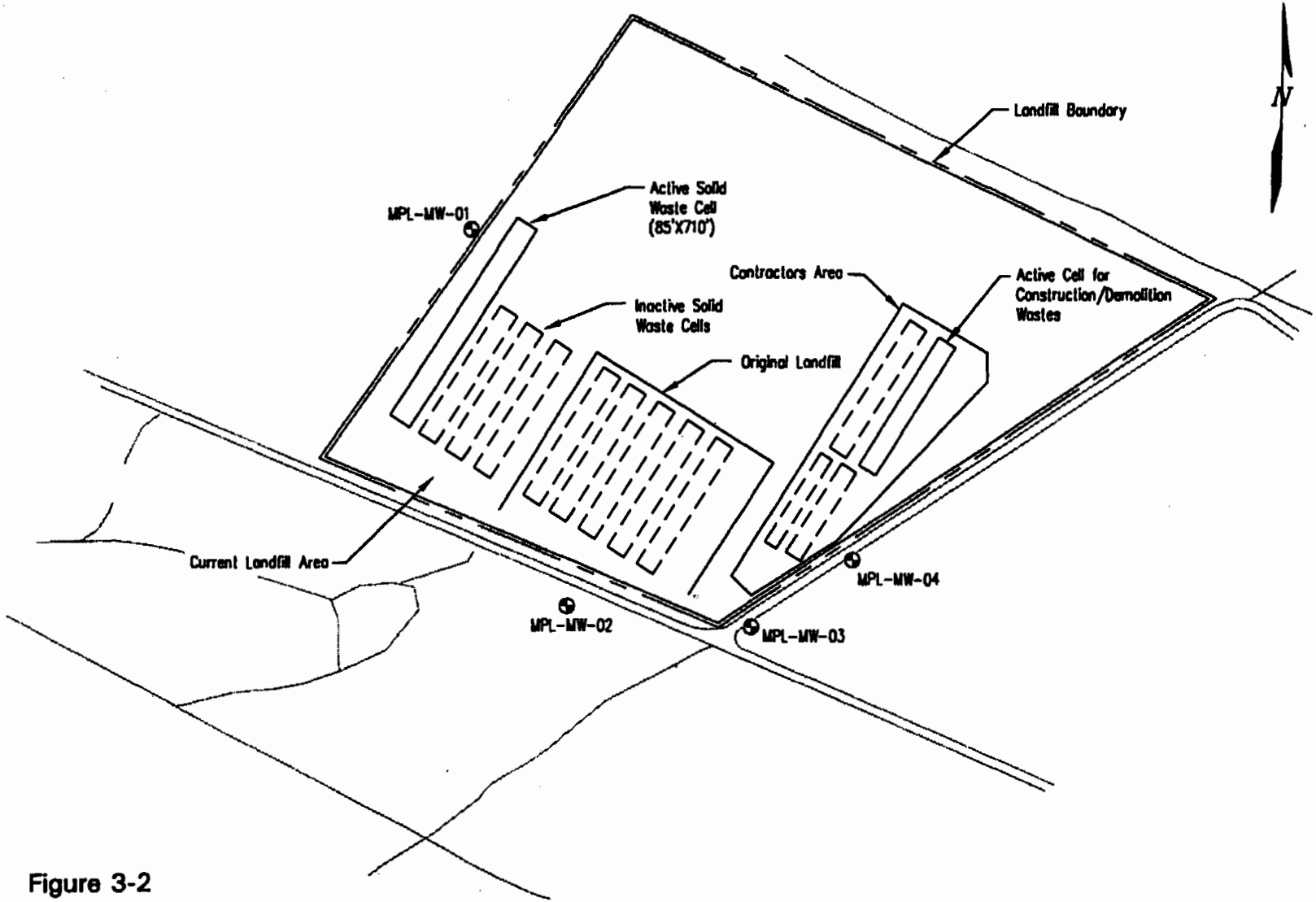

Figure 3-2

DRAWING NOT TO SCALE

Location of Monitoring Wells at the Main Post Landfill

MEVATEC CORPORATION

WHITE SANDS MISSILE RANGE

4. DESCRIPTION OF WORK

The second groundwater sampling event took place on 14-16 August 1996. Prior to sampling, three well volumes of groundwater were purged from each well to obtain a representative groundwater sample. Groundwater was purged and sampled using a portable 2-inch diameter submersible pump. The submersible pump and sampling equipment were thoroughly decontaminated before and after purging and prior to sampling each well. Water quality measurements collected during each sample collection are provided as Table 3-2.

Table 4-1. Field Water Quality Measurements from Monitoring Wells at the Main Post Landfill

Well No.-Sample	Date	Temperature (°C)	Conductivity (microsiemens/cm)	pH
MPL-MW01-GW1	8/15/96	27.2	550	7.19
MPL-MW02-GW1	8/14/96	25.2	610	7.11
MPL-MW03-GW1	8/14/96	26.2	1180	7.24
MPL-MW04-GW1	8/15/96	26.4	1150	6.97

The sample for volatile organic compounds was collected first, followed by the samples for semivolatile organic compounds and phenols, followed by the collection of samples for all other analytes. Preservatives (if necessary) were added to the full sample bottle until the desired pH was reached. Each sample container was labeled with sample name and number, sealed in a plastic bag, and packed in an ice chest so as not to exceed a temperature of 4 degrees Celsius during transport to the laboratory. Chain-of-custody forms were completed and placed inside each sample ice chest. The sample coolers were sealed with chain-of-custody tape and submitted to the analytical laboratory via overnight delivery service.

The samples were submitted for analysis for the following New Mexico Solid Waste Management Regulations (NMSWMR) Subpart XI, Table I parameters.

Table 4-2. Summary of Groundwater Analysis Requirements for the Main Post Landfill

Analyte	Analytical Method	Maximum Holding Time (days)
Organic Compounds		
Polychlorinated Biphenyls	SW846-8080A	40
Volatile Organic Compounds	SW846-8260A	14
Semivolatile Organic Compounds	SW846-8260A	40
Phenols	SW846-9066	28
Water Quality Parameters		
Specific Conductance	EPA 120.1	NA
Carbonate and Bicarbonate	EPA 310.1	28
Total Dissolved Solids	EPA 160.2	7
Chloride	EPA 325.1	28
Fluoride	EPA 340.2	28
Sulfate	EPA 375.1	28
Ammonia	EPA 350.1	28
Total Kjeldahl Nitrogen	EPA 351.1	28
Nitrate/Nitrite as Nitrogen	EPA 352.1	28
Total Cyanide	SW846-9012	14
Laboratory pH	SW846-9040	2
Total Organic Carbon	SW846-9060B	28
Radium 226	EPA 903.1	180
Radium 228	EPA 904.0	180
Total Metals		
Al, Sb, As, Ba, Be, B, Cd, Ca, Cr Co, Cu, Fe, Mg,	SW846-6010A*	180
Mn, Mo, Ni, K Se Ag, Na, Th, V, Zn*	SW846-6010A	180
Hg	SW846-7470A	28
U	EPA 908.1	180

* ICPES was used for metals analysis, in lieu of GFAA. Near identical quantitation limits were reached using the ICPES method.

Primary analytical services for the groundwater samples from the Main Post Landfill were provided by:

PDP Analytical Services
1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Telephone: 713/363-2233

The sample containers for Total Kjeldahl Nitrogen were forwarded to the following lab by PDP for analysis:

Inchcape/NDRC Laboratories
1089 East Collins
Richardson, Texas 75081
Telephone: 214/238-5591

The samples for analysis for uranium, radium 226 and radium 228 were submitted to the following laboratory for analysis.

Controls for Environmental Pollution, Inc.
Post Office Box 5351
Santa Fe, New Mexico 87502
Telephone: 505/982-9841

Quality Assurance laboratory services were provided by:

Westech of Texas, Inc.
4725 Ripley Drive, Suite A
El Paso, Texas 79922-1028
Telephone: 915/585-3443

5. SUMMARY OF ANALYTICAL RESULTS

All samples collected from the Main Post Landfill arrived at the laboratories in good condition, within temperature requirements. All samples were extracted and analyzed within EPA maximum holding times for each analyte. Table 5-1 summarizes the analytical results for **detected** analytes only. The detailed laboratory reports containing analytical results, quality control data and matrix spike and matrix spike duplicated analyses are provided as Appendix A.

No volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls, phenols, radium 226 or radium 228 were detected during this second groundwater sampling event. Detected constituents included various metals, anions and cations. These constituents may be naturally occurring materials in groundwater in the vicinity of the landfill. A discussion of the presence and pervasiveness of non-anthropogenic (not introduced by outside source) compounds will be reserved until additional groundwater data is collected from each of the wells. New Mexico Solid Waste Management Regulation groundwater protection standards and practical quantitation limits (PQLs) are listed on Table 5-2. Practical quantitation limits are the lowest concentration of analytes in groundwater that can be reliably determined within specified limits of precision and accuracy under routine laboratory operating conditions. Actual laboratory quantitation limits are matrix specific, and may vary due to nature of the sample or sample dilutions.

TABLE 5-1
GROUNDWATER ANALYTICAL DATA (DETECTED ANALYTES ONLY)
WSMR MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE, NEW MEXICO
SECOND GROUNDWATER SAMPLING EVENT

Water Quality Parameters						
Bicarbonate Alkalinity (HCO3) (mg/L)	68	67	130	220	115	
Total Dissolved Solids (mg/L)	390	430	1,000	830	890	1000 (close)
over						.2
Laboratory pH	7.66	7.38	7.5	7.5	7.32	
Fluoride (mg/L)	0.34	0.22	0.23	0.6	0.29	
Nitrate/Nitrite as Nitrogen (mg/L)	5.37	6.01	8.86	8.3	9.58	10 (close)
Total Kjeldahl Nitrogen (mg/L)	ND	ND	1.4	0.8	1.68	
Total Metals						
over						5
Arsenic (mg/L)	ND	ND	ND	ND	ND	
Boron (mg/L)	0.12	ND	0.14	0.082	ND	
Chromium (mg/L)	ND	ND	ND	ND	ND	
over						1
over	Lead (mg/L)	0.0099	0.0081	0.014	0.19	0.01 .05
Manganese (mg/L)	0.044	0.053	0.099	0.088	0.051	
Selenium (mg/L)	ND	ND	ND	ND	ND	
Sodium (mg/L)	77.6	81.3	264	210	235	
Thallium (mg/L)	ND		ND	0.02	ND	
Vanadium (mg/L)	0.011	0.01	0.019	0.02	0.012	

ND - Analyte below laboratory quantitation limits

TABLE 5-2
SUMMARY OF GROUNDWATER PROTECTION STANDARDS
AND
PRACTICAL QUANTITATION LIMITS
FOR BACKGROUND GROUNDWATER MONITORING PARAMETERS

WATER QUALITY PARAMETERS		
Alkalinity (mg/L CaCO3)	N/A	N/A
Ammonia (mg/L NH3, as N)	N/A	N/A
Bicarbonate (HCO3)	N/A	N/A
Chloride (mg/L)	250	5
Cyanide (mg/L)	0.2	0.1
Fluoride (mg/L)	1.6	0.4
Nitrate (mg/L)	10	1
Nitrogen, Total	10	1
Nitrogen, Total Kjeldahl (mg/L)	N/A	0.01
pH	6.5-8.5	0.1
Specific Conductance (umhos/cm)	N/A	N/A
Sulfate (mg/L)	250	5
TDS (mg/L)	500	5
Temperature	N/A	N/A
Total Organic Carbon (mg/L)	N/A	N/A
Water Elevation (ft)	N/A	N/A
METALS (mg/L)		
Aluminum	5	3
Antimony	0.006	0.003
Arsenic	0.05	0.01
Barium	1	0.02
Beryllium	0.004	0.002
Boron	0.75	0.5
Cadmium	0.005	0.002
Calcium	N/A	N/A
Chromium	0.05	0.01
Cobalt	0.05	0.03
Copper	1	0.06
Iron	0.3	0.1
Lead	0.05	0.01
Magnesium	N/A	N/A
Manganese	0.05	0.03
Mercury	0.002	0.001
Molybdenum	1	0.75
Nickel	0.1	0.05
Potassium	N/A	N/A
Selenium	0.01	0.005
Silver	0.05	0.01
Sodium	N/A	N/A
Thallium	0.002	0.001
Uranium	5	2.5
Vanadium	N/A	0.08
Zinc	5	0.05

TABLE 5-2 (cont.)
SUMMARY OF GROUNDWATER PROTECTION STANDARDS
AND
PRACTICAL QUANTITATION LIMITS
FOR BACKGROUND GROUNDWATER MONITORING PARAMETERS

PCBs (ug/L)		
PCB-1016	0.001	0.5
PCB-1221	0.001	0.5
PCB-1223	0.001	0.5
PCB-1242	0.001	0.5
PCB-1248	0.001	0.5
PCB-1254	0.001	0.5
PCB-1260	0.001	0.5
PHENOLICS (mg/L)		
Total Phenolics	N/A	N/A
VOLATILE ORGANICS (ug/L)		
Acetone	N/A	0.1
Acrylonitrile	N/A	0.2
Benzene	0.005	1.0
Bromochloromethane	N/A	2.0
Bromodichloromethane	N/A	5.0
Bromoform (tribromomethane)	N/A	15.0
Carbon disulfide	N/A	100
Carbon tetrachloride	0.005	2.0
Cholorobenzene	0.1	5.0
Chloroethane	N/A	10.0
Chloroform	0.1	5.0
Dibromochloromethane	N/A	5.0
1,2-Dibromo-3-chloropropane	0.0002	0.1
1,2-Dichloroethane	0.005	1.0
1,1-Dichloroethane	0.025	5.0
1,1-Dichloroethylene	0.005	1.0
1,2-Dichloropropane	0.005	0.5
cis-1,3-Dichloropropene	N/A	20.0
trans-1,3-Dichloropropene	N/A	10.0
trans-1,4-Dichloro-2-butene	N/A	100
Ethylbenzene	0.07	5.0
Ethylene Dibromide	0.00005	0.025
2-Hexanone	N/A	50.0
Methyl bromide	N/A	20.0
Methyl chloride	0.005	1.0
Methyl ethyl ketone (2-Butanone)	N/A	10.0
Methyl iodide	N/A	40.0
Methylene bromide	N/A	20.0
Methylene chloride	0.005	1.0
4-Methyl-2-pentanone (MIBK)	N/A	15.0

TABLE 5-2 (cont.)
SUMMARY OF GROUNDWATER PROTECTION STANDARDS
AND
PRACTICAL QUANTITATION LIMITS
FOR BACKGROUND GROUNDWATER MONITORING PARAMETERS

VOLATILE ORGANICS (ug/L) (cont.)		
Styrene	0.1	10.0
1,1,1,2-Tetrachloroethane	N/A	5.0
1,1,2,2-Tetrachloroethane	0.01	5.0
Tetrachloroethylene	0.005	0.5
Toluene	0.75	5.0
1,1,1-Trichloroethane	0.06	5.0
1,1,2-Trichloroethane	0.005	2.0
Trichloroethylene	0.005	1.0
Trichlorofluoromethane	N/A	10.0
1,2,3 Trichloropropane	N/A	10.0
Vinyl acetate	N/A	50.0
Vinyl chloride	0.001	0.4
Total Xylenes	0.62	5.0
SEMIVOLATILE ORGANICS (mg/kg)		
1,2-Dichlorobenzene	0.06	0.01
1,4-Dichlorobenzene	0.075	0.015
Benzo(a)pyrene	0.002	0.0001
Total Naphthalene plus monomethylnaphthalenes	0.03	0.01
RADIONUCLIDES (pCi/L)		
Radium 226 and Radium 228 (pCi/L)	5.000	2.5

Notes: CVAA=Cold vapor atomic absorption, GC/MS=Gas chromatography/mass spectrometry.
GFAA=Graphite furnace atomic absorption. HPLC=High proformacnce liquid chromatography.
IC=Ion chromatography, ICPES=Inductively coupled plasma emission spectroscopy. IR=Infrared spectrometry . NA=Not Applicable.

aReporting limit is the minumum conentration of a substance that can be measured and reported for multiple instruments.
Reporting limits are highly matrix dependent and may not always be achievable.
bN-Nitrosodiphenylamine decomposes to diphenylamine. Laboratory quantitates as diphenylamine.

5. CONCLUSIONS

Three additional groundwater samples will be collected from each of the monitoring wells, and analyzed for the NMSWMR Subpart XI, Table 1 constituents. The results of these analyses will then be complied and a mean concentration calculated for each constituent, at each sample location. The resulting mean values will be used to represent the upgradient and downgradient quality of groundwater at the site, as well as for establishing levels for future detection or assessment groundwater monitoring at the Main Post Landfill.

APPENDIX A

DETAILED LABORATORY REPORT

LABORATORY ANALYTICAL REPORT

GROUNDWATER SAMPLE

MPL-MW01-GW2

PDP
Analytical Services

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

September 16, 1996

Ms. Dana Downs
Mevatec Corporation
P.O. Box 399
White Sands Missile Range
New Mexico, 88002

Episode: 3531
Project ID: Background Groundwater Monitoring At MPL
Project #: 300-ii J

Dear Ms. Downs:

Enclosed are the analytical results for the samples received in our laboratory on August 17, 1996. The samples were analyzed for the parameters indicated on the chain of custody.

Please be advised that unused portions of your samples, sample extracts and digestates will be stored for 30 days from the date of this report. Unless prior arrangements were made, at the end of this period your samples will either be disposed of, or returned to you if your samples were determined to be hazardous.

We appreciate your business. Should you have any questions or need assistance with this report, please feel free to call me or Homai Madisetty, Data Review Officer, at (713) 292-7090.

Sincerely,

Bruce D. Howbert

Bruce D. Howbert
Program Manager

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

DATA PACKAGE DOCUMENT INVENTORY

EPISODE NUMBER: 3531

Section	Document Type	Pages
1.	*Case Narrative & Data Qualifiers*	1-4
2.	*Chain-of-Custody Forms*	5-9
3.	*Sample Data*	
	Volatiles	11-13
	Semivolatiles	14-15
	Metals	16-17
	PCBs	18-19
	General Chemistry	20-32
	Sub-Contract Data	33-35
4.	*Quality Control Data*	
	Volatiles	37-40
	Semivolatiles	41-44
	Metals	45-50
	PCBs	51-54
	General Chemistry	55-56
	Sub-Contract Data	57-58
5.	*End of Report*	59

CASE NARRATIVE & DATA QUALIFIERS

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec Corporation **Episode No.: 3531**	**Project Name: Background Groundwater Monitoring At MPL** **Project No.: 300-ii-J**

CASE NARRATIVE

Two water samples were received for analysis on 08/17/96. All regulatory holding times were met by the laboratory.

All batch quality control (QC) results (Duplicates, Matrix Spikes, Matrix Spike Duplicates) are included in this data package. Batch QC may or may not have been performed on your samples. If it was, the QC reports will reference our internal sample identification.

The data qualifiers are presented following the narrative remarks. For CLP data forms, consult the CLP Qualifiers sheet. For standard PDP data spreadsheets, consult the Data Flags and Abbreviations sheet.

SAMPLE RECEIPT AND LOG-IN:

No problems were encountered.

VOLATILES:

No problems were encountered.

SEMIVOLATILES:

No problems were encountered.

METALS:

High analyte concentration prevented accurate determination of the matrix spike recoveries for silicon and strontium.

The matrix spike recoveries for barium were outside the control limits. The laboratory control sample recoveries were acceptable, indicating matrix interference.

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec Corporation **Episode No.: 3531**	**Project Name: Background Groundwater Monitoring At MPL** **Project No.: 300-ii-J**

CASE NARRATIVE Continued

PCBs

No problems were encountered.

GENERAL CHEMISTRY:

No problems were encountered.

SUB-CONTRACT DATA:

The samples for TKN and nitrate/nitrite analysis were sub-contracted to Inchcape Testing Services in Dallas, Texas.

The samples for uranium and radium were sub-contracted to CEP Laboratory in Sante Fe, New Mexico. The data will follow under a separate cover upon receipt from the sub-contract laboratory.

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B The Woodlands, Texas 77380

DATA FLAGS AND ABBREVIATIONS

B	This flag is used when the analyte is found in the associated blank as well as in the sample.
D	Indicates that the compound could not be detected because it was diluted out.
DL	This flag identifies an analysis at a secondary dilution factor.
E	This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. A more accurate quantitation is obtained from a diluted sample analysis.
I	This flag is used to indicate the presence of interference which resulted in not determining the value.
J	This flag is used when the data indicates the presence of a compound below the quanitation limit as determined by the identification criteria.
N	Not applicable.
NC	Not calculated.
ND	Indicates a compound was analyzed for but not detected at the quantitation level.
P	This flag is used for a pesticide/aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.
RE	This flag is used when the sample is re-extracted and re-analyzed.
RA	This flag is used when the sample is re-analyzed.
U	This flag indicates that the compound was analyzed for but not detected.
*	Indicates that the compound is out of the Quality Control limits.

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: RRB DATE OF PHYSICAL LOG-IN: 8/17/96 PAGE 1 OF 1

Episode #: 3531
Client Name: MEVATEC
Project ID: BACKGROUND GROUNDWATER MONITORING AT MPL
Project #: 300-II J
PO Number: NA
Courier/No.: FED EX # 0118791724

DATE OF COMPUTER LOG-IN: 8/17/96 12:19
COMPUTER LOG-IN BY: RRB
DATE RECEIVED: 8/17/96
TIME RECEIVED: 1030

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3531.01	MPL-MW01-GW2	VOA-8260A SVOA-8270B TOC-9060B URANIUM-908.1 TOTAL METALS-6010-Al,,Sb,As,Ba,Be,B,Cd,Cr,Co, Cu,Fe,Pb,Mn,Mg,Mo,Ni,Se,Ag,Ca,K,Tl,Na,V,Zn Hg-7470A CONDUCTANCE-120.1 pH-9040 CARBONATE/BICARBONATE-310.1 CHLORIDE-325.3 FLUORIDE-340.2 SULFATE-375.4 TDS-160.1 AMMONIA-350.3 TKN-351.2 NITRATE/NITRITE-353.2 RADIUM 226 / EPA 903.1 RADIUM 228 / EPA 904.0 PCB-8080 TOTAL CYANIDE-9010 PHENOL-9065	16	WATER	8/16/96	0940	3531A	8/31/96 HC	
3531.02	TRIP BLANK	VOA-8260A	1	WATER	N/A	N/A	3531A		

REMARKS:	Weight basis: X wet ___ dry
TKN AND NITRATE/NITRITE SUBBED TO NDRC DALLAS	Deliverables: X norm ___ CLP-like ___ CLP
URANIUM, RADIUM 226 / 228 SUBBED TO CEP	___ raw data X electronic

APPROVED BY/DATE: RB 8/11/96

SEND REPORT TO: DANA DOWNS

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

CHAIN OF CUSTODY RECORD

3531A

PAGE 1 OF 1

PROJECT NO.: 300-ii J

PROJECT NAME: Background Groundwater Monitoring at MPL

SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/16/96	0940	MPL-MW01-GW2	W	3531.01	16		See attached list
—	—	Trip Blank	W	3531.02	1		VOA

200000

PROJECT INFORMATION	SAMPLES RECEIVED		1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dana Downs	TOTAL NO. OF CONTAINERS		(PRINTED NAME) J. Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
SHIPPING ID. NO.: 300-ii J	CHAIN OF CUSTODY SEALS		RECEIVED BY: Robert Barrientos	RECEIVED BY:	(COMPANY)
VIA: Trk# 011-6791-724 FEDEX	GOOD CONDITION/CHILLED		(TIME / DATE) 8/16/96 1030	(TIME / DATE)	(TIME / DATE)
	CONFORMS TO RECORD		SPECIAL INSTRUCTIONS / COMMENTS:		

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

PDP ANALYTICAL SEP[illegible]CES 1680 Lake Front Circle, Suite [illegible]

SAMPLE L[illegible]-IN CHECKLIST/DISCREP[illegible]Y REPORT

FID: SLCDR01.96

EPISODE #: 3531 DATE/ TIME REC'D: 8/17/96 1030 TEMP & ID: 1) 40°C 3531A

C[illegible] NAME: MEVATEC 2)____ #____

PROJECT NAME: BACKGROUND GROUNDWATER Monitoring AT MPL 3)____ #____

PROJECT NUMBER: 300-11 J 4)____ #____

2 AQUEOUS, # 0 SOIL SAMPLES 5)____ #____

COURIER/AIRBILL # TRK# 011-8791-724 6)____ #____

SAMPLE CONTAINER SEALS: present absent (intact) broken

COOLER CUSTODY SEALS: present absent (intact) broken NAME & DATE: ____

HOW MANY AND WHERE ____

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
C[illegible]er Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :	✓	
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:	✓	
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client?

Project Manager's recommendations?

Who was notified? By whom? Date:

Client's comments:

Corrective actions carried out?

COMMENTS:

000005

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab?

LOG-IN BY: Robert R. Barrientos DATE: 8/17/96

PDP ANALYTICAL SERIVES
24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

P.O. #96593

Sent to: NDRC-DALLAS

Contact: JT Phone: 214-238-5591

Sent by: Walter Bichon

Date sent: 8/19/96 Date Results needed: 8/31/96

PDP Sample ID	No. of Containers	Anaylsis Request a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/Wet
3531.01		X	X									WATER	9215 -1

SCREENED FOR RADIOACTIVITY

COOLER TEMPERATURE WHEN RECEIVED 6 °C

ORIGINAL

CUSTODY TRANSFERS

Relinquished by:	Recieved by:	Date/Time
1. Walter Bichon	8/19/96	1530
2.	D. Fuller	8-20-96 10:2

Courier: 872/272195

ANALYTICAL PARAMETERS

A TKN - 351.2
B NITRATE/NITRITE - 353.2
C
D
E
F
G
H
I
J

Project Manager Approval: RB

Lab Manager Approval:

SAMPLE DATA

VOLATILES

[illegible]

[illegible]

LABORATORY REPORT

[illegible]	MEVATEC	Client Sample ID:	[illegible]	Date Sampled:	08/16/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	5521.01	Date Received:	08/17/96
Project No.:	300-11 3	Report No.:	110064	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	110064
Sample Volume:	20.0 ml			Analyst:	LC

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropane	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	1	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
[illegible]richlorobenzene	1	ND	m,p-Xylene	1	ND
[illegible]richloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	1	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	105
1,2-Dichloroethane-d4	10	(80-120)	101
Toluene-d8	10	(88-110)	100
4-Bromofluorobenzene	10	(86-115)	104

000012

Method Blank ID: BV8.1A025 LCS ID: BV.05A09 MS ID: 5528.01MS MSD ID: 5528.01MSD DUP ID: NA

PDP ANALYTICAL SERVICES

[illegible] Park Circle, Dr. in The Woodlands, TX 77380: (713)363-[illegible]

LABORATORY REPORT

[illegible]:	MEV4750	Client Sample ID:	TRIP BLANK	Date Sampled:	NA
Project Name:	BACKGROUN GW MON. AT MPL	PDP Sample ID:	3321.30	Date Received:	08/17/96
Project No.:	300-11 I	Report No.:	310065	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	310065
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Styrene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
[illegible]-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
[illegible]-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	102
1,2-Dichloroethane-d4	10	(80-120)	96
Toluene-d8	10	(88-110)	100
4-Bromofluorobenzene	10	(86-115)	98

000013

Method Blank ID: BVBLK425 LCS ID: BVLCSH29 MS ID: 3328.01MS MSD ID: 3328.01MSD DUP ID: NA

SEMIVOLATILES

1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380 (713)363-2222

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW01-GW2	Date Sampled:	08/16/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3521.01	Date Received:	08/17/96
Project No.:	300-11 F	Report No.:	60044	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-3270B
Multiplying Factor:	1.00	Date Extracted:	08/19/96	GC/MS File ID:	A0044
Sample Volume:	1000 ml	Date Analyzed:	09/20/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
[illegible]ylphenol	10	ND	Di-n-Butylphthalate	10	ND
[illegible]oaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
[illegible]nzene-d5	50	(35-114)	74	Phenol-d5	75	(10-94)	35
2-[illegible]robiphenyl	50	(43-116)	65	2-Fluorophenol	75	(21-100)	49
Terphenyl-d14	50	(33-141)	42	2,4,6-Tribromophenol	75	(10-123)	79

Method Blank: 3528.WBLK1 LCS ID: 3528.WLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD

000015

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID: MPL-MW01-GW2	Date Sampled: 08/16/96
Project Name:	BACKGROUND GROUNDWATER	PDP Sample ID: 3531.01	Date Received: 08/17/96
Project Number:	300-II-J	Report Number: I53101	Date Reported: 09/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER — Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	2.73	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	0.029	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	0.12	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	1.96	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	0.0099	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	1.0	4.7	DOC
M[illegible]se	SW846-6010A	08-19-96	09-09-96	0.01	0.044	DOC
M[illegible]	SW846-7470A	08-21-96	08-22-96	0.0002	ND	MS
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silicon	SW846-6010A	08-19-96	09-09-96	0.50	24.3	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Strontium	SW846-6010A	08-19-96	09-09-96	0.10	0.10	DOC
Tin	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	0.011	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

		ICP LCS ID: ICPL352	ICP MS ID: 3517.01MS
		GFAA LCS ID: NA	GFAA MS ID: NA
ICP Method Blank ID:	ICPB352	CVAA LCS ID: HGL279	CVAA MS ID: 3517.01MS
GFAA Method Blank ID:	NA		
CVAA Method Blank ID:	HGB279	ICP LCSD ID: ICPL352D	ICP MSD ID: 3517.01MSD
		GFAA LCSD ID: NA	GFAA MSD ID: NA
		CVAA LCSD ID: HGL279D	CVAA MSD ID: 3517.01MSD

PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NEVATEC	Client Sample ID:	MPL-MW01-GW2	Date Sampled:	08/16/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3531.01	Date Received:	08/17/96
Project No.:	300-ii J	Report No.:	E02349	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02349
Sample Weight:	1000 mL	Date Extracted:	08/20/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/30/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	142
Decachlorobiphenyl	0.2	(30-150)	81

Method Blank ID: 3531.WBLK1 LCS ID: 3531.WLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

GENERAL CHEMISTRY

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 08/30/96
Report No: I531AMM
Analyst: KW

WET CHEMISTRY PARAMETER: Ammonia as N

Method Reference: EPA 350.3 UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-22-96	0.25	ND			

QUALITY ASSURANCE/QUALITY CONTROL

35[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	5.47	5.0		109
3[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	5.34	5.0	2.4	107
3528.01	SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	ND			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-22-96	0.25	4.6	5.0		92
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-22-96	0.25	5.1	5.0	10.3	102

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 08/30/96
Report No: I531TDS
Analyst: KM

WET CHEMISTRY PARAMETER: Total Dissolved Solids (TDS)

Method Reference: EPA 160.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-21-96	10	390			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]LK1	METHOD BLANK	WATER	NA	NA	NA	08-21-96	10	ND			
3528.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	10	480	500		96
3528.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	10	500	500	4.1	100
3528.01	SAMPLE	WATER	NA	NA	NA	08-21-96	10	430			
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	10	440		2.3	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 08/30/96
Report No: I531SUL
Analyst: KW

WET CHEMISTRY PARAMETER: Sulfate

Method Reference: EPA 375.4 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-26-96	25	44			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	METHOD BLANK	WATER	NA	NA	NA	08-26-96	5.0	ND			
35[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-26-96	5.0	20	20		100
3504.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-26-96	5.0	19	20	5.1	95
3528.01	SAMPLE	WATER	NA	NA	NA	08-26-96	25	72			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-26-96	25	180	100		108
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-26-96	25	183	100	1.7	111

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/13/96
Report No: I531COND
Analyst: KM

WET CHEMISTRY PARAMETER: Conductance

Method Reference: EPA 120.1 UNITS: umhos/cm

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	09-04-96	NA	538			

QUALITY ASSURANCE/QUALITY CONTROL

35[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	09-04-96	NA	1100	1100		100
3[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	09-04-96	NA	1100	1100	0.0	100
3528.01	SAMPLE	WATER	NA	NA	NA	09-04-96	NA	664			
3528.01D	DUPLICATE	WATER	NA	NA	NA	09-04-96	NA	670		0.9	

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/13/96
Report No: I531TOC
Analyst: KM

WET CHEMISTRY PARAMETER: Total Organic Carbon (TOC)

Method Reference: EPA 415.1 UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-21-96	1.0	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3517.PBW1	METHOD BLANK	WATER	NA	NA	NA	08-21-96	1.0	ND			
3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	2.0	48	49.2		98
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	2.0	48	49.2	0.0	98
3528.01	SAMPLE	WATER	NA	NA	NA	08-21-96	1.0	1			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-21-96	1.0	26	25		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-21-96	1.0	25	25	3.9	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/13/96
Report No: I5318IC8
Analyst: XM

WET CHEMISTRY PARAMETER: Bicarbonate Alkalinity as HCO3-

Method Reference: EPA 310.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-21-96	1.2	68			

QUALITY ASSURANCE/QUALITY CONTROL

351[illegible]S1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	286	305		94
3[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	287	305	0.4	94
352[illegible]	SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	67			
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	1.2	67		0.0	

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEYATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/13/96
Report No: I531CARB
Analyst: KW

WET CHEMISTRY PARAMETER: Carbonate Alkalinity as CO3--

Method Reference: EPA 310.1 UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-21-96	1.2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	281	300		94
3[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	283	300	0.4	94
3528.01	SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	66			
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	1.2	66		0.0	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/13/96
Report No: I531PH
Analyst: KM

WET CHEMISTRY PARAMETER: pH

Method Reference: SW 846 9040 UNITS: NA

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-17-96	NA	7.66			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-17-96	NA	8.89	9.05		98
3[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-17-96	NA	8.91	9.06	0.2	98
3531.01D	DUPLICATE	WATER	NA	NA	NA	08-17-96	NA	7.69		0.4	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Sta. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/13/96
Report No: I531FLO
Analyst: KW

WET CHEMISTRY PARAMETER: Fluoride

Method Reference: EPA 340.2

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-19-96	0.1	0.34			

QUALITY ASSURANCE/QUALITY CONTROL

[illegible]S1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	5.46	5		109
3491.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	5.40	5	1.1	108
3528.01	SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	0.22			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-19-96	0.1	5.23	5		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-19-96	0.1	5.29	5	1.1	101

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 09/13/96
Report No: I531CHL
Analyst: KW

WET CHEMISTRY PARAMETER: Chloride

Method Reference: EPA 325.3

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-27-96	4.0	39			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]W1	METHOD BLANK	WATER	NA	NA	NA	08-27-96	4.0	ND			
3504.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	4.0	206	200		103
3504.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	4.0	209	200	1.4	105
3528.01	SAMPLE	WATER	NA	NA	NA	08-27-96	4.0	60			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-27-96	4.0	252	200		96
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-27-96	4.0	252	200	0.0	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/13/96
Report No: I531PHNL
Analyst: KW

WET CHEMISTRY PARAMETER: Total Recoverable Phenolics

Method Reference: SW-846 9065

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	08-30-96	08-30-96	0.05	ND			

QUALITY ASSURANCE/QUALITY CONTROL

[illegible]W1	METHOD BLANK	WATER	NA	NA	08-30-96	08-30-96	0.05	ND			
3526.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	08-30-96	08-30-96	0.05	0.46	0.500		92
3526.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	08-30-96	08-30-96	0.05	0.46	0.500	0.0	92
3528.01	SAMPLE	WATER	NA	NA	08-30-96	08-30-96	0.05	ND			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	08-30-96	08-30-96	0.05	0.50	0.500		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	08-30-96	08-30-96	0.05	0.50	0.500	0.0	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/13/96
Report No: I531TCN
Analyst: XN

WET CHEMISTRY PARAMETER: Total Cyanide

Method Reference: SW-846 9010

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3531.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	08-23-96	08-27-96	0.01	0.276			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	METHOD BLANK	WATER	NA	NA	08-23-96	08-27-96	0.01	ND			
352[illegible]CS1	LAB CONTROL SAMPLE	WATER	NA	NA	08-23-96	08-27-96	0.01	0.100	0.100		100
3526.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	08-23-96	08-27-96	0.01	0.100	0.100	0.0	100
3528.01	SAMPLE	WATER	NA	NA	08-23-96	08-27-96	0.01	0.44			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	08-23-96	08-27-96	0.10	0.53	0.100		90
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	08-23-96	08-27-96	0.10	0.55	0.100	3.7	110

SUB-CONTRACT DATA

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/03/96
Report No: I531TKN
Analyst: KW

WET CHEMISTRY PARAMETER: Total Kjeldahl Nitrogen (TKN)

Method Reference: EPA 351.3

UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-22-96	1.0	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]W1	METHOD BLANK	WATER	NA	NA	NA	08-22-96	1.0	ND			
3[illegible]S1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	1.0	10.1	9.5		106
3528.02	SAMPLE	WATER	NA	NA	NA	08-22-96	1.0	1.68			
3528.02MS	MATRIX SPIKE	WATER	NA	NA	NA	08-22-96	1.0	20.4	20		94
3528.02MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-22-96	1.0	20.2	20	1.0	93

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/03/96
Report No: I531NINA
Analyst: KN

WET CHEMISTRY PARAMETER: Nitrate-Nitrite as N

Method Reference: EPA 353.2 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW01-GW2	WATER	08-16-96	08-17-96	NA	08-23-96	0.05	5.37			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	METHOD BLANK	WATER	NA	NA	NA	08-23-96	0.05	ND			
3[illegible]CS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-23-96	0.05	9.16	8.8		104
9225.01	SAMPLE	WATER	NA	NA	NA	08-23-96	0.05	ND			
9225.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-23-96	0.05	0.95	1.0		95
9225.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-23-96	0.05	0.94	1.0	1.1	94

QUALITY CONTROL DATA

VOLATILES

[illegible]

[illegible]

LABORATORY REPORT

[illegible]	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	POP Sample ID:	BVBLK025 METHOD BLANK	Date Received:	NA
Project No.:	NA	Report No.:	810057	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/31/96	GC/MS File ID:	B10057
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
[illegible]ichloropropane	1	ND	Isopropylbenzene	1	ND
[illegible]richlorobenzene	1	ND	m/o-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoroethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	100
1,2-Dichloroethane-d4	10	(80-120)	94
Toluene-d8	10	(88-110)	93
4-Bromofluorobenzene	10	(86-115)	93

000035

Method Blank ID: NA	LCS ID: NA	MS ID: NA	MSD ID: NA	DUP ID: NA

[illegible]

[illegible]

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	BVLCSH25 LAB CONTROL SAMPLE	Date Received:	NA
Project No.:	NA	Report No.:	810058	Date Reported:	09/24/96

GC/MS-VOLATILES ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	09/21/96	GC/MS File ID:	810058
Sample Volume:	20.0 ml			Analyst:	RP

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,1-Dichloroethene	10	11	110	(61-145)
Benzene	10	10	100	(76-127)
Chlorobenzene	10	11	110	(75-130)
Toluene	10	10	100	(76-125)
Trichloroethene	10	11	110	(71-120)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	104
1,2-Dichloroethane-d4	10	(80-120)	91
Toluene-d8	10	(88-110)	105
4-Bromofluorobenzene	10	(86-115)	100

Method Blank: BV8LKH25 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

[illegible] TITLE [illegible]
[illegible] Lake Front Circle, Ste. B, The Woodlands, Texas [illegible] Phone ([illegible]-[illegible]

LABORATORY REPORT

Client:	NA	Client Sample ID:	MW02-GW2	Date Received:	08/16/96
Project Name:	NA			Date Reported:	09/26/96
Project No.:	NA			Report No.:	3529V0.2

GC/MS-VOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8260B	Sample Matrix:	WATER	Analyst:	LC

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3529.01	MS Sample ID:	3529.01MS	MSD Sample ID:	3529.01MSD
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	08/21/96	Date Analyzed:	08/21/96	Date Analyzed:	08/21/96
GC/MS File ID:	310059	GC/MS File ID:	310060	GC/MS File ID:	310061

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	10	100	(61-145)
Benzene	10	ND	10	100	(76-127)
Chlorobenzene	10	ND	11	110	(75-130)
Toluene	10	ND	10	100	(76-125)
Trichloroethene	10	ND	10	100	(71-120)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	REC.
1,1-Dichloroethene	10	ND	10	100	0.0	14	(61-145)
Benzene	10	ND	10	100	0.0	11	(76-127)
Chlorobenzene	10	ND	11	110	0.0	13	(75-130)
Toluene	10	ND	10	100	0.0	13	(76-125)
Trichloroethene	10	ND	10	100	0.0	14	(71-120)

* = Values outside of QC limits

RPD: 0 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

SEMIVOLATILES

1680 Lake Front Circle, Ste. 3, The Woodlands, TX 77380; (713)363-2220

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3528.WBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	09298	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	08/19/96	GC/MS File ID:	09298
Sample Volume:	1000 ml	Date Analyzed:	08/19/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	35	Phenol-d5	75	(10-94)	36
2-Fluorobiphenyl	50	(43-116)	77	2-Fluorophenol	75	(21-100)	57
Terphenyl-d14	50	(33-141)	63	2,4,6-Tribromophenol	75	(10-123)	92

Method Blank: NA LCS ID: NA MS ID: NA MSD ID: NA

000042

PDP ANALYTICAL SERVICES
1330 Lake Front Circle, Ste. 3, The Woodlands, TX 77380; (713)363-2333

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3528.WLCS1 (LAB CONT. SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	D9299	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.0	Date Extracted:	08/19/96	GC/MS File ID:	D9299
Sample Volume:	1000 ml	Date Analyzed:	08/19/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,2,4-Trichlorobenzene	50	34	68	(39-98)
1,4-Dichlorobenzene	50	33	66	(36-97)
2,4-Dinitrotoluene	50	37	74	(24-96)
2-Chlorophenol	75	57	76	(27-123)
4-Chloro-3-methylphenol	75	56	75	(23-97)
4-Nitrophenol	75	19	25	(10-80)
Acenaphthene	50	34	68	(46-118)
N-Nitroso-di-N-propylamine	50	41	82	(41-116)
Pentachlorophenol	75	60	80	(9-103)
[illegible]	75	25	33	(12-110)
[illegible]	50	42	84	(26-127)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	80	Phenol-d5	75	(10-94)	37
2-Fluorobiphenyl	50	(43-116)	72	2-Fluorophenol	75	(21-100)	56
Terphenyl-d14	50	(33-141)	52	2,4,6-Tribromophenol	75	(10-123)	87

Method Blank: 3528.WBLK1 LCS ID:NA MS ID:NA MSD ID:NA

LABORATORY REPORT

Client:	NA	Date Received:	08/16/96
Project Name:	NA	Date Reported:	09/03/96
Project No.:	NA	Report No.:	3528S01Q

GC/MS-SEMIVOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8270B	Sample Matrix:	WATER	Analyst:	RP

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
POP Sample ID:	3528.01	MS Sample ID:	3528.01MS	MSD Sample ID:	3528.01MSD
Client Sample ID:	MPL-MW02-GW2	Client Sample ID:	MPL-MW02-GW2MS	Client Sample ID:	MPL-MW02-GW2MSD
Sample Volume:	1000 ml	Sample Volume:	500 ml	Sample Volume:	500 ml
Extract Volume:	1.0 ml	Extract Volume:	1.0 ml	Extract Volume:	1.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	08/19/96	Date Analyzed:	08/19/96	Date Analyzed:	08/19/96
GC/MS File ID:	D9300	GC/MS File ID:	D9301	GC/MS File ID:	D9302

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,2,4-Trichlorobenzene	100	ND	66	66	(39-98)
1,4-Dichlorobenzene	100	ND	60	60	(36-97)
2,4-Dinitrotoluene	100	ND	72	72	(24-96)
2-Chlorophenol	150	ND	104	69	(27-123)
4-Chloro-3-methylphenol	150	ND	104	69	(23-97)
4-Nitrophenol	150	ND	40	27	(10-80)
Acenaphthene	100	ND	66	66	(46-118)
N-Nitroso-di-N-propylamine	100	ND	72	72	(41-116)
Pentachlorophenol	150	ND	132	88	(9-103)
Phenol	150	ND	46	31	(12-110)
Pyrene	100	ND	80	80	(26-127)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
1,2,4-Trichlorobenzene	100	ND	64	64	3.1	42	(39-98)
1,4-Dichlorobenzene	100	ND	58	58	3.4	28	(36-97)
2,4-Dinitrotoluene	100	ND	70	70	2.8	28	(24-96)
2-Chlorophenol	150	ND	98	65	5.9	40	(27-123)
4-Chloro-3-methylphenol	150	ND	102	68	1.9	28	(23-97)
4-Nitrophenol	150	ND	38	25	5.1	42	(10-80)
Acenaphthene	100	ND	66	66	0.0	31	(46-118)
N-Nitroso-di-N-propylamine	100	ND	70	70	2.8	50	(41-116)
Pentachlorophenol	150	ND	122	81	7.9	38	(9-103)
Phenol	150	ND	42	28	9.1	42	(12-110)
Pyrene	100	ND	80	80	0.0	31	(26-127)

* Values outside of QC limits

RPD: 0 out of 11 outside limits

Spike Recovery: 0 out of 22 outside limits

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
PDP Sample ID: ICP8352 (METHOD BLANK)
Report Number: ICP8352

Date Sampled: NA
Date Received: NA
Date Reported: 09/10/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Li[illegible]	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
M[illegible]um	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	5.0	ND	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silicon	SW846-6010A	08-19-96	09-09-96	0.50	ND	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Strontium	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Tin	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
PDP Sample ID: HGB279 (METHOD BLANK)
Report Number: HGB279

Date Sampled: NA
Date Received: NA
Date Reported: 09/11/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Mercury	SW846-7470A	08-21-96	08-22-96	0.00020	ND	MS

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: ICPL352
LCSD ID: ICPL352D

Date Reported: 09/10/96
Report Number: ICPL352

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	5.0	4.69	94	4.61	92	1.7	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	1.25	1.19	95	1.2	96	0.8	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.25	0.24	96	0.235	94	2.1	DOC
Barium	SW846-6010A	08-19-96	09-09-96	5.0	4.87	97	4.8	96	1.4	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.125	0.125	100	0.122	98	2.4	DOC
Boron	SW846-6010A	08-19-96	09-09-96	1.0	1.08	108	1.04	104	3.8	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.125	0.119	95	0.116	93	2.6	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	12.5	12.2	98	12.0	96	1.7	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.50	0.478	96	0.47	94	1.7	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	1.25	1.22	98	1.20	96	1.7	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.625	0.614	98	0.595	95	3.1	DOC
I[illegible]	SW846-6010A	08-19-96	09-09-96	2.5	2.38	95	2.34	94	1.7	DOC
[illegible]	SW846-6010A	08-19-96	09-09-96	0.25	0.237	95	0.231	92	2.6	DOC
Li[illegible]um	SW846-6010A	08-19-96	09-09-96	1.0	1.0	100	0.96	96	4.1	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	12.5	12.0	96	11.8	94	1.7	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	1.25	1.23	98	1.20	96	2.5	DOC
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.50	0.47	94	0.47	94	0.0	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	1.25	1.21	97	1.19	95	1.7	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	12.5	11.7	94	11.6	93	0.9	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.25	0.23	92	0.2	96	4.3	DOC
Silicon	SW846-6010A	08-19-96	09-09-96	1.0	1.13	113	1.1	110	2.7	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.625	0.586	94	0.576	92	1.7	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	12.5	11.3	90	11.1	89	1.8	DOC
Strontium	SW846-6010A	08-19-96	09-09-96	0.50	0.45	90	0.46	92	2.2	DOC
Tin	SW846-6010A	08-19-96	09-09-96	0.50	0.47	94	0.46	92	2.2	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.25	0.242	97	0.224	90	7.7	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	1.25	1.18	94	1.16	93	1.7	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	1.25	1.19	95	1.17	94	1.7	DOC

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: ICPB352

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: HGL279
LCSD ID: HGL2790

Date Reported: 09/11/96
Report Number: HGL279

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER — Units: ug/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Mercury	SW846-7470A	08-21-96	08-22-96	0.0020	0.0021	105	0.0022	110	4.7	MS

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: HGB279

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

PDP MS ID: 3517.01MS
PDP MSD ID: 3517.01MSD
Report Number: I517MS01

Date Sampled: NA
Date Received: NA
Date Reported: 09/10/96

TOTAL METALS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE)

Sample Matrix: WATER — Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	SAMPLE VALUE	MATRIX SPIKE ADDED	MATRIX SPIKE VALUE	PERCENT RECOVERY (75-125)	MATRIX SPIKE DUP VALUE	PERCENT RECOVERY (75-125)	RPD (20)
Aluminum	SW846-6010A	08-19-96	09-09-96	ND	2.0	2.08	104	2.1	105	1.0
Antimony	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.49	98	0.49	98	0.0
Arsenic	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.94	97	1.98	99	2.0
Barium	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.5	75	1.34	67*	11.3
Beryllium	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.044	88	0.045	90	2.2
Boron	SW846-6010A	08-19-96	09-09-96	2.29	1.0	3.27	98	3.36	107	2.7
Cadmium	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.04	80	0.042	84	4.9
Chromium	SW846-6010A	08-19-96	09-09-96	ND	0.20	0.172	86	0.175	87	1.7
Cobalt	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.419	84	0.432	86	3.1
Copper	SW846-6010A	08-19-96	09-09-96	ND	0.25	0.273	109	0.268	107	1.8
Iron	SW846-6010A	08-19-96	09-09-96	0.29	1.0	1.13	84	1.16	87	2.6
Lead	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.38	76	0.383	77	0.8
M[illegible]m	SW846-6010A	08-19-96	09-09-96	288	NA	279	NA	287	NA	2.8
Ma[illegible]se	SW846-6010A	08-19-96	09-09-96	0.021	0.50	0.461	88	0.47	90	1.9
Mercury	SW846-7470A	08-21-96	08-22-96	ND	0.0010	0.001	100	0.0010	100	0.0
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.1	0.50	0.551	90	0.565	93	2.5
Nickel	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.483	97	0.489	98	1.2
Selenium	SW846-6010A	08-19-96	09-09-96	ND	2.0	2.0	100	2.1	105	4.9
Silicon	SW846-6010A	08-19-96	09-09-96	19.6	1.0	20.1	**	20.4	**	1.5
Silver	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.043	86	0.042	84	2.4
Strontium	SW846-6010A	08-19-96	09-09-96	8.3	0.50	8.33	**	8.73	**	4.7
Thallium	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.84	92	1.95	98	5.8
Tin	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.45	90	0.47	94	4.3
Vanadium	SW846-6010A	08-19-96	09-09-96	0.03	0.50	0.479	90	0.488	92	1.9
Zinc	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.378	76	0.396	79	4.7

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL352 — ICP MS ID: NA
GFAA LCS ID: NA — GFAA MS ID: NA
CVAA LCS ID: HGL278 — CVAA MS ID: NA

ICP Method Blank ID: ICPB352
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB278

ICP LCSD ID: ICPL352D — ICP MSD ID: NA
GFAA LCSD ID: NA — GFAA MSD ID: NA
CVAA LCSD ID: HGL278D — CVAA MSD ID: NA

* : Indicates the value is outside control limits.
** : [illegible]h analyte concentration prevented accurate determination of the matrix spike recovery.
D[illegible] sample required a post-digest (instrument) dilution resulting in a dilution of the matrix spike added.

PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3531.MBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	E02342	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02342
Sample Weight:	1000 mL	Date Extracted:	08/20/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	133
Decachlorobiphenyl	0.2	(30-150)	103

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3531.WLCS1 (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	E02343	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	08/20/96	GC File ID:	E02343
Sample Volume:	1000 ml	Date Analyzed:	08/29/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
Aroclor-1254	5.0	4.46	89	(30-150)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	129
Decachlorobiphenyl	0.2	(30-150)	105

Method Blank: 3531.WBLK1 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW02-GW2	Date Received:	NA
Project Name:	NA			Date Reported:	09/09/96
Project No.:	NA			Report No.:	3528A01Q

GC-POLYCHLORINATED BIPHENYLS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8080A	Sample Matrix:	WATER	Analyst:	SM

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3528.01	MS Sample ID:	3528.01MS	MSD Sample ID:	3528.01MSD
Date Analyzed:	08/29/96	Date Analyzed:	08/29/96	Date Analyzed:	08/29/96
GC File ID:	E02338	GC File ID:	E02339	GC File ID:	E02340

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE CONC. (ug/L)	MS % REC.	QC LIMITS REC.
Aroclor-1254	10	ND	10	100	(30-150)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE DUPLICATE CONC. (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
Aroclor-1254	10	ND	9	90	10.5	50	(30-150)

* = Values outside of QC limits

RPD:	0 out of 1 outside limits
Spike Recovery	0 out of 2 outside limits

GENERAL CHEMISTRY

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

SUB-CONTRACT DATA

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

END OF REPORT

LABORATORY ANALYTICAL REPORT

GROUNDWATER SAMPLES

MPL-MW03-GW2 & MPL-MW03-GW2-QC

PDP
Analytical Services

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

September 11, 1996

Ms. Dana Downs
Mevatec Corporation
P.O. Box 399
White Sands Missile Range
New Mexico 88002

Episode: 3526
Project ID: Background Groundwater Monitoring At MPL
Project #: 300-II-J27

Dear Ms. Downs:

Enclosed are the analytical results for the samples received in our laboratory on August 15, 1996. The samples were analyzed for the parameters indicated on the chain of custody.

Please be advised that unused portions of your samples, sample extracts and digestates will be stored for 30 days from the date of this report. Unless prior arrangements were made, at the end of this period your samples will either be disposed of, or returned to you if your samples were determined to be hazardous.

We appreciate your business. Should you have any questions or need assistance with this report, please feel free to call me or Homai Madisetty, Data Review Officer, at (713) 292-7090.

Sincerely,

Bruce D. Howbert

Bruce D. Howbert
Program Manager

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

DATA PACKAGE DOCUMENT INVENTORY

EPISODE NUMBER: *3526*

Section	Document Type	Pages
1.	*Case Narrative & Data Qualifiers*	1-4
2.	*Chain-of-Custody Forms*	5-11
3.	*Sample Data*	
	Volatiles	13-17
	Semivolatiles	18-20
	Metals	21-23
	PCBs	24-26
	General Chemistry	27-39
	Sub-Contract Data	40-44
4.	*Quality Control Data*	
	Volatiles	46-49
	Semivolatiles	50-55
	Metals	56-61
	PCBs	62-65
	General Chemistry	66-67
	Sub-Contract Data	68-69
5.	*End of Report*	70

CASE NARRATIVE & DATA QUALIFIERS

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec Corporation	**Project Name: Background Groundwater Monitoring At MPL**
Episode No.: 3526	**Project No.: 300-II-J27**

CASE NARRATIVE

Four water samples were received for analysis on 08/15/96. All regulatory holding times were met by the laboratory.

All batch quality control (QC) results (Duplicates, Matrix Spikes, Matrix Spike Duplicates) are included in this data package. Batch QC may or may not have been performed on your samples. If it was, the QC reports will reference our internal sample identification.

The data qualifiers are presented following the narrative remarks. For CLP data forms, consult the CLP Qualifiers sheet. For standard PDP data spreadsheets, consult the Data Flags and Abbreviations sheet.

SAMPLE RECEIPT AND LOG-IN:

No problems were encountered.

VOLATILES:

No problems were encountered.

SEMIVOLATILES:

Two matrix spike recoveries and four RPDs were outside the control limits for the matrix spiked sample. Since the laboratory control sample was acceptable, matrix interference is suspected.

METALS:

The matrix spike recovery for barium was outside the control limits. Since the laboratory control sample recoveries were acceptable, matrix effects are suspected.

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec Corporation **Episode No.: 3526**	**Project Name: Background Groundwater Monitoring At MPL** **Project No.: 300-II-J27**

CASE NARRATIVE Continued

PCBs

No problems were encountered.

GENERAL CHEMISTRY:

No problems were encountered.

SUB-CONTRACT DATA:

The samples for TKN and nitrate/nitrite analysis were sub-contracted to Inchcape Testing Services in Dallas, Texas.

The samples for uranium and radium analysis were sub-contracted to CEP Laboratory in Sante Fe, New Mexico.

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B The Woodlands, Texas 77380

DATA FLAGS AND ABBREVIATIONS

B	This flag is used when the analyte is found in the associated blank as well as in the sample.
D	Indicates that the compound could not be detected because it was diluted out.
DL	This flag identifies an analysis at a secondary dilution factor.
E	This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. A more accurate quantitation is obtained from a diluted sample analysis.
I	This flag is used to indicate the presence of interference which resulted in not determining the value.
J	This flag is used when the data indicates the presence of a compound below the quanitation limit as determined by the identification criteria.
NA	Not applicable.
NC	Not calculated.
ND	Indicates a compound was analyzed for but not detected at the quantitation level.
P	This flag is used for a pesticide/aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.
RE	This flag is used when the sample is re-extracted and re-analyzed.
RA	This flag is used when the sample is re-analyzed.
U	This flag indicates that the compound was analyzed for but not detected.
*	Indicates that the compound is out of the Quality Control limits.

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: WGB DATE OF PHYSICAL LOG-IN: 8/15/96 PAGE 1 OF 1

Episode #: 3526
Client Name: MEVATEC
Project ID: BACKGROUND GROUNDWATER MONITORING AT MPL
Project #: 300-8-J27
PO Number: NA
Courier/No.: FED-EX #'S 0118481410, 0118481303

DATE OF COMPUTER LOG-IN: 8/15/96 8:18
COMPUTER LOG-IN BY: WGB
DATE RECEIVED: 8/15/96
TIME RECEIVED: 0900

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3526.01	MPL-MW03-GW2-QC	VOA-8260A SVOA-8270B TOC-9060 URANIUM-908.1 TOTAL METALS-6010-Al,Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Fe,Pb,Mn,Mg,Mo,Ni,Se,Ag,Ca,K,Tl,Na,V,Zn Hg-7470A CONDUCTANCE-120.1 pH-9040 CARBONATE/BICARBONATE-310.1 CHLORIDE-325.3 FLUORIDE-340.2 SULFATE-375.4 TDS-160.1 AMMONIA-350.3 TKN-351.2 NITRATE/NITRITE-353.2 RADIUM 226 / EPA 903.1 RADIUM 228 / EPA 904.0 PCB-8080 TOTAL CYANIDE-9010 PHENOL-9065	16	WATER	8/14/96	1120	3526A	8.29.96 HC	
3526.02	TRIP BLANK	VOA-8260A	1	WATER	N/A	N/A	3526A		
3526.03	MPL-MW03-GW2	SAME AS 3526.01	16	WATER	8/14/96	1110	3526B		
3526.04	TRIP BLANK	VOA-8260A	1	WATER	N/A	N/A	3526B		

PER CLIENT:
DELETE TOTAL PHOSPHORUS-365.2
ELABORATE EPA 903.1 AS RADIUM 226
AND EPA 904.0 AS RADIUM 228

REMARKS:
TKN AND NITRATE/NITRITE SUBBED TO NDRC DALLAS
URANIUM, EPA 903.1 & 904.0 SUBBED TO CEP

Weight basis: ____ wet ____ dry
Deliverables: ____ norm ____ CLP-like ____ CLP
____ raw data ____ electronic

APPROVED BY/DATE: KB 8/19/96

SEND REPORT TO: DANA DOWNS

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

CHAIN OF CUSTODY RECORD

35260

PROJECT NO.: 300-II-J27

PROJECT NAME: Background Groundwater Monitoring at MPL ~~MPL-MW3-Cor2-QC~~

SAMPLER'S SIGNATURE: Charles Clemen

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	Metal	Cat. Cd, Cr, Cu & Spec. Cond	TDS & PH	Chloride-Fluoride Sulfate	Ammonia-TKN Total N	Tac	U-Z-226-228	CN	SVOA	PCB & PCB	Phenols	VOA	REMARKS
8/14/96	1120	1 Liter poly -MPL-MW3-GW20C	W	35260.01	1	X												HNO3
		1 Liter poly	W	— .01	1		X											4°c
		1 Liter poly	W	— .01	1			X										4°c
		1 Liter poly	W	— .01	1				X									4°c
		1 Liter poly	W	— .01	1					X								H2SO4
		1 Liter poly	W	— .01	1						X							H2SO4
		1 Liter poly	W	— .01	1							X						4°c
		1 Liter poly	W	— .01	1								X					NaOH
		1 Liter Amber glass	W	— .01	2									X				4°c
		1 Liter Amber glass	W	— .01	2										X			4°c
8/14/96	1120	1 Liter Amber glass	W	— .01	2											X		H2SO4
		40 ml	W	— .01	2												X	HCL
		Trip Blank (Added By Lab)	W	.02	1												X	

000004

PROJECT INFORMATION			1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dawn Downs	SAMPLES RECEIVED		(PRINTED NAME) Charles Clemen	(PRINTED NAME)	(PRINTED NAME) Walter Bichon
SHIPPING ID. NO.	TOTAL NO. OF CONTAINERS		RECEIVED BY:	RECEIVED BY:	(COMPANY) PDP
VIA:	CHAIN OF CUSTODY SEALS		(TIME / DATE)	(TIME / DATE)	(TIME / DATE) 0900 8/15/96
	GOOD CONDITION/CHILLED		SPECIAL INSTRUCTIONS / COMMENTS:		
	CONFORMS TO RECORD				

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

3526D

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT NO. 300 II-J-27

PROJECT NAME Background Groundwater Monitoring at MPL ~~MPL-MW03-GW2~~

SAMPLER'S SIGNATURE: [signature]

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	METALS	Cl, F, Br, Cn, NO3 & SO4	TDS & pH	Chloride-Fluoride	Sulfate	Ammonia-TKN	Total N	TOC	Ra-226-Ra-228	CN	SVOA	Post & PCB	Phenols	VOA	REMARKS
8/14/96	1110	1 Liter poly - MPL-MW03 (GW2)	W	3526.03	1	X														HNO3
		1 Liter poly	W	— .03	1		X													4°c
		1 Liter poly	W	— .03	1			X												4°c
		1 Liter poly	W	— .03	1				X											4°c
		1 Liter poly	W	— .03	1					X										H2SO4
		1 Liter poly	W	— .03	1						X									H2SO4
		1 Liter poly	W	— .03	1							X								4°c
		1 Liter poly	W	— .03	1								X							NaOH
		1 Liter Amber glass	W	.03	2									X						4°c
		1 Liter Amber glass	W	— .03	2										X					4°c
		1 Liter Amber glass	W	— .03	2											X				H2SO4
8/14/96	1110	40 mL	W	— .03	2													X		HCL
		Trip Blank (Added by lab)	W	.04	1													X		

000005

PROJECT INFORMATION			1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dave Downs	SAMPLES RECEIVED		(PRINTED NAME) Charles Cleaver	(PRINTED NAME)	(PRINTED NAME) Walter Dickon
SHIPPING ID. NO.	TOTAL NO. OF CONTAINERS		RECEIVED BY:	RECEIVED BY:	(COMPANY) PDP
VIA:	CHAIN OF CUSTODY SEALS		(TIME / DATE)	(TIME / DATE)	(TIME / DATE) 0900 8/15/96
	GOOD CONDITION/CHILLED		SPECIAL INSTRUCTIONS / COMMENTS:		
	CONFORMS TO RECORD				

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

PDP ANALYTICAL SEP''CES 1680 Lake Front Circle, Suite B, The Woodlands, TX 77380

SAMPLE L .-IN CHECKLIST/DISCREP. Y REPORT

FID: SLCDR01.96

EP[illegible] #: 3526 DATE/ REC'D: 8/15/96 TIME

TEMP & ID: 1) 6.0°C # 3526A

CLIENT NAME: Mevatec

2) 6.0°C # 3526B

PROJECT NAME: ~~Ground~~ WBB Background Groundwater Monitoring Ar MPh

3) ____ # ____

PROJECT NUMBER: 300-II-J27

4) ____ # ____

2 AQUEOUS, # Ø SOIL SAMPLES

5) ____ # ____

COURIER/AIRBILL # 0118451410, 0118451303

6) ____ # ____

SAMPLE CONTAINER SEALS: present (absent) intact broken

COOLER CUSTODY SEALS: present (absent) intact broken NAME & DATE: ____

HOW MANY AND WHERE ____

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
Container Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :	✓	
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:		✓
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client? Trip Blanks Qty 2 each have Peasize Bubbles

Project Manager's recommendations? NOTIFY CLIENT VIA FAX

Who was notified? D. Downs By whom? ~~BAH~~ Date: 8-16-96

Client's comments:

Corrective actions carried out?

[illegible]MENTS:

000005

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab?		

LOG IN BY: [illegible] DATE: 8/15/96

PDP
ANALYTICAL SERIVES
24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

PO# 96591

Sent to: CEP

Contact: Elsie Phone: 505-982-9841

Sent by: Walter Bichon

Date sent: 8/15/96 Date Results needed: 8/29/96

PDP Sample ID	No. of Containers	a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/Wet
3526.01	2	X	X									Water	
3526.03	2	X	X									Water	

00001U

CUSTODY TRANSFERS

Relinquished by:	Recieved by:	Date/Time
1. Walter Bichon	8/15/96	1530
2.	[illegible] 8/16/96	

Courier: FedEx # 8721272221

ANALYTICAL PARAMETERS

A Uranium 908.1
B ~~R226 & R228~~ WED EPA 903.1 + 904.0
C
D
E
F
G
H
I
J

Project Manager Approval: [illegible]

Lab Manager Approval:

PDP
ANALYTICAL SERIVES
24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

PO# 96590

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Sent to: NDRC

Contact: JT

Phone: ~~JT~~ WGB 214-238-5591

Sent by: Walter

Date sent: 8 / 15 / 96

Date Results needed: 8 / 29 / 96

PDP Sample ID	No. of Containers	Anaylsis Request a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/ Wet
3526.01	2	X	X									Water	9083-1
3526.03	2	X	X									Water	2

ORIGINAL

000011

CUSTODY TRANSFERS

Relinquished by:	Recieved by:	Date/Time
1. Walter Bucha	8/15/96	1530
2.	B. Wilson	8-16-96 1115

Courier: FedEx # 872127221 0

ANALYTICAL PARAMETERS

A TKN 351.2 (WGB)
B Nitrate/Nitrite 353.2
C
D
E
F
G
H
I
J

Project Manager Approval: BAJ

Lab Manager Approval:

COOLER TEMPERATURE WHEN RECEIVED 4 °C

SCREENED FOR RADIOACTIVITY

SAMPLE DATA

VOLATILES

[illegible]

[illegible]

[illegible] REPORT

Client:	MEVATEC	Client Sample ID:	MW-MW02-GWZ-QC	Date Sampled:	03/14/96
Project Name:	BACKGROUND GW CON. AT MPL	PDF Sample ID.	C31c.01	Date Received:	03/15/96
Project No.:	300-II-027	Report No.:	310053	Date Reported:	03/04/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.1	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	03/20/96	GC/MS File ID:	310053
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	86-118	94
1,2-Dichloroethane-d4	10	80-120	93
Toluene-d8	10	88-110	94
4-Bromofluorobenzene	10	86-115	92

000014

Method Blank ID: BVBLKW24 LCS ID: BVLCSW28 MS ID: B317.01MS MSD ID: B317.01MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1550 Lake Front Circle, Ste. B; The Woodlands, TX 77380 Tel:281-[illegible]

LABORATORY REPORT

Client:	MEWATER	Client Sample ID:	TRIP BLANK	Date Sampled:	NA
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3526.02	Date Received:	08/15/96
Project No.:	300-II-027	Report No.:	810050	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260B
Multiplying Factor:	1.00	Date Analyzed:	08/20/96	GC/MS File ID:	810050
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
[illegible]nloroethane	1	ND	Hexachlorobutadiene	1	ND
[illegible]nloropropane	1	ND	Isopropylbenzene	1	ND
1,[illegible]-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	104
1,2-Dichloroethane-d4	10	(80-120)	107
Toluene-d8	10	(88-110)	102
4-Bromofluorobenzene	10	(86-115)	103

000015

Method Blank ID: BVBLKH24 LCS ID: BVLCSH29 MS ID: 3517.01MS MSD ID: 3517.01MSD DUP ID: NA

[illegible]

[illegible]

LABORATORY REPORT

Client:	NEVATEC	Client Sample ID:	[illegible]	Date Sampled:	08/14/96
Project Name:	[illegible]	PDP Sample ID:	[illegible]	Date Received:	08/15/96
Project No.:	300-II-127	Report No.:	810034	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260B
Multiplying Factor:	1.00	Date Analyzed:	08/20/96	GC/MS File ID:	810034
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
[illegible]chloroethane	1	ND	Hexachlorobutadiene	1	ND
[illegible]chloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromochloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	100
1,2-Dichloroethane-d4	10	(80-120)	99
Toluene-d8	10	(88-110)	96
4-Bromofluorobenzene	10	(86-115)	99

000016

Method Blank ID: BV8LKHD4 LCS ID: BV8LCSH28 MS ID: 8517.01MS MSD ID: 8517.01MSD DUP ID: NA

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380 (713) 363-[illegible]

LABORATORY REPORT

Sample ID:	MSVA[illegible]	Client Sample ID:	TRIP BLANK	Date Sampled:	NA
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	352[illegible].04	Date Received:	03/15/96
Project No.:	300-II-027	Report No.:	310051	Date Reported:	09/04.96

GC/MS-VOLATILE ORGANICS DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	05/20/96	GC/MS File ID:	310051
Sample Volume:	20.0 ml			Analyst:	LI

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoroethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-[illegible])	105
1,2-Dichloroethane-d4	10	(80-120)	105
Toluene-d8	10	(88-110)	101
4-Bromofluorobenzene	10	(86-115)	109

000017

Method Blank ID: BVBLKH24 LCS ID: BVLCSH28 MS ID: 3517.01MS MSD ID: 3517.01MSD DUP ID: NA

SEMIVOLATILES

PDP ANALYTICAL SERVICES
1080 Lake Front Circle, Ste. B, The Woodlands, TX 77380, (713)363-0233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MWCC-GW2-GC	Date Sampled:	08/14/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3526.01	Date Received:	08/15/96
Project No.:	300-II-327	Report No.:	A0040	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	08/15/96	GC/MS File ID:	A0040
Sample Volume:	1000 ml	Date Analyzed:	08/20/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	106	Phenol-d5	75	(10-94)	62
2-Fluorobiphenyl	50	(43-116)	95	2-Fluorophenol	75	(21-100)	79
Terphenyl-d14	50	(33-141)	119	2,4,6-Tribromophenol	75	(10-123)	101

Method Blank: 3526.WBLK1 LCS ID: 3526.WLCS1 MS ID: 3526.03MS MSD ID: 3526.03MSD

000019

PDP ANALYTICAL SERVICES
1650 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2200

LABORATORY REPORT

Client:	MEWATER	Client Sample ID:	MPL-MW01-GW2	Date Sampled:	08/14/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3526.03	Date Received:	08/15/96
Project No.:	300-II-027	Report No.:	A0041	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	08/15/96	GC/MS File ID:	A0041
Sample Volume:	1000 ml	Date Analyzed:	08/20/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
[illegible]rophenol	10	ND	Diethyl phthalate	10	ND
[illegible]ylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-n-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

[illegible]ate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	74	Phenol-d5	75	(10-94)	33
2-Fluorobiphenyl	50	(43-116)	68	2-Fluorophenol	75	(21-100)	46
Terphenyl-d14	50	(33-141)	106	2,4,6-Tribromophenol	75	(10-123)	67

Method Blank: 3526.MBLK1 LCS ID: 3526.MLCS1 MS ID: 3526.03MS MSD ID: 3526.03MSD

000020

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER
Project Number: 300-II-J27

Client Sample ID: MPL-MW03-GW2-QC
PDP Sample ID: 3526.01
Report Number: I52601

Date Sampled: 08/14/96
Date Received: 08/15/96
Date Reported: 09/11/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	6.31	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	0.037	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	0.18	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	1.0	24.2	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	3.9	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	0.012	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	1.0	7.3	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	0.01	0.091	DOC
Mercury	SW846-7470A	08-21-96	08-22-96	0.0002	ND	MS
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	5.0	22.7	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	1.0	250	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	0.016	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	0.019	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	0.032	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: ICP8352
GFAA Method Blank ID: NA
CVAA Method Blank ID: HG8279

ICP LCS ID: ICPL352
GFAA LCS ID: NA
CVAA LCS ID: HGL279

ICP LCSD ID: ICPL352D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL279D

ICP MS ID: 3517.01MS
GFAA MS ID: NA
CVAA MS ID: 3517.01MS

ICP MSD ID: 3517.01MSD
GFAA MSD ID: NA
CVAA MSD ID: 3517.01MSD

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER
Project Number: 300-II-J27

Client Sample ID: MPL-MW03-GW2
PDP Sample ID: 3526.03
Report Number: I52603

Date Sampled: 08/14/96
Date Received: 08/15/96
Date Reported: 09/11/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: ug/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	5.44	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	0.043	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	0.14	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	1.0	27.7	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	3.69	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	0.014	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	1.0	7.5	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	0.01	0.099	DOC
Mercury	SW846-7470A	08-21-96	08-22-96	0.0002	ND	NS
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	5.0	22.7	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	1.0	264	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	0.02	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	0.019	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	0.029	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL352
GFAA LCS ID: NA
CVAA LCS ID: HGL279

ICP MS ID: 3517.01MS
GFAA MS ID: NA
CVAA MS ID: 3517.01MS

ICP Method Blank ID: ICPB352
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB279

ICP LCSD ID: ICPL352D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL279D

ICP MSD ID: 3517.01MSD
GFAA MSD ID: NA
CVAA MSD ID: 3517.01MSD

PCBs

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW03-GW2-QC	Date Sampled:	08/14/96
Project Name:	BACKGROUND GW MON. AT MPL	POP Sample ID:	3526.01	Date Received:	08/15/96
Project No.:	300-II-J27	Report No.:	E02336	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02336
Sample Weight:	1000 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	92
Decachlorobiphenyl	0.2	(30-150)	65

Method Blank ID: 3526.WBLK1 LCS ID: 3526.WLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW03-GW2	Date Sampled:	08/14/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3526.03	Date Received:	08/15/96
Project No.:	300-II-J27	Report No.:	E02337	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02337
Sample Weight:	1000 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	93
Decachlorobiphenyl	0.2	(30-150)	75

Method Blank ID: 3526.MBLK1 LCS ID: 3526.MLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

GENERAL CHEMISTRY

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 08/30/96
Report No: I526SUL
Analyst: KN

WET CHEMISTRY PARAMETER: Sulfate

Method Reference: EPA 375.4 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-26-96	25	148			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-26-96	25	150			

QUALITY ASSURANCE/QUALITY CONTROL

3504.PBW1	METHOD BLANK	WATER	NA	NA	NA	08-26-96	5.0	ND			
3504.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-26-96	5.0	20	20		100
3504.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-26-96	5.0	19	20	5.1	95
3528.01	SAMPLE	WATER	NA	NA	NA	08-26-96	25	72			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-26-96	25	180	100		108
3504.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-26-96	25	183	100	1.7	111

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 08/30/96
Report No: I526AMM
Analyst: KM

WET CHEMISTRY PARAMETER: Ammonia as N

Method Reference: EPA 350.3 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-22-96	0.25	ND			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-22-96	0.25	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	5.47	5.0		109
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	5.34	5.0	2.4	107
3528.01	SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	ND			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-22-96	0.25	4.6	5.0		92
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-22-96	0.25	5.1	5.0	10.3	102

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/10/96
Report No: I526TCN
Analyst: KM

WET CHEMISTRY PARAMETER: Total Cyanide

Method Reference: SW-846 9010 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	08-23-96	08-27-96	0.10	0.46			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	08-23-96	08-27-96	0.10	0.46			

QUALITY ASSURANCE/QUALITY CONTROL

3526.PBW1	METHOD BLANK	WATER	NA	NA	NA	08-27-96	0.01	ND			
3526.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	0.01	0.100	0.100		100
3526.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	0.01	0.100	0.100	0.0	100
3528.01	SAMPLE	WATER	NA	NA	NA	08-27-96	0.01	0.44			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-27-96	0.10	0.53	0.100		90
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-27-96	0.10	0.55	0.100	3.7	110

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: I526TDS
Analyst: KM

WET CHEMISTRY PARAMETER: Total Dissolved Solids (TDS)

Method Reference: EPA 160.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-18-96	10	1000			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-18-96	10	1000			

QUALITY ASSURANCE/QUALITY CONTROL

3517.PBW1	METHOD BLANK	WATER	NA	NA	NA	08-18-96	10	ND			
3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-18-96	10	500	500		100
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-18-96	10	510	500	2.0	102
3520.01	SAMPLE	WATER	NA	NA	NA	08-18-96	10	63960			
3520.010	DUPLICATE	WATER	NA	NA	NA	08-18-96	10	64320		0.6	

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: I526CHL
Analyst: KW

WET CHEMISTRY PARAMETER: Chloride

Method Reference: EPA 325.3 UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-27-96	4	67			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-27-96	4	67			

QUALITY ASSURANCE/QUALITY CONTROL

3504.PBW1	METHOD BLANK	WATER	NA	NA	NA	08-27-96	4	ND			
3504.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	4	206	200		103
3504.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	4	209	200	1.4	105
3528.01	SAMPLE	WATER	NA	NA	NA	08-27-96	4	60			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-27-96	4	252	200		96
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-27-96	4	252	200	0.0	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-827

Date Reported: 09/09/96
Report No: I526FLO
Analyst: KN

WET CHEMISTRY PARAMETER: Fluoride

Method Reference: EPA 340.2

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-19-96	0.1	0.27			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-19-96	0.1	0.23			

QUALITY ASSURANCE/QUALITY CONTROL

3491.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	5.46	5		109
3491.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	5.40	5	1.1	108
3528.01	SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	0.22			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-19-96	0.1	5.23	5		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-19-96	0.1	5.29	5	1.1	101

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: I526COND
Analyst: KM

WET CHEMISTRY PARAMETER: Conductance

Method Reference: EPA 120.1 UNITS: umhos/cm

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	09-04-96	NA	1100			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	09-04-96	NA	1100			

QUALITY ASSURANCE/QUALITY CONTROL

3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	09-04-96	NA	1100	1100		100
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	09-04-96	NA	1100	1100	0.0	100
3528.01	SAMPLE	WATER	NA	NA	NA	09-04-96	NA	664			
3528.01D	DUPLICATE	WATER	NA	NA	NA	09-04-96	NA	670		0.9	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: I526TOC
Analyst: KW

WET CHEMISTRY PARAMETER: Total Organic Carbon (TOC)

Method Reference: EPA 415.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-21-96	1.0	2			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-21-96	1.0	1			

QUALITY ASSURANCE/QUALITY CONTROL

3517.PBW1	METHOD BLANK	WATER	NA	NA	NA	08-21-96	1.0	ND			
3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	2.0	48	49.2		98
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	2.0	48	49.2	0.0	98
3528.01	SAMPLE	WATER	NA	NA	NA	08-20-96	1.0	1			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-20-96	1.0	26	25		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-20-96	1.0	25	25	3.9	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: I5268ICB
Analyst: KW

WET CHEMISTRY PARAMETER: Bicarbonate Alkalinity as HCO3-

Method Reference: EPA 310.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-21-96	1.2	127			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-21-96	1.2	130			

QUALITY ASSURANCE/QUALITY CONTROL

3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	286	305		94
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	287	305	0.4	94
3528.01	SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	67			
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	1.2	67		0.0	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: I526CARB
Analyst: KW

WET CHEMISTRY PARAMETER: Carbonate Alkalinity as CO3--

Method Reference: EPA 310.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-21-96	1.2	ND			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-21-96	1.2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	281	300		94
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	283	300	0.4	94
3528.01	SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	66			
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	1.2	66		0.0	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: I526PH
Analyst: KM

WET CHEMISTRY PARAMETER: pH

Method Reference: SW-846 9040 UNITS: NA

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-15-96	NA	7.53			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-15-96	NA	7.50			

QUALITY ASSURANCE/QUALITY CONTROL

3526.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-15-96	NA	9.08	9.05		100
3526.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-15-96	NA	9.05	9.05	0.3	100
3526.01D	DUPLICATE	WATER	NA	NA	NA	08-15-96	NA	7.49		0.5	

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/09/96
Report No: IS26PHNL
Analyst: KN

WET CHEMISTRY PARAMETER: Total Recoverable Phenolics

Method Reference: SW-846 9065 UNITS: mg/L

POP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	08-30-96	08-30-96	0.05	ND			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	08-30-96	08-30-96	0.05	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3526.PBW1	METHOD BLANK	WATER	NA	NA	08-30-96	08-30-96	0.05	ND			
3526.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	08-30-96	08-30-96	0.05	0.46	0.500		92
3526.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	08-30-96	08-30-96	0.05	0.46	0.500	0.0	92
3528.01	SAMPLE	WATER	NA	NA	08-30-96	08-30-96	0.05	ND			
3528.01MS	MATRIX SPIKE	WATER	NA	NA	08-30-96	08-30-96	0.05	0.50	0.500		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	08-30-96	08-30-96	0.05	0.50	0.500	0.0	100

SUB-CONTRACT DATA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle. Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/03/96
Report No: I526TKN
Analyst: KN

WET CHEMISTRY PARAMETER: Total Kjeldahl Nitrogen (TKN)

Method Reference: EPA 351.3 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-22-96	1.0	1.68			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-22-96	1.0	1.40			

QUALITY ASSURANCE/QUALITY CONTROL

3526.WBLK1	METHOD BLANK	WATER	NA	NA	NA	08-22-96	1.0	ND			
3526.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	1.0	10.1	9.5		106
3528.02	SAMPLE	WATER	NA	NA	NA	08-22-96	1.0	1.68			
3528.02MS	MATRIX SPIKE	WATER	NA	NA	NA	08-22-96	1.0	20.4	20.0		94
3528.02MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-22-96	1.0	20.2	20.0	1.0	93

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/03/96
Report No: I526NINA
Analyst: XN

WET CHEMISTRY PARAMETER: Nitrate-Nitrite as N

Method Reference: EPA 353.2 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3526.01	MPL-MW03-GW2-QC	WATER	08-14-96	08-15-96	NA	08-23-96	0.05	8.96			
3526.03	MPL-MW03-GW2	WATER	08-14-96	08-15-96	NA	08-23-96	0.05	8.86			

QUALITY ASSURANCE/QUALITY CONTROL

3526.NBLK1	METHOD BLANK	WATER	NA	NA	NA	08-23-96	0.05	ND			
3526.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-23-96	0.05	9.16	8.8		104
9225.01	SAMPLE	WATER	NA	NA	NA	08-23-96	0.05	ND			
9225.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-23-96	0.05	0.950	1.0		95
9225.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-23-96	0.05	0.940	1.0	1.1	94

Controls for Environmental
Pollution, Inc.
P.O. Box 5351
Santa Fe, NM 87502

Phone: (505) 982-9841/(800) 545-2188

PDP Analytical Services
1680 Lake Front Circle Ste B
The Woodland, TX 77380

Attn: Jon Lindquist

Purchase Order: 96591
Invoice Number:

Order #: 96-08-099
Date: 08/25/96 11:46
Work ID: Water (NR)
Date Received: 08/16/96
Date Completed: 08/25/96

Client Code: PDP_ANALYT

SAMPLE IDENTIFICATION

Sample Number	Sample Description	Sample Number	Sample Description
01	3526.01	02	3526.03

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Remainder of sample(s) for routine analysis will be disposed of three weeks from final report date. Sample(s) for bacteria analysis only, will be disposed of immediately after analysis. This is not applicable if other arrangements have been made.

Certified By

000043

Sample: 01A 3526.01 MPL-MW03-GW2-QC Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Total Uranium	<0.001	0.001	mg/liter	08/20/96	TM

Sample: 01B 3526.01 MPL-MW03-GW2-QC Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Radium-226	<0.6	0.6	pCi/liter	08/21/96	MM
Radium-228	<1	1	pCi/liter	08/21/96	MM

Sample: 02A 3526.03 MPL-MW03-GW2 Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Total Uranium	<0.001	0.001	mg/liter	08/20/96	TM

Sample: 02B 3526.03 MPL-MW03-GW2 Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Radium-226	<0.6	0.6	pCi/liter	08/21/96	MM
Radium-228	<2	2	pCi/liter	08/21/96	MM

QUALITY CONTROL DATA

VOLATILES

PDP ANALYTICAL SERVICES
1580 Lake Front Circle, Ste. 5, The Woodlands, TX 77380; 713 367-1337

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	SVB_XH24 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	B10035	Date Reported:	09/03/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/20/96	GC/MS File ID:	B10035
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,3-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
[illegible]nloropropane	1	ND	Isopropylbenzene	1	ND
[illegible]richlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	3	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloroethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoroethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	97
1,2-Dichloroethane-d4	10	(80-120)	92
Toluene-d8	10	(88-110)	100
4-Bromofluorobenzene	10	(86-115)	100

000017

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1651 Lake Front Circle, Ste. B; The Woodlands, TX 77380, 713 363-1330

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	BVLCSW2B (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	310036	Date Reported:	09/03/96

GC/MS-VOLATILES ORGANICS (QA/QA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/20/96	GC/MS File ID:	B13036
Sample Volume:	20.0 ml			Analyst:	JZ

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,1-Dichloroethane	10	10	100	(61-145)
Benzene	10	10	100	(76-127)
Chlorobenzene	10	11	110	(75-130)
Toluene	10	10	100	(76-125)
Trichloroethene	10	10	100	(71-120)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	100
1,2-Dichloroethane-d4	10	(80-120)	94
Toluene-d8	10	(88-110)	104
4-Bromofluorobenzene	10	(86-115)	102

Method Blank: BVBLKW2A LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

000045

[illegible]

[illegible]

LABORATORY REPORT

Client:	NA	Client Sample ID:	MW-2-141	Date Received:	08/09/96
Project Name:	NA			Date Reported:	09/03/96
Project No.:	NA			Report No.:	3517V012

GC/MS-VOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8260A	Sample Matrix:	WATER	Analyst:	LJ

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3517.01	MS Sample ID:	3517.01MS	MSD Sample ID:	3517.01MSD
Dilution:	1.0	Dilution:	1.1	Dilution:	1.0
Date Analyzed:	08/20/96	Date Analyzed:	08/20/96	Date Analyzed:	08/20/96
GC/MS File ID:	310037	GC/MS File ID:	310039	GC/MS File ID:	310039

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	10	100	(61-145)
Benzene	10	ND	10	100	(76-127)
Chlorobenzene	10	ND	10	100	(75-130)
Toluene	10	ND	10	100	(76-125)
Trichloroethene	10	ND	10	100	(71-120)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	10	100	0.0	14	(61-145)
Benzene	10	ND	10	100	0.0	11	(76-127)
Chlorobenzene	10	ND	11	110	9.5	13	(75-130)
Toluene	10	ND	10	100	0.0	13	(76-125)
Trichloroethene	10	ND	10	100	0.0	14	(71-120)

* = Values outside of QC limits

RPD: 0 out of 5 outside limits
Spike Recovery: 0 out of 12 outside limits

SEMIVOLATILES

PDP ANALYTICAL SERVICES
1690 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
[redacted]t Name:	NA	PDP Sample ID:	3526.WBLK1 (METHOD BLANK)	Date Received:	NA
[redacted]t No.:	NA	Report No.:	A0035	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	08/15/96	GC/MS File ID:	A0035
Sample Volume:	1000 ml	Date Analyzed:	08/20/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
[redacted]rophenol	10	ND	Diethyl phthalate	10	ND
[redacted]ylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

[redacted]ate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	64	Phenol-d5	75	(10-94)	28
2-Fluorobiphenyl	50	(43-116)	62	2-Fluorophenol	75	(21-100)	44
Terphenyl-d14	50	(33-141)	89	2,4,6-Tribromophenol	75	(10-123)	71

Method Blank: NA LCS ID: NA MS ID: NA MSD ID: NA

000031

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-1111

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3526.WLCS1 (LAB CONT. SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	A0036	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.0	Date Extracted:	08/15/96	GC/MS File ID:	A0036
Sample Volume:	1000 ml	Date Analyzed:	08/26/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,2,4-Trichlorobenzene	50	34	68	(39-98)
1,4-Dichlorobenzene	50	33	66	(36-97)
2,4-Dinitrotoluene	50	38	76	(24-96)
2-Chlorophenol	75	51	68	(27-123)
4-Chloro-3-methylphenol	75	54	72	(23-97)
4-Nitrophenol	75	22	29	(10-80)
Acenaphthene	50	36	72	(46-118)
N[illegible]oso-di-N-propylamine	50	40	80	(41-116)
[illegible]hlorophenol	75	58	77	(9-103)
Phenol	75	22	29	(12-110)
Pyrene	50	36	72	(26-127)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	77	Phenol-d5	75	(10-94)	31
2-Fluorobiphenyl	50	(43-116)	68	2-Fluorophenol	75	(21-100)	50
Terphenyl-d14	50	(33-141)	108	2,4,6-Tribromophenol	75	(10-123)	83

Method Blank: 3526.WBLK1 LCS ID:NA MS ID:NA MSD ID:NA

[illegible] ANALYTICAL SERVICES

[illegible] Lake Road [illegible] Site, [illegible] Woodlawn, [illegible] [illegible]; [illegible]

[illegible] REPORT

Client:	NA	Client Sample ID:	[illegible]	Date Sampled:	[illegible]
[illegible] Name:	NA	RSP Sample ID:	[illegible]	Date Received:	[illegible]
[illegible] No.:	NA	Record No.:	40042	Date Reported:	[illegible]

[illegible]

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-[illegible]
Multiplying Factor:	2.00	Date Extracted:	06/15/96	GC/MS File ID:	40042
Sample Volume:	500 ml	Date Analyzed:	06/20/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	20	73	Benzo(a)pyrene	20	ND
1,2-Dichlorobenzene	20	ND	Benzo(b) fluoranthene	20	ND
1,3-Dichlorobenzene	20	ND	Benzo(g,h,i)perylene	20	ND
1,4-Dichlorobenzene	20	73	Benzo(k)fluoranthene	20	ND
2,2'-oxybis (1-Chloropropane)	20	ND	Benzyl Alcohol	40	ND
2,4,5-Trichlorophenol	50	ND	Bis(2-chloroethoxy)methane	20	ND
2,4,6-Trichlorophenol	20	ND	Bis(2-chloroethyl)ether	20	ND
2,4-Dichlorophenol	20	ND	Bis(2-ethylhexyl)phthalate	20	ND
2,4-Dimethylphenol	20	ND	Butylbenzylphthalate	20	ND
2,4-Dinitrophenol	50	ND	Carbazole	20	ND
2,4-Dinitrotoluene	20	35	Chrysene	20	ND
2,6-Dinitrotoluene	20	ND	Dibenzofuran	20	ND
2-Chloronaphthalene	20	ND	Dibenz(a,h)anthracene	20	ND
2-Chlorophenol	20	130	Diethyl phthalate	20	ND
2-Methylnaphthalene	20	ND	Dimethyl phthalate	20	ND
2-Methylphenol	20	ND	Di-n-Butylphthalate	20	ND
2-Nitroaniline	50	ND	Di-n-Octylphthalate	20	ND
2-Nitrophenol	20	ND	Fluoranthene	20	ND
3,3-Dichlorobenzidine	40	ND	Fluorene	20	ND
3-Nitroaniline	50	ND	Hexachlorobenzene	20	ND
4,6-Dinitro-2-methylphenol	50	ND	Hexachlorobutadiene	20	ND
4-Bromophenyl-phenylether	20	ND	Hexachlorocyclopentadiene	20	ND
4-Chloroaniline	40	ND	Hexachloroethane	20	ND
4-Chlorophenyl-phenylether	20	ND	Indeno(1,2,3-cd)pyrene	20	ND
4-Chloro-3-methylphenol	40	120	Isophorone	20	ND
4-Methylphenol	20	ND	Naphthalene	20	ND
4-Nitroaniline	50	ND	Nitrobenzene	20	ND
4-Nitrophenol	50	63	N-Nitrosodimethylamine	20	ND
Acenaphthene	20	90	N-Nitrosodiphenylamine	20	ND
Acenaphthylene	20	ND	N-Nitroso-di-n-propylamine	20	92
Anthracene	20	ND	Pentachlorophenol	50	130
Benzidine	50	ND	Phenanthrene	20	ND
Benzoic Acid	100	ND	Phenol	20	74
Benzo(a)anthracene	20	ND	Pyrene	20	73

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
[illegible]benzene-d5	50	(35-114)	39	Phenol-d5	75	(10-94)	33
2-Fluorobiphenyl	50	(43-116)	79	2-Fluorophenol	75	(21-100)	67
Terphenyl-d14	50	(33-141)	96	2,4,6-Tribromophenol	75	(10-123)	86

Method Blank: 3526.WBL41 LCS ID: 3526.WLCS1 MS ID: NA MSD ID: NA

000053

[illegible]

[illegible] Lake Front [illegible] Site [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

Client:	NA	Client Sample ID: [illegible]	Date Sampled: [illegible]
Project Name:	NA	EPA Sample ID: [illegible]	Date Received: [illegible]
[illegible] No.:	NA	Report No.: [illegible]	Date Reported: [illegible]

SW846-8270/SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	[illegible]	GC/MS File ID:	A0043
Sample Volume:	500 ml	Date Analyzed:	[illegible]	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	20	61	Benzo(a)pyrene	20	ND
1,2-Dichlorobenzene	20	ND	Benzo(b)fluoranthene	20	ND
1,3-Dichlorobenzene	20	ND	Benzo(g,h,i)perylene	20	ND
1,4-Dichlorobenzene	20	56	Benzo(k)fluoranthene	20	ND
2,2'-oxybis (1-Chloropropane)	20	ND	Benzyl Alcohol	40	ND
2,4,5-Trichlorophenol	50	ND	Bis(2-chloroethoxy)methane	20	ND
2,4,6-Trichlorophenol	20	ND	Bis(2-chloroethyl)ether	20	ND
2,4-Dichlorophenol	20	ND	Bis(2-ethylhexyl)phthalate	20	ND
2,4-Dimethylphenol	20	ND	Butylbenzylphthalate	20	ND
2,4-Dinitrophenol	50	ND	Carbazole	20	ND
2,4-Dinitrotoluene	20	72	Chrysene	20	ND
2,6-Dinitrotoluene	20	ND	Dibenzofuran	20	ND
2-Chloronaphthalene	20	ND	Dibenz(a,h)anthracene	20	ND
2-Chlorophenol	20	61	Diethyl phthalate	20	ND
[illegible]methylnaphthalene	20	ND	Dimethyl phthalate	20	ND
[illegible]methylphenol	20	ND	Di-n-Butylphthalate	20	ND
2-Nitroaniline	50	ND	Di-n-Octylphthalate	20	ND
2-Nitrophenol	20	ND	Fluoranthene	20	ND
3,3-Dichlorobenzidine	40	ND	Fluorene	20	ND
3-Nitroaniline	50	ND	Hexachlorobenzene	20	ND
4,6-Dinitro-2-methylphenol	50	ND	Hexachlorobutadiene	20	ND
4-Bromophenyl-phenylether	20	ND	Hexachlorocyclopentadiene	20	ND
4-Chloroaniline	40	ND	Hexachloroethane	20	ND
4-Chlorophenyl-phenylether	20	ND	Indeno(1,2,3-cd)pyrene	20	ND
4-Chloro-3-methylphenol	40	70	Isophorone	20	ND
4-Methylphenol	20	ND	Naphthalene	20	ND
4-Nitroaniline	50	ND	Nitrobenzene	20	ND
4-Nitrophenol	50	10	N-Nitrosodimethylamine	20	ND
Acenaphthene	20	71	N-Nitrosodiphenylamine	20	ND
Acenaphthylene	20	ND	N-Nitroso-di-N-propylamine	20	77
Anthracene	20	ND	Pentachlorophenol	50	95
Benzidine	50	ND	Phenanthrene	20	ND
Benzoic Acid	100	ND	Phenol	20	15
Benzo(a)anthracene	20	ND	Pyrene	20	67

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
[illegible]benzene-d5	50	(35-114)	70	Phenol-d5	75	(10-94)	10
2-Fluorobiphenyl	50	(43-116)	76	2-Fluorophenol	75	(21-100)	15*
Terphenyl-d14	50	(33-141)	84	2,4,6-Tribromophenol	75	(10-123)	67

Method Blank: 3526.MBLK1 LCS ID: 3526.WLCS1 MS ID: NA MSD ID: NA

000054

[illegible] ANALYTICAL SERVICES
[illegible] Front Street, Ste. B, The Woodlands, TX 77380 713/363-[illegible]

LABORATORY REPORT

[illegible]	[illegible]	Date Received:	08/15/96
[illegible] Name:	NA	Date Reported:	09/06/96
[illegible] No.:	NA	Report No.:	33[illegible]

GC/MS-SEMIVOLATILES MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY

Method Ref.:	SW846-8270B	Sample Matrix:	WATER	Analyst:	RP

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
POP Sample ID:	3326.33	MS Sample ID:	3326.03MS	MSD Sample ID:	3326.03MSD
Client Sample ID:	MPL-MW03-SW2	Client Sample ID:	MPL-MW03-SW2MS	Client Sample ID:	MPL-MW03-SW2MSD
Sample Volume:	1000 ml	Sample Volume:	500 ml	Sample Volume:	500 ml
Extract Volume:	1.0 ml	Extract Volume:	1.0 ml	Extract Volume:	1.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	08/20/96	Date Analyzed:	08/20/96	Date Analyzed:	08/20/96
GC/MS File ID:	A0041	GC/MS File ID:	A0042	GC/MS File ID:	A0043

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,2,4-Trichlorobenzene	100	ND	75	75	(39-98)
1,4-Dichlorobenzene	100	ND	73	73	(36-97)
2,4-Dinitrotoluene	100	ND	85	85	(24-96)
[illegible]ophenol	150	ND	130	87	(27-123)
[illegible]bro-3-methylphenol	150	ND	120	80	(23-97)
4-Nitrophenol	150	ND	60	40	(10-80)
Acenaphthene	100	ND	80	80	(46-118)
N-Nitroso-di-N-propylamine	100	ND	92	92	(41-116)
Pentachlorophenol	150	ND	130	87	(9-103)
Phenol	150	ND	74	49	(12-110)
Pyrene	100	ND	78	78	(26-127)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	REC.
1,2,4-Trichlorobenzene	100	ND	81	81	24.3	42	(39-98)
1,4-Dichlorobenzene	100	ND	86	86	26.4	23	(36-97)
2,4-Dinitrotoluene	100	ND	72	72	14.2	18	(24-96)
2-Chlorophenol	150	ND	61	41	72.6 *	40	(27-123)
4-Chloro-3-methylphenol	150	ND	70	47	52.6 *	28	(23-97)
4-Nitrophenol	150	ND	10	7 *	143.1 *	42	(10-80)
Acenaphthene	100	ND	71	71	11.9	31	(46-118)
N-Nitroso-di-N-propylamine	100	ND	77	77	17.3	30	(41-116)
Pentachlorophenol	150	ND	98	65	28.1	38	(9-103)
Phenol	150	ND	13	13 *	102.6 *	42	(12-110)
[illegible]	100	ND	89	89	18.2	24	(26-127)

* = Values outside of QC limits

RPD: 4 out of 11 outside limits

Spike Recovery: 2 out of 22 outside limits

METALS

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
POP Sample ID: ICP8352 (METHOD BLANK)
Report Number: ICP8352

Date Sampled: NA
Date Received: NA
Date Reported: 09/11/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	5.0	ND	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
PDP Sample ID: HGB279 (METHOD BLANK)
Report Number: HG8279

Date Sampled: NA
Date Received: NA
Date Reported: 09/11/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: ug/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Mercury	SW846-7470A	08-21-96	08-22-96	0.00020	ND	NS

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: ICPL352
LCSD ID: ICPL352D

Date Reported: 09/10/96
Report Number: ICPL352

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	5.0	4.69	94	4.61	92	1.7	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	1.25	1.19	95	1.2	96	0.8	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.25	0.24	96	0.235	94	2.1	DOC
Barium	SW846-6010A	08-19-96	09-09-96	5.0	4.87	97	4.8	96	1.4	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.125	0.125	100	0.122	98	2.4	DOC
Boron	SW846-6010A	08-19-96	09-09-96	1.0	1.08	108	1.04	104	3.8	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.125	0.119	95	0.116	93	2.6	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	12.5	12.2	98	12.0	96	1.7	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.50	0.478	96	0.47	94	1.7	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	1.25	1.22	98	1.20	96	1.7	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.625	0.614	98	0.595	95	3.1	DOC
[illegible]	SW846-6010A	08-19-96	09-09-96	2.5	2.38	95	2.34	94	1.7	DOC
Le[illegible]	SW846-6010A	08-19-96	09-09-96	0.25	0.237	95	0.231	92	2.6	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	12.5	12.0	96	11.8	94	1.7	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	1.25	1.23	98	1.20	96	2.5	DOC
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.50	0.47	94	0.47	94	0.0	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	1.25	1.21	97	1.19	95	1.7	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	12.5	11.7	94	11.6	93	0.9	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.25	0.23	92	0.2	96	4.3	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.625	0.586	94	0.576	92	1.7	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	12.5	11.3	90	11.1	89	1.8	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.25	0.242	97	0.224	90	7.7	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	1.25	1.18	94	1.16	93	1.7	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	1.25	1.19	95	1.17	94	1.7	DOC

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: ICPB352

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: HGL279
LCSD ID: HGL279D

Date Reported: 09/11/96
Report Number: HGL279

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER

Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Mercury	SW846-7470A	08-21-96	08-22-96	0.0020	0.0021	105	0.0022	110	4.7	NS

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: HGB279

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

PDP MS ID: 3517.01MS
PDP MSD ID: 3517.01MSD
Report Number:I517MS01

Date Sampled: NA
Date Received: NA
Date Reported: 09/10/96

TOTAL METALS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE)

Sample Matrix: WATER — Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	SAMPLE VALUE	MATRIX SPIKE ADDED	MATRIX SPIKE VALUE	PERCENT RECOVERY (75-125)	MATRIX SPIKE DUP VALUE	PERCENT RECOVERY (75-125)	RPD (20)
Aluminum	SW846-6010A	08-19-96	09-09-96	ND	2.0	2.08	104	2.1	105	1.0
Antimony	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.49	98	0.49	98	0.0
Arsenic	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.94	97	1.98	99	2.0
Barium	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.5	75	1.34	67*	11.3
Beryllium	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.044	88	0.045	90	2.2
Boron	SW846-6010A	08-19-96	09-09-96	2.29	1.0	3.27	98	3.36	107	2.7
Cadmium	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.04	80	0.042	84	4.9
Calcium	SW846-6010A	08-19-96	09-09-96	453	NA	432	NA	457	NA	5.6
Chromium	SW846-6010A	08-19-96	09-09-96	ND	0.20	0.172	86	0.175	87	1.7
Cobalt	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.419	84	0.432	86	3.1
Copper	SW846-6010A	08-19-96	09-09-96	ND	0.25	0.273	109	0.268	107	1.8
I[illegible]	SW846-6010A	08-19-96	09-09-96	0.29	1.0	1.13	84	1.16	87	2.6
L[illegible]	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.38	76	0.383	77	0.8
Magnesium	SW846-6010A	08-19-96	09-09-96	288	NA	279	NA	287	NA	2.8
Manganese	SW846-6010A	08-19-96	09-09-96	0.021	0.50	0.461	88	0.47	90	1.9
Mercury	SW846-7470A	08-21-96	08-22-96	ND	0.0010	0.001	100	0.0010	100	0.0
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.1	0.50	0.551	90	0.565	93	2.5
Nickel	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.483	97	0.489	98	1.2
Potassium	SW846-6010A	08-19-96	09-09-96	48.6	NA	49.5	NA	49.4	NA	0.2
Selenium	SW846-6010A	08-19-96	09-09-96	ND	2.0	2.0	100	2.1	105	4.9
Silver	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.043	86	0.042	84	2.4
Sodium	SW846-6010A	08-19-96	09-09-96	501	NA	496	NA	497	NA	0.2
Thallium	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.84	92	1.95	98	5.8
Vanadium	SW846-6010A	08-19-96	09-09-96	0.03	0.50	0.479	90	0.488	92	1.9
Zinc	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.378	76	0.396	79	4.7

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL352
GFAA LCS ID: NA
CVAA LCS ID: HGL279

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP Method Blank ID: ICPB352
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB279

ICP LCSD ID: ICPL352D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL279D

ICP MSD ID: NA
GFAA MSD ID:NA
CVAA MSD ID:NA

* [illegible]cates the value is outside control limits.
** [illegible]n analyte concentration prevented accurate determination of the matrix spike recovery.
D : The sample required a post-digest (instrument) dilution resulting in a dilution of the matrix spike added.

PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3526.MBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	E02334	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02334
Sample Weight:	1000 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	85
Decachlorobiphenyl	0.2	(30-150)	81

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

000063

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3526.WLCS1(LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	E02335	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	08/16/96	GC File ID:	E02335
Sample Volume:	1000 ml	Date Analyzed:	08/29/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
Aroclor-1254	5.0	4.16	83	(30-150)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	83
Decachlorobiphenyl	0.2	(30-150)	77

Method Blank: 3526.WBLK1 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:MPL-MW02-GW2		Date Received:	NA
Project Name:	NA			Date Reported:	09/09/96
Project No.:	NA			Report No.:	3528A01Q

GC-POLYCHLORINATED BIPHENYLS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8080A	Sample Matrix:	WATER	Analyst:	SM

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3528.01	MS Sample ID:	3528.01MS	MSD Sample ID:	3528.01MSD
Date Analyzed:	08/29/96	Date Analyzed:	08/29/96	Date Analyzed:	08/29/96
GC File ID:	E02338	GC File ID:	E02339	GC File ID:	E02340

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE CONC. (ug/L)	MS % REC.	QC LIMITS REC.
Aroclor-1254	10	ND	10	100	(30-150)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE DUPLICATE CONC. (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
Aroclor-1254	10	ND	9	90	10.5	50	(30-150)

* = Values outside of QC limits

RPD:	0 out of 1 outside limits
Spike Recovery	0 out of 2 outside limits

GENERAL CHEMISTRY

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

SUB-CONTRACT DATA

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

END OF REPORT

LABORATORY ANALYTICAL REPORT

GROUNDWATER SAMPLES

MPL-MW02-GW2 & MPL-MW04-GW2

PDP
Analytical Services

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

September 16 1996

Ms. Dana Downs
Mevatec Corporation
P.O. Box 399
White Sands Missile Range
New Mexico 88002

Episode: 3528
Project ID: Background Groundwater Monitoring At MPL
Project #: 300-ii-J

Dear Ms. Downs:

Enclosed are the analytical results for the samples received in our laboratory on August 16, 1996. The samples were analyzed for the parameters indicated on the chain of custody.

Please be advised that unused portions of your samples, sample extracts and digestates will be stored for 30 days from the date of this report. Unless prior arrangements were made, at the end of this period your samples will either be disposed of, or returned to you if your samples were determined to be hazardous.

We appreciate your business. Should you have any questions or need assistance with this report, please feel free to call me or Homai Madisetty, Data Review Officer, at (713) 292-7090.

Sincerely,

Bruce D. Howbert

Bruce D. Howbert
Program Manager

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

DATA PACKAGE DOCUMENT INVENTORY

EPISODE NUMBER: *3528*

Section	Document Type	Pages
1.	*Case Narrative & Data Qualifiers*	1-4
2.	*Chain-of-Custody Forms*	5
3.	*Sample Data*	
	Volatiles	12
	Semivolatiles	13-16
	Metals	17-19
	PCBs	20-22
	General Chemistry	23-25
	Sub-Contract Data	39-41
4.	*Quality Control Data*	
	Volatiles	43-48
	Semivolatiles	49-54
	Metals	55-60
	PCBs	61-66
	General Chemistry	67-68
	Sub-Contract Data	69-70
5.	*End of Report*	71

CASE NARRATIVE & DATA QUALIFIERS

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec Corporation **Episode No.: 3528**	**Project Name: Background Groundwater Monitoring At MPL** **Project No.: 300-ii-J**

CASE NARRATIVE

Three water samples were received for analysis on 08/16/96. All regulatory holding times were met by the laboratory.

All batch quality control (QC) results (Duplicates, Matrix Spikes, Matrix Spike Duplicates) are included in this data package. Batch QC may or may not have been performed on your samples. If it was, the QC reports will reference our internal sample identification.

The data qualifiers are presented following the narrative remarks. For CLP data forms, consult the CLP Qualifiers sheet. For standard PDP data spreadsheets, consult the Data Flags and Abbreviations sheet.

SAMPLE RECEIPT AND LOG-IN:

No problems were encountered.

VOLATILES:

No problems were encountered.

SEMIVOLATILES:

No problems were encountered.

METALS:

High analyte concentration prevented accurate determination of the matrix spike recoveries for silicon and strontium.

The matrix spike recoveries for barium were outside the control limits. The laboratory control sample recoveries were acceptable, indicating matrix interference.

PDP ANALYTICAL SERVICES

1680 Lake Front Circle, Suite B • The Woodlands, TX 77380 • Phone (713)363-2233

Client: Mevatec Corporation **Episode No.: 3528**	**Project Name: Background Groundwater Monitoring At MPL** **Project No.: 300-ii-J**

CASE NARRATIVE Continued

PCBs

No problems were encountered.

GENERAL CHEMISTRY:

No problems were encountered.

SUB-CONTRACT DATA:

The samples for TKN and nitrate/nitrite analysis were sub-contracted to Inchcape Testing Services in Dallas, Texas.

The samples for uranium and radium were sub-contracted to CEP Laboratory in Sante Fe, New Mexico. The data will follow under a separate cover upon receipt from the sub-contract laboratory.

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Suite B The Woodlands, Texas 77380

DATA FLAGS AND ABBREVIATIONS

B	This flag is used when the analyte is found in the associated blank as well as in the sample.
D	Indicates that the compound could not be detected because it was diluted out.
DL	This flag identifies an analysis at a secondary dilution factor.
E	This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. A more accurate quantitation is obtained from a diluted sample analysis.
I	This flag is used to indicate the presence of interference which resulted in not determining the value.
J	This flag is used when the data indicates the presence of a compound below the quanitation limit as determined by the identification criteria.
N	Not applicable.
NC	Not calculated.
ND	Indicates a compound was analyzed for but not detected at the quantitation level.
P	This flag is used for a pesticide/aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.
RE	This flag is used when the sample is re-extracted and re-analyzed.
RA	This flag is used when the sample is re-analyzed.
U	This flag indicates that the compound was analyzed for but not detected.
*	Indicates that the compound is out of the Quality Control limits.

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: RRB DATE OF PHYSICAL LOG-IN: 8/16/96 PAGE 1 OF 1

Episode #: 3528
Client Name: MEVATEC
Project ID: BACKGROUND GROUNDWATER MONITORING AT MPL
Project #: 300-II J
PO Number: NA
Courier/No.: FED EX #'s 0323900721 / 0323900861 / 0323900824

DATE OF COMPUTER LOG-IN: 8/16/96 13:19
COMPUTER LOG-IN BY: RRB
DATE RECEIVED: 8/16/96
TIME RECEIVED: 1000

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3528.01	MPL-MW02-GW2	VOA-8260A SVOA-8270B TOC-9060B URANIUM-908.1 TOTAL METALS-6010-Al,,Sb,As,Ba,Be,B,Cd,Cr,Co, Cu,Fe,Pb,Mn,Mg,Mo,Ni,Se,Ag,Ca,K,Tl,Na,V,Zn Hg-7470A CONDUCTANCE-120.1 pH-9040 CARBONATE/BICARBONATE-310.1 CHLORIDE-325.3 FLUORIDE-340.2 SULFATE-375.4 TDS-160.1 AMMONIA-350.3 TKN-351.2 NITRATE/NITRITE-353.2 RADIUM 226 / EPA 903.1 RADIUM 228 / EPA 904.0 PCB-8080 TOTAL CYANIDE-9010 PHENOL-9065	32	WATER	8/15/96	0840 / 0900	3528A / 3528C	8/30/96 HC	MS/MSD
3528.02	MPL-MW04-GW2	SAME AS ABOVE	16	WATER	8/15/96	1320	3528B		
3528.03	TRIP BLANK	VOA-8260A	1	WATER	N/A	N/A	3528A		

REMARKS:
TKN AND NITRATE/NITRITE SUBBED TO NDRC DALLAS
URANIUM, RADIUM 226 / 228 SUBBED TO CEP

Weight basis: X wet ___ dry
Deliverables: X norm ___ CLP-like ___ CLP
___ raw data X electronic

APPROVED BY/DATE: RB 8/16/96

SEND REPORT TO: DANA DOWNS

#3528A

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT NO.: 300-ii J
PROJECT NAME: Background Groundwater Monitoring @ MPC
SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/15/96	0840	MPL-MW02-GW2-MS	W	3528.01	16		see attached
8/15/96	0900	MPL-MW02-GW2	W	3528.02	2		VOA's only
8/15/96	1320	MPL-MW04-GW2	W	3528.03	2		VOA's only
—	—	Trip Blank	W	3528.04	1		

PROJECT INFORMATION	SAMPLES RECEIVED	1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dana Downs	TOTAL NO. OF CONTAINERS	(PRINTED NAME) J. Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
SHIPPING ID. NO.: 300 ii J	CHAIN OF CUSTODY SEALS	RECEIVED BY: Walter R. Barrientos	RECEIVED BY:	(COMPANY)
VIA: ~~TRK #032-3900-721~~ FEDEX	GOOD CONDITION/CHILLED	(TIME / DATE) 1060 8/16/96	(TIME / DATE)	(TIME / DATE)
	CONFORMS TO RECORD	SPECIAL INSTRUCTIONS / COMMENTS: includes VOA's for samples MPL-MW02-GW2 + MPL-MW04-GW2		

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

CHAIN OF CUSTODY RECORD

#3528B

PAGE 1 OF 1

PROJECT NO.: 300-11 J

PROJECT NAME: Background Groundwater Monitoring @ MPL

SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/15/96	1320	MPL-MW04-GW2	W	3528.02	14		see attached list

PROJECT INFORMATION

PROJECT MANAGER: Dana Downs

SHIPPING ID. NO.: 300-11 J

VIA: TRK#032.3900.8bl FEDEX

SAMPLES RECEIVED

TOTAL NO. OF CONTAINERS

CHAIN OF CUSTODY SEALS

GOOD CONDITION/CHILLED

CONFORMS TO RECORD

1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
(PRINTED NAME) Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
RECEIVED BY: Tony R Barrientos	RECEIVED BY:	(COMPANY)
(TIME / DATE) 10:00AM 8/16/96	(TIME / DATE)	(TIME / DATE)

SPECIAL INSTRUCTIONS / COMMENTS: VOA's shipped with sample # MPL-MW02-GW2-MS

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

CHAIN OF CUSTODY RECORD

3528C

PAGE 1 OF 1

PROJECT NO.: 300-ii J

PROJECT NAME: Background Groundwater Monitoring at MPL

SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/15/96	0900	MPL-MW02-GW2	w	3528.01	14		see attached list

000003

PROJECT INFORMATION			1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dana Downs	SAMPLES RECEIVED		(PRINTED NAME) J. Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
	TOTAL NO. OF CONTAINERS		RECEIVED BY: Hector Barrientos	RECEIVED BY:	(COMPANY)
SHIPPING ID. NO.: 300 ii J	CHAIN OF CUSTODY SEALS		(TIME / DATE) 10:00 AM 8/16/96	(TIME / DATE)	(TIME / DATE)
VIA: TRK# 032-3900-824 FEDEX	GOOD CONDITION/CHILLED		SPECIAL INSTRUCTIONS / COMMENTS: VOAs shipped with sample # MPL-MW02-GW2-MS		
	CONFORMS TO RECORD				

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

SAMPLE L .-IN CHECKLIST/DISCREP. Y REPORT

FID: SLCDR01.96

EPISODE #: 3528 DATE/ REC'D: 8/16/96 1000AM TEMP & ID: 1) 4.1°C 3528A
TIME

CLIENT NAME: MEVATEC 2) 4.6°C 3528B

PROJECT NAME: BACKGROUND GROUNDWATER MONITORING @ MPC 3) 4.0°C 3528C

PROJECT NUMBER: 300-11 J 4) ____ # ____

2 AQUEOUS, # Ø SOIL SAMPLES 5) ____ # ____

COURIER/AIRBILL # 032-3900-721/861/824 6) ____ # ____

SAMPLE CONTAINER SEALS: present absent (intact) broken

COOLER CUSTODY SEALS: present absent (intact) broken NAME & DATE: ____

HOW MANY AND WHERE ____

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
Container Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :	✓	
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:		✓
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client? TRIP BLANK (3528.03) HAS AIR BUBBLES.

Project Manager's recommendations? NOTIFY CLIENT VIA FAX

Who was notified? D. DOWNS By whom? RB Date: 8-16-96

Client's comments:

Corrective actions carried out?

COMMENTS:

000010

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab? | |

LOG-IN BY: Robert B. Barrientos DATE: 8/16/96

PDP ANALYTICAL SERIVES

24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

P.O. #96592

Sent to: NDRC - DALLAS

Contact: JT Phone: 214.238.5591

Sent by: Walter Bichon

Date sent: 8/19/96 Date Results needed: 8/30/96

PDP Sample ID	No. of Containers	Anaylsis Request a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/ ~~Wet~~
3528.01		X	X									WATER	9216 -1
3528.02		X	X										-2
SCREENED FOR RADIOACTIVITY	COOLER TEMPERATURE WHEN RECEIVED 6 °C												

000011

ORIGINAL

CUSTODY TRANSFERS

	Relinquished by:	Recieved by:	Date/Time
1.	Walter Bichon	8/19/96	1530
2.	D. Fields	D. Fields	8-20-96 10:20

Courier: 8721272195

ANALYTICAL PARAMETERS

A TKN - 351.2
B NITRATE/NITRITE - 353.2
C
D
E
F
G
H
I
J

Project Manager Approval: RB

Lab Manager Approval: _____

SAMPLE DATA

VOLATILES

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW02-GW2	Date Sampled:	08/15/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3528.01	Date Received:	08/16/96
Project No.:	300-ii J	Report No.:	810059	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	810059
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
[illegible]hloroethane	1	ND	Hexachlorobutadiene	1	ND
1,[illegible]hloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	99
1,2-Dichloroethane-d4	10	(80-120)	93
Toluene-d8	10	(88-110)	101
4-Bromofluorobenzene	10	(86-115)	96

000014

Method Blank ID: BVBLKH25 LCS ID: BVLCSH29 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	NEVATEC	Client Sample ID:	MPL-MW04-GW2	Date Sampled:	08/15/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3528.02	Date Received:	08/16/96
Project No.:	300-ii J	Report No.:	B10062	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	B10062
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
[illegible]hloroethane	1	ND	Hexachlorobutadiene	1	ND
1[illegible]hloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	102
1,2-Dichloroethane-d4	10	(80-120)	102
Toluene-d8	10	(88-110)	101
4-Bromofluorobenzene	10	(86-115)	99

000015

Method Blank ID: BVBLKH25 LCS ID: BVLCSH29 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	TRIP BLANK	Date Sampled:	NA
Project Name:	BACKGROUND GW MON. AT MPL	POP Sample ID:	3528.03	Date Received:	08/16/96
Project No.:	300-ii J	Report No.:	B10063	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	B10063
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1[illegible]hloroethane	1	ND	Hexachlorobutadiene	1	ND
1[illegible]hloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	102
1,2-Dichloroethane-d4	10	(80-120)	97
Toluene-d8	10	(88-110)	98
4-Bromofluorobenzene	10	(86-115)	101

000016

Method Blank ID: BV8LKM25 LCS ID: BVLCSM29 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

SEMIVOLATILES

-BP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B, The Woodlands, TX 77380; (713)363-2333

LABORATORY REPORT

Client:	MEWATER	Client Sample ID:	MPL-4W02-GW2	Date Sampled:	08/15/96
Project Name:	BACKGROUND 1a MON. AT MPL	BP Sample ID:	3528.01	Date Received:	08/16/96
[illegible] No.:	300-11 J	Report No.:	09300	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	08/19/96	GC/MS File ID:	09300
Sample Volume:	1000 ml	Date Analyzed:	08/19/96	Analyst:	BP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
[illegible]lphenol	10	ND	Di-n-Butylphthalate	10	ND
2-[illegible]roaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
[illegible]enzene-d5	50	(35-114)	72	Phenol-d5	75	(10-94)	31
2-[illegible]fluorobiphenyl	50	(43-116)	73	2-Fluorophenol	75	(21-100)	49
Terphenyl-d14	50	(33-141)	57	2,4,6-Tribromophenol	75	(10-123)	86

Method Blank: 3528.MBLK1 LCS ID: 3528.WLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD

000015

1680 Lake Front Circle, Ste. 5, The Woodlands, TX 77380, (713)367-2223

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW04-GW2	Date Sampled:	08/15/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3528.02	Date Received:	08/16/96
Project No.:	300-11 J	Report No.:	09303	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	08/19/96	GC/MS File ID:	09303
Sample Volume:	1000 ml	Date Analyzed:	08/19/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-Methylnaphthalene	10	ND	Dimethyl phthalate	10	ND
2-Methylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-Nitroaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	75	Phenol-d5	75	(10-94)	30
2-Fluorobiphenyl	50	(43-116)	75	2-Fluorophenol	75	(21-100)	47
Terphenyl-d14	50	(33-141)	49	2,4,6-Tribromophenol	75	(10-123)	82

Method Blank: 3528.WBLK1 LCS ID: 3528.WLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD

000019

METALS

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID: MPL-MW02-GW2	Date Sampled: 08/15/96
Project Name:	BACKGROUND GROUNDWATER	PDP Sample ID: 3528.01	Date Received: 08/16/96
Project Number:	300-II-J	Report Number: I52801	Date Reported: 09/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER — Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	1.41	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	0.023	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	1.09	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	0.0081	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	1.0	7.3	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	0.01	0.053	DOC
Mercury	SW846-7470A	08-21-96	08-22-96	0.0002	ND	MS
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silicon	SW846-6010A	08-19-96	09-09-96	0.50	22	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Strontium	SW846-6010A	08-19-96	09-09-96	0.10	0.20	DOC
Tin	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	0.01	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

		ICP LCS ID: ICPL352	ICP MS ID: 3517.01MS
		GFAA LCS ID: NA	GFAA MS ID: NA
ICP Method Blank ID:	ICPB352	CVAA LCS ID: HGL279	CVAA MS ID: 3517.01MS
GFAA Method Blank ID:	NA		
CVAA Method Blank ID:	HGB279	ICP LCSD ID: ICPL352D	ICP MSD ID: 3517.01MSD
		GFAA LCSD ID: NA	GFAA MSD ID: NA
		CVAA LCSD ID: HGL279D	CVAA MSD ID: 3517.01MSD

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER
Project Number: 300-II-J

Client Sample ID: MPL-MW04-GW2
PDP Sample ID: 3528.02
Report Number: I52802

Date Sampled: 08/15/96
Date Received: 08/16/96
Date Reported: 09/12/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	2.1	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	0.022	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	1.43	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	0.01	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	1.0	5.4	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	0.01	0.051	DOC
Mercury	SW846-7470A	08-21-96	08-22-96	0.0002	ND	MS
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silicon	SW846-6010A	08-19-96	09-09-96	0.50	27.4	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Strontium	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Tin	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	0.012	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL352
GFAA LCS ID: NA
CVAA LCS ID: HGL279

ICP MS ID: 3517.01MS
GFAA MS ID: NA
CVAA MS ID: 3517.01MS

ICP Method Blank ID: ICPB352
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB279

ICP LCSD ID: ICPL352D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL279D

ICP MSD ID: 3517.01MSD
GFAA MSD ID: NA
CVAA MSD ID: 3517.01MSD

PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

[illegible]:	KEVATEC	Client Sample ID:	MPL-MW02-GW2	Date Sampled:	08/15/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3528.01	Date Received:	08/16/96
Project No.:	300-ii J	Report No.:	E02338	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02338
Sample Weight:	1000 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	86
Decachlorobiphenyl	0.2	(30-150)	69

Method Blank ID: 3526.WBLK1 LCS ID: 3526.WLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	MEVATEC	Client Sample ID:	MPL-MW04-GW2	Date Sampled:	08/15/96
Project Name:	BACKGROUND GW MON. AT MPL	PDP Sample ID:	3528.02	Date Received:	08/16/96
Project No.:	300-ii J	Report No.:	E02341	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02341
Sample Weight:	1000 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	83
Decachlorobiphenyl	0.2	(30-150)	72

Method Blank ID: 3526.WBLK1 LCS ID: 3526.WLCS1 MS ID: 3528.01MS MSD ID: 3528.01MSD DUP ID: NA

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GENERAL CHEMISTRY

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 08/29/96
Report No: I528SUL
Analyst: KM

WET CHEMISTRY PARAMETER: Sulfate

Method Reference: EPA 375.4 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-26-96	25	72			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-26-96	25	173			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	METHOD BLANK	WATER	NA	NA	NA	08-26-96	5.0	ND			
3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-26-96	5.0	20	20		100
3504.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-26-96	5.0	19	20	5.1	95
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-26-96	25	180	100		108
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-26-96	25	183	100	1.7	111

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 08/30/96
Report No: I528AMM
Analyst: KW

WET CHEMISTRY PARAMETER: Ammonia as N

Method Reference: EPA 350.3

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-22-96	0.25	ND			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-22-96	0.25	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	5.47	5.0		109
35[illegible]S2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	0.25	5.34	5.0	2.4	107
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-22-96	0.25	4.6	5.0		92
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-22-96	0.25	5.1	5.0	10.3	102

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 08/30/96
Report No: I528TDS
Analyst: KM

WET CHEMISTRY PARAMETER: Total Dissolved Solids (TDS)

Method Reference: EPA 160.1

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	10	430			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	10	890			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]BLK1	METHOD BLANK	WATER	NA	NA	NA	08-21-96	10	ND			
3528.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	10	480	500		96
3528.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	10	500	500	4.1	100
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	10	440		2.3	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II J

Date Reported: 09/10/96
Report No: I528COND
Analyst: KM

WET CHEMISTRY PARAMETER: Conductance

Method Reference: EPA 120.1 UNITS: umhos/cm

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	09-04-96	NA	664			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	09-04-96	NA	1080			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]S1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	09-04-96	NA	1100	1100		100
3[illegible]S2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	09-04-96	NA	1100	1100	0.0	100
3528.01D	DUPLICATE	WATER	NA	NA	NA	09-04-96	NA	670		0.9	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 09/10/96
Report No: I528TOC
Analyst: KW

WET CHEMISTRY PARAMETER: Total Organic Carbon (TOC)

Method Reference: EPA 415.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	1.0	1			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	1.0	1			

QUALITY ASSURANCE/QUALITY CONTROL

3517.P8W1	METHOD BLANK	WATER	NA	NA	NA	08-21-96	1.0	ND			
3517.LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	2.0	48	49.2		98
3517.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	2.0	48	49.2	0.0	98
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-21-96	1.0	26	25		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-21-96	1.0	25	25	3.9	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 09/10/96
Report No: I5288IC8
Analyst: KW

WET CHEMISTRY PARAMETER: Bicarbonate Alkalinity as HCO3-

Method Reference: EPA 310.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	1.2	67			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	1.2	115			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	286	305		94
35[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	287	305	0.4	94
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	1.2	67		0.0	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 09/10/96
Report No: I528CAR8
Analyst: KW

WET CHEMISTRY PARAMETER: Carbonate Alkalinity as CO3--

Method Reference: EPA 310.1 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	1.2	ND			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-21-96	1.2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	281	300		94
35[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-21-96	1.2	283	300	0.4	94
3528.01D	DUPLICATE	WATER	NA	NA	NA	08-21-96	1.2	ND		NC	

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 09/10/96
Report No: I528PH
Analyst: KW

WET CHEMISTRY PARAMETER: pH

Method Reference: SW-846 9040 UNITS: NA

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-16-96	NA	7.38			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-16-96	NA	7.32			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-16-96	NA	8.92	9.05		99
3[illegible]2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-16-96	NA	8.95	9.05	0.3	99
3528.010	DUPLICATE	WATER	NA	NA	NA	08-16-96	NA	7.40		0.3	

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PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-7

Date Reported: 09/10/96
Report No: I528FLO
Analyst: KM

WET CHEMISTRY PARAMETER: Fluoride

Method Reference: EPA 340.2 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-19-96	0.1	0.22			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-19-96	0.1	0.29			

QUALITY ASSURANCE/QUALITY CONTROL

[illegible]S1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	5.46	5		109
3[illegible]CS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-19-96	0.1	5.40	5	1.1	108
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-19-96	0.1	5.23	5		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-19-96	0.1	5.29	5	1.1	101

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 09/10/96
Report No: I528CHL
Analyst: KW

WET CHEMISTRY PARAMETER: Chloride

Method Reference: EPA 325.3

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-27-96	4.0	60			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-27-96	4.0	67			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	METHOD BLANK	WATER	NA	NA	NA	08-27-96	4.0	ND			
3[illegible]1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	4.0	206	200		103
3504.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-27-96	4.0	209	200	1.4	105
3528.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-27-96	4.0	252	200		96
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-27-96	4.0	252	200	0.0	96

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/10/96
Report No: I528PHNL
Analyst: KW

WET CHEMISTRY PARAMETER: Total Recoverable Phenolics

Method Reference: SW-846 9065 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	08-20-96	08-30-96	0.05	ND			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	08-20-96	08-30-96	0.05	ND			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	METHOD BLANK	WATER	NA	NA	08-20-96	08-20-96	0.05	ND			
3[illegible]S1	LAB CONTROL SAMPLE	WATER	NA	NA	08-20-96	08-20-96	0.05	0.46	0.500		92
3526.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	08-20-96	08-20-96	0.05	0.46	0.500	0.0	92
3528.01MS	MATRIX SPIKE	WATER	NA	NA	08-20-96	08-20-96	0.05	0.50	0.500		100
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	08-20-96	08-20-96	0.05	0.50	0.500	0.0	100

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/10/96
Report No: I528TCN
Analyst: KN

WET CHEMISTRY PARAMETER: Total Cyanide

Method Reference: SW-846 9010

UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	08-23-96	08-27-96	0.10	0.44			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	08-23-96	08-27-96	0.10	0.56			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]1	METHOD BLANK	WATER	NA	NA	08-23-96	08-27-96	0.01	ND			
352[illegible]LCS1	LAB CONTROL SAMPLE	WATER	NA	NA	08-23-96	08-27-96	0.01	0.100	0.100		100
3526.LCS2	LAB CONTROL SAMPLE	WATER	NA	NA	08-23-96	08-27-96	0.01	0.100	0.100	0.0	100
3528.01MS	MATRIX SPIKE	WATER	NA	NA	08-23-96	08-27-96	0.10	0.53	0.100		90
3528.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	08-23-96	08-27-96	0.10	0.55	0.100	3.7	110

SUB-CONTRACT DATA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J

Date Reported: 09/03/96
Report No: I528TKN
Analyst: KW

WET CHEMISTRY PARAMETER: Total Kjeldahl Nitrogen (TKN)

Method Reference: EPA 351.3 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-22-96	1.0	ND			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-22-96	1.0	1.68			

QUALITY ASSURANCE/QUALITY CONTROL

[illegible]W1	METHOD BLANK	WATER	NA	NA	NA	08-22-96	1.0	ND			
3[illegible]CS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-22-96	1.0	10.1	10		106
3528.02	SAMPLE	WATER	NA	NA	NA	08-22-96	1.0	1.68			
3528.02MS	MATRIX SPIKE	WATER	NA	NA	NA	08-22-96	1.0	20.4	20		102
3528.02MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-22-96	1.0	20.2	20	1.0	101

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: MEVATEC
Project Name: BACKGROUND GROUNDWATER MONITORING AT MPL
Project No: 300-II-J27

Date Reported: 09/03/96
Report No: I528NIMA
Analyst: KM

WET CHEMISTRY PARAMETER: Nitrate-Nitrite as N

Method Reference: EPA 353.2 UNITS: mg/L

PDP LABORATORY ID	CLIENT ID	MATRIX	DATE SAMPLED	DATE RECEIVED	DATE PREPARED	DATE ANALYZED	QUANT LIMIT	RESULT	SPIKE ADDED OR TRUE VALUE	RELATIVE PERCENT DIFF(20)	PERCENT RECOVERY (75-125)
3528.01	MPL-MW02-GW2	WATER	08-15-96	08-16-96	NA	08-23-96	0.05	6.01			
3528.02	MPL-MW04-GW2	WATER	08-15-96	08-16-96	NA	08-23-96	0.05	9.58			

QUALITY ASSURANCE/QUALITY CONTROL

3[illegible]K1	METHOD BLANK	WATER	NA	NA	NA	08-23-96	0.05	ND			
352[illegible]CS1	LAB CONTROL SAMPLE	WATER	NA	NA	NA	08-23-96	0.05	9.16	8.8		104
9225.01	SAMPLE	WATER	NA	NA	NA	08-23-96	0.05	ND			
9225.01MS	MATRIX SPIKE	WATER	NA	NA	NA	08-23-96	0.05	0.950	1.0		95
9225.01MSD	MATRIX SPIKE DUP	WATER	NA	NA	NA	08-23-96	0.05	0.940	1.0	1.1	94

QUALITY CONTROL DATA

VOLATILES

[illegible]

[illegible]

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	NA	Date Sampled:	NA
[illegible]ject Name:	NA	PDP Sample ID:	SV8LAA05 METHOD BLANK	Date Received:	NA
Project No.:	NA	Report No.:	810057	Date Reported:	10/04/96

GC/MS-VOLATILE ORGANICS DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260B
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	810057
Sample Volume:	20.0 ml			Analyst:	LC

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	ND
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	ND	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
[illegible]-Trichlorobenzene	1	ND	m,p-xylene	1	ND
[illegible]-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	ND	Toluene	1	ND
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	ND
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	100
1,2-Dichloroethane-d4	10	(80-120)	94
Toluene-d8	10	(88-110)	93
4-Bromofluorobenzene	10	(86-115)	95

Method Blank ID: NA LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

000044

[illegible]

[illegible]

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDF Sample ID:	BV8LKH25 (LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	313055	Date Reported:	08/21/96

GC/MS-VOLATILES ORGANICS (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.1	Method Ref.:	SW846-8010
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	313055
Sample Volume:	10.0 ml			Analyst:	[illegible]

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,1-Dichloroethane	10	11	110	(61-145)
Benzene	10	10	100	(76-127)
Chlorobenzene	10	11	110	(75-130)
Toluene	10	10	100	(76-125)
Trichloroethene	10	11	110	(71-120)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	104
1,2-Dichloroethane-d4	10	(80-120)	91
Toluene-d8	10	(88-110)	103
4-Bromofluorobenzene	10	(86-115)	100

Method Blank: BV8LKH25 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

[illegible] ANALYTICAL [illegible]
1180 Lake Front Circle, Ste. 1; The Woodlands, TX 77380; (713)363-[illegible]

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MWC2-GACMS	Date Sampled:	08/15/96
Project Name:	NA	PDP Sample ID:	3529.01MS (MATRIX SPIKE)	Date Received:	08/16/96
Project No.:	NA	Report No.:	810060	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS DATA SHEET:

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260A
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	810060
Sample Volume:	20.0 ml			Analyst:	LZ

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	11
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	10	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
[illegible]chloroethane	1	ND	Hexachlorobutadiene	1	ND
[illegible]chloropropane	1	ND	Isopropylbenzene	1	ND
1,2,3-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	10	Toluene	1	10
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	10
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	2	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	(86-118)	103
1,2-Dichloroethane-d4	10	(80-120)	97
Toluene-d8	10	(88-110)	103
4-Bromofluorobenzene	10	(86-115)	99

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Method Blank ID: BVBLKH25 LCS ID: BVLCSH29 MS ID: NA MSD ID: NA DUP ID: NA

[illegible] QUALITICAL SERVICES
[illegible] Lake Front Circle, Ste. 1, The Woodlands, TX [illegible] [illegible]-[illegible]

LABORATORY REPORT

Client:	NA	Client Sample ID:	MPL-MW02-SW2MSD	Date Sampled:	08/15/96
Project Name:	NA	PQA Sample ID:	5528.01MSD (MATRIX SPIKE DUPLICATE)	Date Received:	08/16/96
Project No.:	NA	Report No.:	5100c1	Date Reported:	09/04/96

GC/MS-VOLATILE ORGANICS DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8260B
Multiplying Factor:	1.00	Date Analyzed:	08/21/96	GC/MS File ID:	5100c1
Sample Volume:	20.0 ml			Analyst:	LI

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,1,1-Trichloroethane	1	ND	Carbon tetrachloride	1	ND
1,1,1,2-Tetrachloroethane	1	ND	Chlorobenzene	1	11
1,1,2,2-Tetrachloroethane	1	ND	Chlorodibromomethane	1	ND
1,1,2-Trichloroethane	1	ND	Chloroethane	2	ND
1,1-Dichloroethane	1	ND	Chloroform	1	ND
1,1-Dichloroethene	1	10	Chloromethane	2	ND
1,1-Dichloropropene	1	ND	Cis-1,2-Dichloroethene	1	ND
1,2-Dibromo-3-chloropropane	1	ND	Dichlorodifluoromethane	2	ND
1,2-Dibromoethane	1	ND	Dibromomethane	1	ND
1,2-Dichlorobenzene	1	ND	Ethylbenzene	1	ND
1,2-Dichloroethane	1	ND	Hexachlorobutadiene	1	ND
1,2-Dichloropropane	1	ND	Isopropylbenzene	1	ND
1,3,5-Trichlorobenzene	1	ND	m/p-Xylene	1	ND
1,2,3-Trichloropropane	1	ND	Methylene chloride	2	ND
1,2,4-Trichlorobenzene	1	ND	n-Butylbenzene	1	ND
1,2,4-Trimethylbenzene	1	ND	n-Propylbenzene	1	ND
1,3-Dichlorobenzene	1	ND	Naphthalene	1	ND
1,3-Dichloropropane	1	ND	o-Xylene	1	ND
1,3,5-Trimethylbenzene	1	ND	p-Isopropyltoluene	1	ND
1,4-Dichlorobenzene	1	ND	Sec-Butylbenzene	1	ND
2-Chlorotoluene	1	ND	Styrene	1	ND
2,2-Dichloropropane	1	ND	Tert-Butylbenzene	1	ND
4-Chlorotoluene	1	ND	Tetrachloroethene	1	ND
Benzene	1	10	Toluene	1	10
Bromodichloromethane	1	ND	Trans-1,2-Dichloroethene	1	ND
Bromobenzene	1	ND	Trichloroethene	1	10
Bromochloromethane	1	ND	Trichlorofluoromethane	1	ND
Bromoform	1	ND	Vinyl chloride	1	ND
Bromomethane	1	ND			

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Dibromofluoromethane	10	86-118	102
1,2-Dichloroethane-d4	10	80-120	98
Toluene-d8	10	88-110	100
4-Bromofluorobenzene	10	86-115	97

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Method Blank ID: BVBLKW25 LCS ID: BVLCSW29 MS ID: NA MSD ID: NA DUP ID: NA

[illegible] ANALYTICAL SERVICES

[illegible] Phone [illegible] Fax: [illegible] Toll Free [illegible]

LABORATORY REPORT

Client:	NA	Client Sample ID: MPL-MW02-GW2	Date Received: 08/16/96
Project Name:	NA		Date Reported: 09/06/96
Project No.:	NA		Report No.: 5525V012

GC/MS-VOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8260A	Sample Matrix:	WATER	Analyst:	LJ

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	5528.01	MS Sample ID:	5528.01MS	MSD Sample ID:	5528.01MSD
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	08/21/96	Date Analyzed:	08/21/96	Date Analyzed:	08/21/96
GC/MS File ID:	810059	GC/MS File ID:	810063	GC/MS File ID:	810061

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,1-Dichloroethene	10	ND	10	100	(61-145)
Benzene	10	ND	10	100	(76-127)
[illegible]benzene	10	ND	11	110	(75-130)
[illegible]e	10	ND	10	100	(76-125)
Trichloroethene	10	ND	10	100	(71-120)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	REC.
1,1-Dichloroethene	10	ND	11	100	0.0	14	(61-145)
Benzene	10	ND	10	100	0.0	11	(76-127)
Chlorobenzene	10	ND	11	110	0.0	13	(75-130)
Toluene	10	ND	10	100	0.0	13	(76-125)
Trichloroethene	10	ND	10	100	0.0	14	(71-120)

* : Values outside of QC limits

RPD: 0 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

SEMIVOLATILES

[illegible] INTERNATIONAL SERVICES
1680 Lake Front Circle, Ste. 3, The Woodlands, TX 77380; (713)363-2232

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PSP Sample ID:	[illegible] METHOD BLANK	Date Received:	NA
[illegible]ct No.:	NA	Report No.:	09298	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.00	Date Extracted:	08/19/96	GC/MS File ID:	09298
Sample Volume:	1000 ml	Date Analyzed:	08/19/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	10	ND	Benzo(a)pyrene	10	ND
1,2-Dichlorobenzene	10	ND	Benzo(b)fluoranthene	10	ND
1,3-Dichlorobenzene	10	ND	Benzo(g,h,i)perylene	10	ND
1,4-Dichlorobenzene	10	ND	Benzo(k)fluoranthene	10	ND
2,2'-oxybis (1-Chloropropane)	10	ND	Benzyl Alcohol	20	ND
2,4,5-Trichlorophenol	25	ND	Bis(2-chloroethoxy)methane	10	ND
2,4,6-Trichlorophenol	10	ND	Bis(2-chloroethyl)ether	10	ND
2,4-Dichlorophenol	10	ND	Bis(2-ethylhexyl)phthalate	10	ND
2,4-Dimethylphenol	10	ND	Butylbenzylphthalate	10	ND
2,4-Dinitrophenol	25	ND	Carbazole	10	ND
2,4-Dinitrotoluene	10	ND	Chrysene	10	ND
2,6-Dinitrotoluene	10	ND	Dibenzofuran	10	ND
2-Chloronaphthalene	10	ND	Dibenz(a,h)anthracene	10	ND
2-Chlorophenol	10	ND	Diethyl phthalate	10	ND
2-[illegible]thylnaphthalene	10	ND	Dimethyl phthalate	10	ND
[illegible]ylphenol	10	ND	Di-n-Butylphthalate	10	ND
2-[illegible]troaniline	25	ND	Di-n-Octylphthalate	10	ND
2-Nitrophenol	10	ND	Fluoranthene	10	ND
3,3-Dichlorobenzidine	20	ND	Fluorene	10	ND
3-Nitroaniline	25	ND	Hexachlorobenzene	10	ND
4,6-Dinitro-2-methylphenol	25	ND	Hexachlorobutadiene	10	ND
4-Bromophenyl-phenylether	10	ND	Hexachlorocyclopentadiene	10	ND
4-Chloroaniline	20	ND	Hexachloroethane	10	ND
4-Chlorophenyl-phenylether	10	ND	Indeno(1,2,3-cd)pyrene	10	ND
4-Chloro-3-methylphenol	20	ND	Isophorone	10	ND
4-Methylphenol	10	ND	Naphthalene	10	ND
4-Nitroaniline	25	ND	Nitrobenzene	10	ND
4-Nitrophenol	25	ND	N-Nitrosodimethylamine	10	ND
Acenaphthene	10	ND	N-Nitrosodiphenylamine	10	ND
Acenaphthylene	10	ND	N-Nitroso-di-N-propylamine	10	ND
Anthracene	10	ND	Pentachlorophenol	25	ND
Benzidine	25	ND	Phenanthrene	10	ND
Benzoic Acid	50	ND	Phenol	10	ND
Benzo(a)anthracene	10	ND	Pyrene	10	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
[illegible]enzene-d5	50	(35-114)	35	Phenol-d5	75	(10-94)	36
2-[illegible]luoropiphenyl	50	(43-116)	77	2-Fluorophenol	75	(21-100)	57
Terphenyl-d14	50	(33-141)	63	2,4,6-Tribromophenol	75	(10-123)	92

Method Blank: NA LCS ID: NA MS ID: NA MSD ID: NA

000050

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 2, The Woodlands, TX 77380; (713)363-2200

LABORATORY REPORT

Client:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3528.WLCS1 (LAB CONT. SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	D9299	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270B
Multiplying Factor:	1.0	Date Extracted:	08/19/96	GC/MS File ID:	D9299
Sample Volume:	1000 ml	Date Analyzed:	08/19/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
1,2,4-Trichlorobenzene	50	34	68	(39-98)
1,4-Dichlorobenzene	50	33	66	(36-97)
2,4-Dinitrotoluene	50	37	74	(24-96)
2-Chlorophenol	75	57	76	(27-123)
4-Chloro-3-methylphenol	75	56	75	(23-97)
4-Nitrophenol	75	19	25	(10-80)
Acenaphthene	50	34	68	(46-118)
N-Nitroso-di-N-propylamine	50	41	82	(41-116)
Pe[illegible]hlorophenol	75	60	80	(9-103)
[illegible]	75	25	33	(12-110)
Py[illegible]	50	42	84	(26-127)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Nitrobenzene-d5	50	(35-114)	80	Phenol-d5	75	(10-94)	37
2-Fluorobiphenyl	50	(43-116)	72	2-Fluorophenol	75	(21-100)	56
Terphenyl-d14	50	(33-141)	52	2,4,6-Tribromophenol	75	(10-123)	87

Method Blank: 3528.WBLX1 LCS ID:NA MS ID:NA MSD ID:NA

1650 Lake Front Circle, Ste. B, The Woodlands, TX 77380 713-363-2222

LABORATORY REPORT

Client:	NA	Client Sample ID:	MW1-MW01-SWCMS	Date Sampled:	07-15-96
Project Name:	NA	PDS Sample ID:	3528.01MS (MATRIX SPIKE)	Date Received:	08-16-96
Project No.:	NA	Report No.:	39301	Date Reported:	09-11-96

GC/MS-SEMI/SLIGHTLES DATA SHEET

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8270
Multiplying Factor:	2.00	Date Extracted:	08/19/96	GC/MS File ID:	39301
Sample Volume:	500 ml	Date Analyzed:	08/19/96	Analyst:	RF
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	20	66	Benzo(a)pyrene	20	ND
1,2-Dichlorobenzene	20	ND	Benzo(b)fluoranthene	20	ND
1,3-Dichlorobenzene	20	ND	Benzo(g,h,i)perylene	20	ND
1,4-Dichlorobenzene	20	60	Benzo(k)fluoranthene	20	ND
2,2'-oxybis (1-Chloropropane)	20	ND	Benzyl Alcohol	40	ND
2,4,5-Trichlorophenol	50	ND	Bis(2-chloroethoxy)methane	20	ND
2,4,6-Trichlorophenol	20	ND	Bis(2-chloroethyl)ether	20	ND
2,4-Dichlorophenol	20	ND	Bis(2-ethylhexyl)phthalate	20	ND
2,4-Dimethylphenol	20	ND	Butylbenzylphthalate	20	ND
2,4-Dinitrophenol	50	ND	Carbazole	20	ND
2,4-Dinitrotoluene	20	72	Chrysene	20	ND
2,6-Dinitrotoluene	20	ND	Dibenzofuran	20	ND
2-Chloronaphthalene	20	ND	Dibenz(a,h)anthracene	20	ND
2-Chlorophenol	20	104	Diethyl phthalate	20	ND
2-Methylnaphthalene	20	ND	Dimethyl phthalate	20	ND
2-[illegible]lphenol	20	ND	Di-n-butylphthalate	20	ND
2-[illegible]aniline	50	ND	Di-n-octylphthalate	20	ND
2-Nitrophenol	20	ND	Fluoranthene	20	ND
3,3-Dichlorobenzidine	40	ND	Fluorene	20	ND
3-Nitroaniline	50	ND	Hexachlorobenzene	20	ND
4,6-Dinitro-2-methylphenol	50	ND	Hexachlorobutadiene	20	ND
4-Bromophenyl-phenylether	20	ND	Hexachlorocyclopentadiene	20	ND
4-Chloroaniline	40	ND	Hexachloroethane	20	ND
4-Chlorophenyl-phenylether	20	ND	Indeno(1,2,3-cd)pyrene	20	ND
4-Chloro-3-methylphenol	40	104	Isophorone	20	ND
4-Methylphenol	20	ND	Naphthalene	20	ND
4-Nitroaniline	50	ND	Nitrobenzene	20	ND
4-Nitrophenol	50	40	N-Nitrosodimethylamine	20	ND
Acenaphthene	20	66	N-Nitrosodiphenylamine	20	ND
Acenaphthylene	20	ND	N-Nitroso-di-N-propylamine	20	72
Anthracene	20	ND	Pentachlorophenol	50	152
Benzidine	50	ND	Phenanthrene	20	ND
Benzoic Acid	100	ND	Phenol	20	46
Benzo(a)anthracene	20	ND	Pyrene	20	90

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
[illegible]nzene-d5	50	(33-114)	72	Phenol-d5	75	(10-94)	32
[illegible]biphenyl	50	(43-116)	69	2-Fluorophenol	75	(21-100)	49
Terphenyl-d14	50	(33-141)	49	2,4,6-Tribromophenol	75	(10-123)	84

Method Blank: 3528.MBLK1 LCS ID: 3528.WLCS1 MS ID: NA MSD ID: NA

000052

[illegible]

[illegible] Drive, Suite B, The Woodlands, TX 77380: [illegible]

[illegible] REPORT

[illegible]:	NA	Client Sample ID:	[illegible]	Date Sampled:	[illegible]
Project Name:	NA	RDF Sample ID:	3523.01MSD (MATRIX SPIKE DUP)	Date Received:	[illegible]
[illegible] No.:	NA	Report No.:	09302	Date Reported:	09/03/96

GC/MS-SEMIVOLATILES (DATA SHEET)

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-3510C
Multiplying Factor:	2.00	Date Extracted:	08/19/96	GC/MS File ID:	09302
Sample Volume:	500 ml	Date Analyzed:	08/19/96	Analyst:	RP
Extract Volume:	1.0 ml				

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)	COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
1,2,4-Trichlorobenzene	20	64	Benzo(a)pyrene	20	ND
1,2-Dichlorobenzene	20	ND	Benzo(b)fluoranthene	20	ND
1,3-Dichlorobenzene	20	ND	Benzo(g,h,i)perylene	20	ND
1,4-Dichlorobenzene	20	38	Benzo(k)fluoranthene	20	ND
2,2'-oxybis (1-Chloropropane)	20	ND	Benzyl Alcohol	40	ND
2,4,5-Trichlorophenol	50	ND	Bis(2-chloroethoxy)methane	20	ND
2,4,6-Trichlorophenol	20	ND	Bis(2-chloroethyl)ether	20	ND
2,4-Dichlorophenol	20	ND	Bis(2-ethylhexyl)phthalate	20	ND
2,4-Dimethylphenol	20	ND	Butylbenzylphthalate	20	ND
2,4-Dinitrophenol	50	ND	Carbazole	20	ND
2,4-Dinitrotoluene	20	70	Chrysene	20	ND
2,6-Dinitrotoluene	20	ND	Dibenzofuran	20	ND
2-Chloronaphthalene	20	ND	Dibenz(a,h)anthracene	20	ND
2-Chlorophenol	20	95	Diethyl phthalate	20	ND
2-Methylnaphthalene	20	ND	Dimethyl phthalate	20	ND
[illegible]ylphenol	20	ND	Di-n-Butylphthalate	20	ND
2-[illegible]roaniline	50	ND	Di-n-Octylphthalate	20	ND
2-Nitrophenol	20	ND	Fluoranthene	20	ND
3,3-Dichlorobenzidine	40	ND	Fluorene	20	ND
3-Nitroaniline	50	ND	Hexachlorobenzene	20	ND
4,6-Dinitro-2-methylphenol	50	ND	Hexachlorobutadiene	20	ND
4-Bromophenyl-phenylether	20	ND	Hexachlorocyclopentadiene	20	ND
4-Chloroaniline	40	ND	Hexachloroethane	20	ND
4-Chlorophenyl-phenylether	20	ND	Indeno(1,2,3-cd)pyrene	20	ND
4-Chloro-3-methylphenol	40	102	Isophorone	20	ND
4-Methylphenol	20	ND	Naphthalene	20	ND
4-Nitroaniline	50	ND	Nitrobenzene	20	ND
4-Nitrophenol	50	38	N-Nitrosodimethylamine	20	ND
Acenaphthene	20	66	N-Nitrosodiphenylamine	20	ND
Acenaphthylene	20	ND	N-Nitroso-di-n-propylamine	20	70
Anthracene	20	ND	Pentachlorophenol	50	122
Benzidine	50	ND	Phenanthrene	20	ND
Benzoic Acid	100	ND	Phenol	20	42
Benzo(a)anthracene	20	ND	Pyrene	20	80

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery	Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
[illegible]nzene-d5	50	(35-114)	71	Phenol-d5	75	(10-94)	30
2-[illegible]ropiophenyl	50	(43-116)	70	2-Fluorophenol	75	(21-100)	46
Terphenyl-d14	50	(33-141)	48	2,4,6-Tribromophenol	75	(10-123)	83

Method Blank: 3523.MBLK1 LCS ID: 3523.MLCS1 MS ID: NA MSD ID: NA

000053

1 [illegible] Lake Park Circle, Ste. B, [illegible] Sioux City, IA 1[illegible], (712)[illegible]

LABORATORY REPORT

Client:	NA	Date Received:	08/16/96
Project Name:	NA	Date Reported:	09/03/96
Project No.:	NA	Report No.:	3528S01Q

GC/MS-SEMIVOLATILES (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.: SW846-8270B Sample Matrix: WATER Analyst: RP

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3528.01	MS Sample ID:	3528.01MS	MSD Sample ID:	3528.01MSD
Client Sample ID:	MPL-MW02-GW2	Client Sample ID:	MPL-MW02-GW2MS	Client Sample ID:	MPL-MW02-GW2MSD
Sample Volume:	1000 ml	Sample Volume:	500 ml	Sample Volume:	500 ml
Extract Volume:	1.0 ml	Extract Volume:	1.0 ml	Extract Volume:	1.0 ml
Dilution:	1.0	Dilution:	1.0	Dilution:	1.0
Date Analyzed:	08/19/96	Date Analyzed:	08/19/96	Date Analyzed:	08/19/96
GC/MS File ID:	D9300	GC/MS File ID:	D9301	GC/MS File ID:	D9302

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC.	QC LIMITS REC.
1,2,4-Trichlorobenzene	100	ND	66	66	(39-98)
1,4-Dichlorobenzene	100	ND	60	60	(36-97)
2,4-Dinitrotoluene	100	ND	72	72	(24-96)
2-Chlorophenol	150	ND	104	69	(27-123)
4-Chloro-3-methylphenol	150	ND	104	69	(23-97)
4-Nitrophenol	150	ND	40	27	(10-80)
Acenaphthene	100	ND	66	66	(46-118)
N-Nitroso-di-N-propylamine	100	ND	72	72	(41-116)
Pentachlorophenol	150	ND	132	88	(9-103)
Phenol	150	ND	46	31	(12-110)
Pyrene	100	ND	80	80	(26-127)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
1,2,4-Trichlorobenzene	100	ND	64	64	3.1	42	(39-98)
1,4-Dichlorobenzene	100	ND	58	58	3.4	28	(36-97)
2,4-Dinitrotoluene	100	ND	70	70	2.8	28	(24-96)
2-Chlorophenol	150	ND	98	65	5.9	40	(27-123)
4-Chloro-3-methylphenol	150	ND	102	68	1.9	28	(23-97)
4-Nitrophenol	150	ND	38	25	5.1	42	(10-80)
Acenaphthene	100	ND	66	66	0.0	31	(46-118)
N-Nitroso-di-N-propylamine	100	ND	70	70	2.8	50	(41-116)
Pentachlorophenol	150	ND	122	81	7.9	38	(9-103)
Phenol	150	ND	42	28	9.1	42	(12-110)
Pyrene	100	ND	80	80	0.0	31	(26-127)

* - Values outside of QC limits

RPD: 0 out of 11 outside limits

Spike Recovery: 0 out of 22 outside limits

METALS

POP ANALYTICAL SERVICES
1680 Lake Front Circle, Sts. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
POP Sample ID: ICPB352 (METHOD BLANK)
Report Number: ICPB352

Date Sampled: NA
Date Received: NA
Date Reported: 09/10/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER — Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	0.06	ND	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Barium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Boron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC
Iron	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Lead	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Li[illegible]	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Ma[illegible]um	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.05	ND	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	0.04	ND	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	5.0	ND	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Silicon	SW846-6010A	08-19-96	09-09-96	0.50	ND	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	1.0	ND	DOC
Strontium	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Tin	SW846-6010A	08-19-96	09-09-96	0.10	ND	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.005	ND	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	0.01	ND	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	0.02	ND	DOC

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

Client Sample ID: NA
PDP Sample ID: HGB279 (METHOD BLANK)
Report Number: HGB279

Date Sampled: NA
Date Received: NA
Date Reported: 09/11/96

TOTAL METALS (DATA SHEET)

Sample Matrix: WATER

Units: mg/L

ANALYTE	METHOD	DATE PREPARED	DATE ANALYZED	QUANTITATION LIMIT	RESULT	ANALYST
Mercury	SW846-7470A	08-21-96	08-22-96	0.00020	ND	MS

QUALITY ASSURANCE/QUALITY CONTROL

ICP Method Blank ID: NA
GFAA Method Blank ID: NA
CVAA Method Blank ID: NA

ICP LCS ID: NA
GFAA LCS ID: NA
CVAA LCS ID: NA

ICP LCSD ID: NA
GFAA LCSD ID: NA
CVAA LCSD ID: NA

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: ICPL352
LCSD ID: ICPL352D

Date Reported: 09/10/96
Report Number: ICPL352

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER — Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Aluminum	SW846-6010A	08-19-96	09-09-96	5.0	4.69	94	4.61	92	1.7	DOC
Antimony	SW846-6010A	08-19-96	09-09-96	1.25	1.19	95	1.2	96	0.8	DOC
Arsenic	SW846-6010A	08-19-96	09-09-96	0.25	0.24	96	0.235	94	2.1	DOC
Barium	SW846-6010A	08-19-96	09-09-96	5.0	4.87	97	4.8	96	1.4	DOC
Beryllium	SW846-6010A	08-19-96	09-09-96	0.125	0.125	100	0.122	98	2.4	DOC
Boron	SW846-6010A	08-19-96	09-09-96	1.0	1.08	108	1.04	104	3.8	DOC
Cadmium	SW846-6010A	08-19-96	09-09-96	0.125	0.119	95	0.116	93	2.6	DOC
Calcium	SW846-6010A	08-19-96	09-09-96	12.5	12.2	98	12.0	96	1.7	DOC
Chromium	SW846-6010A	08-19-96	09-09-96	0.50	0.478	96	0.47	94	1.7	DOC
Cobalt	SW846-6010A	08-19-96	09-09-96	1.25	1.22	98	1.20	96	1.7	DOC
Copper	SW846-6010A	08-19-96	09-09-96	0.625	0.614	98	0.595	95	3.1	DOC
Iron	SW846-6010A	08-19-96	09-09-96	2.5	2.38	95	2.34	94	1.7	DOC
L[illegible]	SW846-6010A	08-19-96	09-09-96	0.25	0.237	95	0.231	92	2.6	DOC
Li[illegible]	SW846-6010A	08-19-96	09-09-96	1.0	1.0	100	0.96	96	4.1	DOC
Magnesium	SW846-6010A	08-19-96	09-09-96	12.5	12.0	96	11.8	94	1.7	DOC
Manganese	SW846-6010A	08-19-96	09-09-96	1.25	1.23	98	1.20	96	2.5	DOC
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.50	0.47	94	0.47	94	0.0	DOC
Nickel	SW846-6010A	08-19-96	09-09-96	1.25	1.21	97	1.19	95	1.7	DOC
Potassium	SW846-6010A	08-19-96	09-09-96	12.5	11.7	94	11.6	93	0.9	DOC
Selenium	SW846-6010A	08-19-96	09-09-96	0.25	0.23	92	0.2	96	4.3	DOC
Silicon	SW846-6010A	08-19-96	09-09-96	1.0	1.13	113	1.1	110	2.7	DOC
Silver	SW846-6010A	08-19-96	09-09-96	0.625	0.586	94	0.576	92	1.7	DOC
Sodium	SW846-6010A	08-19-96	09-09-96	12.5	11.3	90	11.1	89	1.8	DOC
Strontium	SW846-6010A	08-19-96	09-09-96	0.50	0.45	90	0.46	92	2.2	DOC
Tin	SW846-6010A	08-19-96	09-09-96	0.50	0.47	94	0.46	92	2.2	DOC
Thallium	SW846-6010A	08-19-96	09-09-96	0.25	0.242	97	0.224	90	7.7	DOC
Vanadium	SW846-6010A	08-19-96	09-09-96	1.25	1.18	94	1.16	93	1.7	DOC
Zinc	SW846-6010A	08-19-96	09-09-96	1.25	1.19	95	1.17	94	1.7	DOC

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: ICPB352

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

Client: NA
Project Name: NA
Project Number: NA

LCS ID: HGL279
LCSD ID: HGL279D

Date Reported: 09/11/96
Report Number: HGL279

TOTAL METALS (LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE)

Sample Matrix: WATER — Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	TRUE VALUE	LCS FOUND VALUE	LCS % RECOVERY (80-120)	LCSD FOUND VALUE	LCSD % RECOVERY (80-120)	RPD (20)	ANALYST
Mercury	SW846-7470A	08-21-96	08-22-96	0.0020	0.0021	105	0.0022	110	4.7	MS

QUALITY ASSURANCE/QUALITY CONTROL

Method Blank ID: MGB279

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, TX 77380; Phone (713)363-2233

LABORATORY REPORT

[redacted]: NA
Project Name: NA
Project Number: NA

PDP MS ID: 3517.01MS
PDP MSD ID: 3517.01MSD
Report Number: I517MS01

Date Sampled: NA
Date Received: NA
Date Reported: 09/10/96

TOTAL METALS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE)

Sample Matrix: WATER — Units: mg/L

ELEMENT	METHOD	DATE PREPARED	DATE ANALYZED	SAMPLE VALUE	MATRIX SPIKE ADDED	MATRIX SPIKE VALUE	PERCENT RECOVERY (75-125)	MATRIX SPIKE DUP VALUE	PERCENT RECOVERY (75-125)	RPD (20)
Aluminum	SW846-6010A	08-19-96	09-09-96	ND	2.0	2.08	104	2.1	105	1.0
Antimony	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.49	98	0.49	98	0.0
Arsenic	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.94	97	1.98	99	2.0
Barium	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.5	75	1.34	67*	11.3
Beryllium	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.044	88	0.045	90	2.2
Boron	SW846-6010A	08-19-96	09-09-96	2.29	1.0	3.27	98	3.36	107	2.7
Cadmium	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.04	80	0.042	84	4.9
Chromium	SW846-6010A	08-19-96	09-09-96	ND	0.20	0.172	86	0.175	87	1.7
Cobalt	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.419	84	0.432	86	3.1
Copper	SW846-6010A	08-19-96	09-09-96	ND	0.25	0.273	109	0.268	107	1.8
Iron	SW846-6010A	08-19-96	09-09-96	0.29	1.0	1.13	84	1.16	87	2.6
Lead	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.38	76	0.383	77	0.8
[redacted]	SW846-6010A	08-19-96	09-09-96	288	NA	279	NA	287	NA	2.8
[redacted]	SW846-6010A	08-19-96	09-09-96	0.021	0.50	0.461	88	0.47	90	1.9
Mercury	SW846-7470A	08-21-96	08-22-96	ND	0.0010	0.001	100	0.0010	100	0.0
Molybdenum	SW846-6010A	08-19-96	09-09-96	0.1	0.50	0.551	90	0.565	93	2.5
Nickel	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.483	97	0.489	98	1.2
Selenium	SW846-6010A	08-19-96	09-09-96	ND	2.0	2.0	100	2.1	105	4.9
Silicon	SW846-6010A	08-19-96	09-09-96	19.6	1.0	20.1	**	20.4	**	1.5
Silver	SW846-6010A	08-19-96	09-09-96	ND	0.05	0.043	86	0.042	84	2.4
Strontium	SW846-6010A	08-19-96	09-09-96	8.3	0.50	8.33	**	8.73	**	4.7
Thallium	SW846-6010A	08-19-96	09-09-96	ND	2.0	1.84	92	1.95	98	5.8
Tin	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.45	90	0.47	94	4.3
Vanadium	SW846-6010A	08-19-96	09-09-96	0.03	0.50	0.479	90	0.488	92	1.9
Zinc	SW846-6010A	08-19-96	09-09-96	ND	0.50	0.378	76	0.396	79	4.7

QUALITY ASSURANCE/QUALITY CONTROL

ICP LCS ID: ICPL352
GFAA LCS ID: NA
CVAA LCS ID: HGL278

ICP MS ID: NA
GFAA MS ID: NA
CVAA MS ID: NA

ICP Method Blank ID: ICPB352
GFAA Method Blank ID: NA
CVAA Method Blank ID: HGB278

ICP LCSD ID: ICPL352D
GFAA LCSD ID: NA
CVAA LCSD ID: HGL278D

ICP MSD ID: NA
GFAA MSD ID: NA
CVAA MSD ID: NA

* = Indicates the value is outside control limits.
[redacted]h analyte concentration prevented accurate determination of the matrix spike recovery.
D[redacted] sample required a post-digest (instrument) dilution resulting in a dilution of the matrix spike added.

PCBs

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3526.WBLK1 (METHOD BLANK)	Date Received:	NA
Project No.:	NA	Report No.:	E02334	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010			GC File ID:	E02334
Sample Weight:	1000 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	1	ND
Aroclor-1221	2	ND
Aroclor-1232	1	ND
Aroclor-1242	1	ND
Aroclor-1248	1	ND
Aroclor-1254	1	ND
Aroclor-1260	1	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	85
Decachlorobiphenyl	0.2	(30-150)	81

Method Blank ID: NA	LCS ID: NA	MS ID: NA	MSD ID: NA	DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	NA	Date Sampled:	NA
Project Name:	NA	PDP Sample ID:	3526.WLCS1(LAB CONTROL SAMPLE)	Date Received:	NA
Project No.:	NA	Report No.:	E02335	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS

Sample Matrix:	WATER	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.010	Date Extracted:	08/16/96	GC File ID:	E02335
Sample Volume:	1000 ml	Date Analyzed:	08/29/96	Analyst:	SM
Extract Volume:	10 ml				

COMPOUND	LCS TRUE VALUE (ug/L)	LCS RESULT (ug/L)	LCS % REC.	LCS REC. LIMITS
Aroclor-1254	5.0	4.16	83	(30-150)

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.2	(30-150)	83
Decachlorobiphenyl	0.2	(30-150)	77

Method Blank: 3526.WBLK1 LCS ID: NA MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

[illegible]	NA	Client Sample ID:	MPL-MW02-GW2MS	Date Sampled:	08/15/96
Project Name:	NA	PDP Sample ID:	3528.01MS (MATRIX SPIKE)	Date Received:	08/16/96
Project No.:	NA	Report No.:	E02339	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.020			GC File ID:	E02339
Sample Weight:	500 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	2	ND
Aroclor-1221	4	ND
Aroclor-1232	2	ND
Aroclor-1242	2	ND
Aroclor-1248	2	ND
Aroclor-1254	2	10
Aroclor-1260	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.4	(30-150)	85
Decachlorobiphenyl	0.4	(30-150)	61

Method Blank ID: 3526.WBLK1 LCS ID: 3526.WLCS1 MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. B; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

[illegible]:	NA	Client Sample ID:	MPL-MW02-GW2MSD	Date Sampled:	08/15/96
Project Name:	NA	PDP Sample ID:	3528.01MSD (MATRIX SPIKE DUPLICATE)	Date Received:	08/16/96
Project No.:	NA	Report No.:	E02340	Date Reported:	09/09/96

GC-POLYCHLORINATED BIPHENYLS (DATA SHEET)

Sample Matrix:	Water	Dilution:	1.0	Method Ref.:	SW846-8080A
Multiplying Factor:	0.020			GC File ID:	E02340
Sample Weight:	500 mL	Date Extracted:	08/16/96	Analyst:	SM
Extract Volume:	10 mL	Date Analyzed:	08/29/96		

COMPOUND	QUANTITATION LIMIT (ug/L)	RESULTS (ug/L)
Aroclor-1016	2	ND
Aroclor-1221	4	ND
Aroclor-1232	2	ND
Aroclor-1242	2	ND
Aroclor-1248	2	ND
Aroclor-1254	2	9
Aroclor-1260	2	ND

QUALITY ASSURANCE/QUALITY CONTROL

Surrogate	Spike Added (ug/L)	QC Limits (Recovery)	% Recovery
Tetrachloro-m-xylene	0.4	(30-150)	78
Decachlorobiphenyl	0.4	(30-150)	61

Method Blank ID: 3526.WBLK1 LCS ID: 3526.WLCS1 MS ID: NA MSD ID: NA DUP ID: NA

PDP ANALYTICAL SERVICES
1680 Lake Front Circle, Ste. 8; The Woodlands, Texas 77380; Phone (713)363-2233

LABORATORY REPORT

Client:	NA	Client Sample ID:MPL-MW02-GW2		Date Received:	NA
Project Name:	NA			Date Reported:	09/09/96
Project No.:	NA			Report No.:	3528A01Q

GC-POLYCHLORINATED BIPHENYLS (MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERY SUMMARY)

Method Ref.:	SW846-8080A	Sample Matrix:	WATER	Analyst:	SM

SAMPLE		MATRIX SPIKE		MATRIX SPIKE DUPLICATE	
PDP Sample ID:	3528.01	MS Sample ID:	3528.01MS	MSD Sample ID:	3528.01MSD
Date Analyzed:	08/29/96	Date Analyzed:	08/29/96	Date Analyzed:	08/29/96
GC File ID:	E02338	GC File ID:	E02339	GC File ID:	E02340

MATRIX SPIKE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE CONC. (ug/L)	MS % REC.	QC LIMITS REC.
Aroclor-1254	10	ND	10	100	(30-150)

MATRIX SPIKE DUPLICATE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONC. (ug/L)	MATRIX SPIKE DUPLICATE CONC. (ug/L)	MSD % REC.	RPD	QC LIMITS RPD.	QC LIMITS REC.
Aroclor-1254	10	ND	9	90	10.5	50	(30-150)

* = Values outside of QC limits

RPD:	0 out of 1 outside limits
Spike Recovery	0 out of 2 outside limits

GENERAL CHEMISTRY

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

SUB-CONTRACT DATA

QUALITY CONTROL DATA PRESENTED ON DATA SHEET

END OF REPORT

LABORATORY ANALYTICAL REPORT

ANALYSES FOR URANIUM, RADIUM 226 AND RADIUM 228

PDP
Analytical Services

1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Phone (713) 363-2233
Fax (713) 298-5784

September 20, 1996

Ms. Dana Downs
Mevatec Corporation
P.O. Box 399
White Sands Missile Range
New Mexico 88002

Episode: 3528 & 3531
Project ID: Background Groundwater Monitoring At MPL
Project #: 300-ii-J

Dear Ms. Downs:

Enclosed are the analytical results for uranium and radium. The samples for these analyses were sub-contracted to CEP Laboratory in Sante Fe, New Mexico.

We appreciate your business. Should you have any questions or need assistance with this report, please feel free to call me or Homai Madisetty, Data Review Officer, at (713) 292-7090.

Sincerely,

Homai Madisetty for

Bruce D. Howbert
Program Manager

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: RRB DATE OF PHYSICAL LOG-IN: 8/16/96 PAGE 1 OF 1

Episode #: 3528
Client Name: MEVATEC
Project ID: BACKGROUND GROUNDWATER MONITORING AT MPL
Project #: 300-II J
PO Number: NA
Courier/No.: FED EX #'s 0323900721 / 0323900861 / 0323900824

DATE OF COMPUTER LOG-IN: 8/16/96 13:19
COMPUTER LOG-IN BY: RRB
DATE RECEIVED: 8/16/96
TIME RECEIVED: 1000

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3528.01	MPL-MW02-GW2	VOA-8260A SVOA-8270B TOC-9060B URANIUM-906.1 TOTAL METALS-6010-Al,Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Fe,Pb,Mn,Mg,Mo,Ni,Se,Ag,Ca,K,Tl,Na,V,Zn Hg-7470A CONDUCTANCE-120.1 pH-9040 CARBONATE/BICARBONATE-310.1 CHLORIDE-325.3 FLUORIDE-340.2 SULFATE-375.4 TDS-160.1 AMMONIA-350.3 TKN-351.2 NITRATE/NITRITE-353.2 RADIUM 226 / EPA 903.1 RADIUM 228 / EPA 904.0 PCB-8080 TOTAL CYANIDE-9010 PHENOL-9065	32	WATER	8/15/96	0840 / 0900	3528A / 3528C	8/30/96 HC	MS/MSD
3528.02	MPL-MW04-GW2	SAME AS ABOVE	16	WATER	8/15/96	1320	3528B		
3528.03	TRIP BLANK	VOA-8260A	1	WATER	N/A	N/A	3528A		

REMARKS:
TKN AND NITRATE/NITRITE SUBBED TO NDRC DALLAS
URANIUM, RADIUM 226 / 228 SUBBED TO CEP

Weight basis: X wet ___ dry
Deliverables: X norm ___ CLP-like ___ CLP
___ raw data X electronic

APPROVED BY/DATE: RB 8/16/96

SEND REPORT TO: DANA DOWNS

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

#[illegible]2BA

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT NO.: 300-ii J

PROJECT NAME: Background Groundwater Monitoring @ MPC

SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/15/96	0840	MPL-MW02-GW2-MS	W	3528.01	16		see attached file
8/15/96	0900	MPL-MW02-GW2	W	3528.02	2		VOAs only
8/15/96	1320	MPL-MW04-GW2	W	3528.03	2		VOAs only
—	—	Trip Blank	W	3528.04	1		

PROJECT INFORMATION			1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dana Downs	SAMPLES RECEIVED		(PRINTED NAME) J. Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
SHIPPING ID. NO.: 300 ii J	TOTAL NO. OF CONTAINERS		RECEIVED BY: Adolfo R. Barrientes	RECEIVED BY:	(COMPANY)
VIA: FEDEX	CHAIN OF CUSTODY SEALS		(TIME / DATE) 1600 8/16/96	(TIME / DATE)	(TIME / DATE)
	GOOD CONDITION/CHILLED		SPECIAL INSTRUCTIONS / COMMENTS: includes VOAs for samples MPL-MW02-GW2 + MPL-MW04-GW2		
	CONFORMS TO RECORD				

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

200002

003

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

CHAIN OF CUSTODY RECORD

#3528B

PAGE 1 OF 1

PROJECT NO.: 300-ii J

PROJECT NAME: Background Groundwater Monitoring @ MPL

SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/15/96	1320	MPL-MW04-GW2	W	3528.02	14		see attached list

SUBMITTED

PROJECT INFORMATION		
PROJECT MANAGER: Dana Downs	SAMPLES RECEIVED	
	TOTAL NO. OF CONTAINERS	
SHIPPING ID. NO.: 300-ii J	CHAIN OF CUSTODY SEALS	
BILL: TRK#032.3900.8621	GOOD CONDITION/CHILLED	
FEDEX	CONFORMS TO RECORD	

1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
(PRINTED NAME) J Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
RECEIVED BY: Tony R Barrientos	RECEIVED BY:	(COMPANY)
(TIME / DATE) 10:30 AM 8/16/96	(TIME / DATE)	(TIME / DATE)

SPECIAL INSTRUCTIONS / COMMENTS: VOA's shipped with sample # MPL-MW02-GW2-MS

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

3528C

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT NO.: 300-ii J

PROJECT NAME: Background Groundwater Monitoring at MPL

SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/15/96	0900	MPL-MW02-GW2	w	3528.01	14		see attached list

PROJECT INFORMATION	SAMPLES RECEIVED		1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dana Downs	TOTAL NO. OF CONTAINERS		(PRINTED NAME): Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
SHIPPING ID. NO.: 300 ii J	CHAIN OF CUSTODY SEALS		RECEIVED BY: Mark R. Barrientos	RECEIVED BY:	(COMPANY)
WATER# 032-3900-B24	GOOD CONDITION/CHILLED		(TIME / DATE): 10:00 AM 8/16/96	(TIME / DATE)	(TIME / DATE)
FEDEX	CONFORMS TO RECORD		SPECIAL INSTRUCTIONS / COMMENTS: VOAs shipped with sample # MPL-MW02-GW2-MS		

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

SAMPLE L -IN CHECKLIST/DISCREPA Y REPORT

FID: SLCDR01.96

EPISODE #: 3528 DATE/ REC'D: 8/16/96 1000AM TEMP & ID: 1) 4.1°C 3528A
TIME

CLIENT NAME: McVATEC 2) 4.6°C 3528B

ECT NAME: BACKGROUND GROUNDWATER MONITORING @ MPC 3) 4.0°C 3528C

PROJECT NUMBER: 300-11 J 4) ____ # ____

2 AQUEOUS, # Ø SOIL SAMPLES 5) ____ # ____

COURIER/AIRBILL # 032-3900-721/861/824 6) ____ # ____

SAMPLE CONTAINER SEALS: present absent intact broken

COOLER CUSTODY SEALS: present absent intact broken NAME & DATE: ____

HOW MANY AND WHERE ____

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
Container Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :	✓	
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:		✓
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client? TRIP BLANK (3528.03) HAS AIR BUBBLES.

Project Manager's recommendations? NOTIFY CLIENT VIA FAX

Who was notified? D. DOWNS By whom? RB Date: 8-16-96

Client's comments:

Corrective actions carried out?

COMMENTS:

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab?

LOG-IN BY: Robert R. Barrientos DATE: 8/16/96

000006

PDP ANALYTICAL SERIVES

24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

P.O. #96592

Sent to: NDRC-DALLAS

Contact: JT Phone: 214.238.5591

Sent by: Walter Bichon

Date sent: 8/19/96 Date Results needed: 8/30/96

PDP Sample ID	No. of Containers	a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/ ~~Wet~~
3528.01		X	X									WATER	9216 -1
3528.02		X	X										-2
SCREENED FOR RADIOACTIVITY	COOLER TEMPERATURE WHEN RECEIVED 6 °C												

ORIGINAL

CUSTODY TRANSFERS

	Relinquished by:	Recieved by:	Date/Time
1.	Walter Bichon	8/19/96	1530
	D. Fields	D. Fields	8-20-96 10:20

Courier: 8721272195

ANALYTICAL PARAMETERS

A TKN - 351.2
B NITRATE/NITRITE - 353.2
C
D
E
F
G
H
I
J

Project Manager Approval: RB

Lab Manager Approval:

000011
000007

1680 LAKE FOREST CIRCLE NO D

WOODLAND SP TX 77380

PDP ANALYTICAL SERIVES
24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

P.O.# 96594

Sent to: CEP

Contact: Elsie Phone: 505.982.9841

Sent by: Walter Bichon

Date sent: 8/19/96 Date Results needed: 8/30/96

PDP Sample ID	No. of Containers	Anaylsis Request a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/ Wet
3528.01		X	X									WATER	
3528.02		X	X									WATER	

CUSTODY TRANSFERS

	Relinquished by:	Recieved by:	Date/Time
1.	Walter Bichon		8/19/96 1530
2.		[illegible]	8-20-96 [illegible]

Courier: 872272184

ANALYTICAL PARAMETERS

A URANIUM - 908.1
B RADIUM 226 & RADIUM 228
C
D
E
F
G
H
I
J

Project Manager Approval: [illegible]

Lab Manager Approval:

00005

SUB-CONTRACT DATA

Controls for Environmental
Pollution, Inc.
P.O. Box 5351
Santa Fe, NM 87502

Phone: (505) 982-9841/(800) 545-2188

PDP Analytical Services
1680 Lake Front Circle Ste B
The Woodland, TX 77380

Attn: Jon Lindquist
Invoice Number:

Order #: 96-08-114
Date: 09/10/96 16:07
Work ID: Water (NR)
Date Received: 08/20/96
Date Completed: 09/10/96
Client Code: PDP_ANALYT

SAMPLE IDENTIFICATION

Sample Number	Sample Description	Sample Number	Sample Description
01	3528.01	02	3528.02

Our reports are rendered upon the condition that they are not to be reproduced wholly or in part for advertising and/or other purposes over our signature or in connection with our name without special permission in writing.

Remainder of sample(s) for routine analysis will be disposed of three weeks from final report date. Sample(s) for bacteria analysis only, will be disposed of immediately after analysis. This is not applicable if other arrangements have been made.

James Mueller
Certified By
by Heidi P. Wallace

000010

Controls for Environmental

TEST RESULTS BY SAMPLE

Sample: 01A 3528.01 MPL-MW02-G02 Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Total Uranium	<0.001	0.001	mg/liter	09/06/96	TM

Sample: 01B 3528.01 Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Radium-226	<0.6	0.6	pCi/liter	09/04/96	MM
Radium-228	<2	2	pCi/liter	09/04/96	MM

Sample: 02A 3528.02 MPL-MW04-G02 Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Total Uranium	<0.001	0.001	mg/liter	09/06/96	TM

Sample: 02B 3528.02 Collected.

Test Description	Result	D.L.	Units	Analyzed	By
Radium-226	<0.6	0.6	pCi/liter	09/04/96	MM
Radium-228	<2	2	pCi/liter	09/04/96	MM

END OF REPORT

CHAIN-OF-CUSTODY

PDP ANALYTICAL SERVICES
SAMPLE LOG-IN SHEET

LOGGED BY: RRB DATE OF PHYSICAL LOG-IN: 8/17/96 PAGE 1 OF 1

Episode #: 3531
Client Name: MEVATEC
Project ID: BACKGROUND GROUNDWATER MONITORING AT MPL
Project #: 300-II J
PO Number: NA
Courier/No.: FED EX # 0118791724

DATE OF COMPUTER LOG-IN: 8/17/96 12:19
COMPUTER LOG-IN BY: RRB
DATE RECEIVED: 8/17/96
TIME RECEIVED: 1030

Lab Sample ID	Client Sample ID	Testing Required	No. Cont	Sample Matrix	Date Sampled	Time Sampled	Chain - of - Custody No.	Date Due	Remarks
3531.01	MPL-MW01-GW2	VOA-8260A SVOA-8270B TOC-9060B URANIUM-908.1 TOTAL METALS-6010-Al,,Sb,As,Ba,Be,B,Cd,Cr,Co, Cu,Fe,Pb,Mn,Mg,Mo,Ni,Se,Ag,Ca,K,Tl,Na,V,Zn Hg-7470A CONDUCTANCE-120.1 pH-9040 CARBONATE/BICARBONATE-310.1 CHLORIDE-325.3 FLUORIDE-340.2 SULFATE-375.4 TDS-160.1 AMMONIA-350.3 TKN-351.2 NITRATE/NITRITE-353.2 RADIUM 226 / EPA 903.1 RADIUM 228 / EPA 904.0 PCB-8080 TOTAL CYANIDE-9010 PHENOL-9065	16	WATER	8/16/96	0940	3531A	8/31/96 HC	
3531.02	TRIP BLANK	VOA-8260A	1	WATER	N/A	N/A	3531A		

REMARKS:	Weight basis: X wet ___ dry
TKN AND NITRATE/NITRITE SUBBED TO NDRC DALLAS	Deliverables: X norm ___ CLP-like ___ CLP
URANIUM, RADIUM 226 / 228 SUBBED TO CEP	___ raw data X electronic

APPROVED BY/DATE: RB 8/17/96

SEND REPORT TO: DANA DOWNS

000014

~~000006~~

MEVATEC CORPORATION
P.O. Box 399
Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

3531A

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT NO.: 300-ii J

PROJECT NAME: Background Groundwater Monitoring at MPL

SAMPLER'S SIGNATURE:

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
8/16/96	0940	MPL-MW01-GW2	W	3531.01	16		See attached list
—	—	Trip Blank	W	3531.02	1		VOA

PROJECT INFORMATION			1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dana Downs	SAMPLES RECEIVED		(PRINTED NAME) J. Kyle Williams	(PRINTED NAME)	(PRINTED NAME)
	TOTAL NO. OF CONTAINERS		RECEIVED BY: Ronald Barrientos	RECEIVED BY:	(COMPANY)
SHIPPING ID. NO.: 300-ii J	CHAIN OF CUSTODY SEALS		(TIME / DATE) 8/16/96 1030	(TIME / DATE)	(TIME / DATE)
VIA: TRK# 011-8791-722 FEDEX	GOOD CONDITION/CHILLED		SPECIAL INSTRUCTIONS / COMMENTS:		
	CONFORMS TO RECORD				

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

TDI ANALYTICAL SER[illegible]

SAMPLE L[illegible]-IN CHECKLIST/DISCREPA[illegible]Y REPORT

FID: SLCDR01.96

EPISODE #: 3531 DATE/ TIME REC'D: 8/17/96 1030 TEMP & ID: 1) 4.0°C 3531A

CLIENT NAME: MEVATEC 2) ____ # ____

PROJECT NAME: BACKGROUND GROUNDWATER MONITORING AT MPL 3) ____ # ____

PROJECT NUMBER: 300-11 J 4) ____ # ____

2 AQUEOUS, # 0 SOIL SAMPLES 5) ____ # ____

COURIER/AIRBILL # TRK# 011-8741-724 6) ____ # ____

SAMPLE CONTAINER SEALS: present absent (intact) broken

COOLER CUSTODY SEALS: present absent (intact) broken NAME & DATE: ____

HOW MANY AND WHERE ____

	YES	NO
Were samples screened for radioactivity?	✓	
Chain-of-custody present?	✓	
Custody documents: Sealed in a plastic bag?	✓	
Signed and dated by field personnel	✓	
Filled out properly in indelable ink?	✓	
Signed and dated by log-in personnel?	✓	
Container Condition: Each containers sealed in a separate plastic bag?	✓	
Labels complete (ID, date, time, signature, preservative, etc.)?	✓	
Labels agree with chain-of-custody?	✓	
Received without leakage or breakage? If no, list :	✓	
Correct quantity indicated on chain-of-custody?	✓	
Sample Integrity: Correct containers used for the test indicated? If no, list:	✓	
Correct preservatives added to the samples? If no, list:	✓	
Sufficient sample amount sent for the tests indicated? If no, list	✓	
VOA vials filled completely? If no, list:	✓	
Aqueous volatiles samples preserved? If no, list:	✓	

Descrepancy Report:

Discepancies to be discussed with the client?

Project Manager's recommendations?

Who was notified? By whom? Date:

Client's comments:

Corrective actions carried out?

COMMENTS:

~~000015~~

For those short holding time and fast turn-around parameters, has a Rush Notification sheet been issued to the lab? | |

LOG-IN BY: Robert R. Barrientos DATE: 8/17/96

000016

PDP ANALYTICAL SERIVES

24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

P.O. #96593

Sent to: NDRC-DALLAS

Contact: JT Phone: 214.238.5591

Sent by: Walter Bichon

Date sent: 8/19/96 Date Results needed: 8/31/96

PDP Sample ID	No. of Containers	Anaylsis Request a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/Wet
3531.01		X	X									WATER	9015 -1

COOLER TEMPERATURE WHEN RECEIVED 6 °C

SCREENED FOR RADIOACTIVITY

ORIGINAL

000003

CUSTODY TRANSFERS

	Relinquished by:	Recieved by:	Date/Time
1.	Walter Bichon		8/19/96 1530
2.		D. Fuller	8-20-96 10:2

Courier: 872/272195

ANALYTICAL PARAMETERS

A TKN - 351.2
B NITRATE/NITRITE - 353.2
C
D
E
F
G
H
I
J

000007

Project Manager Approval: RB

Lab Manager Approval:

PDP ANALYTICAL SERIVES
24900 Pitkin Dr. Suite 300, Spring, Texas 77386
Phone (713) 363-2233 - Fax (713) 298-5784

SUBCONTRACT LABORATORY SERVICES
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

P.O. #96595

Sent to: CEP

Contact: Elsie Phone: 505-982-9844

Sent by: Walter Bichon

Date sent: 8/19/96 Date Results needed: 8/31/96

PDP Sample ID	No. of Containers	Anaylsis Request a	b	c	d	e	f	g	h	i	j	Matrix	Remarks Weight?? Dry/Wet
3531.01		X	X									WATER	

CUSTODY TRANSFERS

Relinquished by:	Recieved by:	Date/Time
1. Walter Bichon 8/19/96		1530
2.	J.A. Brown	8-20-96 8:50

Courier: 8721272184

ANALYTICAL PARAMETERS

A URANIUM - 908.1
B RADIUM 226 & RADIUM 228
C
D
E
F
G
H
I
J

Project Manager Approval: RB

Lab Manager Approval:

000015

SUB-CONTRACT DATA

Controls for Environmental
Pollution, Inc.
P.O. Box 5351
Santa Fe, NM 87502

Phone: (505) 982-9841/(800) 545-2188

PDP Analytical Services
1680 Lake Front Circle Ste B
The Woodland, TX 77380

Attn: Jon Lindquist
Invoice Number:

Order #: 96-08-115
Date: 09/10/96 16:18
Work ID: Water (NR)
Date Received: 08/20/96
Date Completed: 09/10/96
Client Code: PDP_ANALYT

SAMPLE IDENTIFICATION

Sample Number	Sample Description	Sample Number	Sample Description
01	3531.01		

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Remainder of sample(s) for routine analysis will be disposed of three weeks from final report date. Sample(s) for bacteria analysis only, will be disposed of immediately after analysis. This is not applicable if other arrangements have been made.

James Mueller
Certified By
by Linda L. Wallace

000020

Controls for E[illegible]onmental

TEST RESULTS BY SAMPLE

Sample: 01A 3531.01 MPL- MW01-6-W2 Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Total Uranium	<0.001	0.001	mg/liter	09/06/96	TM

Sample: 01B 3531.01 Collected:

Test Description	Result	D.L.	Units	Analyzed	By
Radium-226	<0.6	0.6	pCi/liter	09/04/96	MM
Radium-228	<2	2	pCi/liter	09/04/96	MM

END OF REPORT

LABORATORY ANALYTICAL REPORT

QUALITY ASSURANCE SAMPLE

MPL-MW03-GW2

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(915) 585-3443 • fax 585-4944

ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 09-03-96
REVIEWED BY:
PAGE : 1 OF 1

CLIENT SAMPLE ID : MPL-MW3-GW2-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: C. Clemen
SUBMITTED BY ....: C. Clemen
SAMPLE SOURCE ...: --

AUTHORIZED BY : --
CLIENT P.O. : --
SAMPLE DATE ...: 08-14-96
SUBMITTAL DATE : 08-15-96
EXTRACTION DATE: --

Inorganic Non-Metals

DATA TABLE

Parameter	Result	Unit	Detection Limit	Analysis Date	Test Method	Analyst
Ammonia Nitrogen .....:	<0.10	mg/L	0.10	09-03-96	E-350.3	F. Armendariz
Bicarbonate .....:	220	mg/L	2.0	08-26-96	STD METH 2320 B	F. Armendariz
Carbonate .....:	<2.0	mg/L	2.0	08-26-96	STD METH 2320 B	F. Armendariz
Chloride .....:	56	mg/L	5.0	08-27-96	EPA 300.0	F. Armendariz
Cyanide, Total(Distillation) .....:	0.42	mg/L	0.01	08-29-96	E-355.2	Triple Point Labs
Electrical Conductivity .....:	1100	umhos/cm		08-26-96	STD METH 2510 B	F. Armendariz
Fluoride .....:	0.60	mg/L	0.50	08-16-96	EPA 300.0	F. Armendariz
Nitrate Nitrogen .....:	8.3	mg/L	0.50	08-16-96	EPA 300.0	F. Armendariz
Nitrite Nitrogen .....:	<0.50	mg/L	0.50	08-16-96	EPA 300.0	F. Armendariz
Nitrogen, Total Kjeldahl .....:	0.8	mg/L	0.10	08-29-96	STD METH 4500 N-C	Triple Point Labs
pH .....:	7.5	S.U.		08-15-96	STD METH 4500-H+	F. Armendariz
Phenol, Total .....:	<0.01	mg/L	0.01	08-29-96	STD METH 5530-C	Triple Point Labs
Sulfate .....:	140	mg/L	5.0	08-27-96	EPA 300.0	F. Armendariz
Total Dissolved Solids .....:	830	mg/L	10	08-16-96	EPA 160.1	F. Armendariz
Total Organic Carbon .....:	1.4	mg/L	0.5	08-29-96	EPA 415.1	Triple Point Labs

ANALYTICAL RESULTS REPORTED HEREIN APPLY ONLY TO THE SAMPLES TESTED. FURTHERMORE, THIS REPORT CAN ONLY BE COPIED IN ITS ENTIRETY.

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El Paso, Texas 79922-1028
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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 08-28-96
REVIEWED BY:
PAGE : 1 OF 2

CLIENT SAMPLE ID : MPL-MW3-GW2-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: C. Clemen
SUBMITTED BY ....: C. Clemen
SAMPLE SOURCE ...: --
ANALYST .....: C. Warner

AUTHORIZED BY : --
CLIENT P.O. : --
SAMPLE DATE ...: 08-14-96
SUBMITTAL DATE : 08-15-96
EXTRACTION DATE: --
ANALYSIS DATE .: 08-28-96

Method 8260 - Volatile Organics

DATA TABLE

Parameter	Result	Unit	Detection Limit
1,1,1,2-Tetrachloroethane .....:	<5.0	ug/L	5.0
1,1,1-Trichloroethane .....:	<5.0	ug/L	5.0
1,1,2,2-Tetrachloroethane .....:	<5.0	ug/L	5.0
1,1,2,2-Tetrachloroethene .....:	<5.0	ug/L	5.0
1,1,2-Trichloroethane .....:	<5.0	ug/L	5.0
1,1-Dichloroethane .....:	<5.0	ug/L	5.0
1,1-Dichloroethene .....:	<5.0	ug/L	5.0
1,1-Dichloropropene .....:	<5.0	ug/L	5.0
1,2-Dibromoethane (EDB) .....:	<10.0	ug/L	10.0
1,2,3-Trichlorobenzene .....:	<5.0	ug/L	5.0
1,2,3-Trichloropropane .....:	<5.0	ug/L	5.0
1,2,4-Trichlorobenzene .....:	<5.0	ug/L	5.0
1,2,4-Trimethylbenzene .....:	<5.0	ug/L	5.0
1,2-Dichlorobenzene .....:	<10.0	ug/L	10.0
1,2-Dichloroethane .....:	<5.0	ug/L	5.0
1,2-Dichloropropane .....:	<5.0	ug/L	5.0
1,3,5-Trimethylbenzene .....:	<5.0	ug/L	5.0
1,3-Dichlorobenzene .....:	<10.0	ug/L	10.0
1,3-Dichloropropane .....:	<5.0	ug/L	5.0
1,4-Dichlorobenzene .....:	<10.0	ug/L	10.0
2,2-Dichloropropane .....:	<5.0	ug/L	5.0
2-Chlorotoluene .....:	<5.0	ug/L	5.0
4-Chlorotoluene .....:	<5.0	ug/L	5.0
4-Isopropyltoluene .....:	<5.0	ug/L	5.0
Benzene .....:	<10.0	ug/L	10.0
Bromobenzene .....:	<10.0	ug/L	10.0
Bromochloromethane .....:	<10.0	ug/L	10.0
Bromodichloromethane .....:	<10.0	ug/L	10.0
Bromoform .....:	<10.0	ug/L	10.0
Bromomethane .....:	<10.0	ug/L	10.0

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 08-28-96
REVIEWED BY:
PAGE : 2 OF 2

DATA TABLE (Cont.)

Parameter	Result	Unit	Detection Limit
Carbon tetrachloride	<5.0	ug/L	5.0
Chlorobenzene	<10.0	ug/L	10.0
Chloroethane	<10.0	ug/L	10.0
Chloroform	<5.0	ug/L	5.0
Chloromethane	<10.0	ug/L	10.0
cis 1,2-Dichloroethene	<5.0	ug/L	5.0
Dibromochloromethane	<10.0	ug/L	10.0
Dibromochloropropane (DBCP)	<10.0	ug/L	10.0
Dibromomethane	<10.0	ug/L	10.0
Dichlorodifluoromethane	<10.0	ug/L	10.0
Dichloromethane	<5.0	ug/L	5.0
Ethylbenzene	<10.0	ug/L	10.0
Hexachlorobutadiene	<5.0	ug/L	5.0
Isopropylbenzene	<5.0	ug/L	5.0
m,p - Xylene	<10.0	ug/L	10.0
Napthalene	<5.0	ug/L	5.0
n-Butylbenzene	<10.0	ug/L	10.0
o-Xylene	<10.0	ug/L	10.0
Propylbenzene	<5.0	ug/L	5.0
sec-Butylbenzene	<10.0	ug/L	10.0
Styrene	<5.0	ug/L	5.0
tert-Butylbenzene	<10.0	ug/L	10.0
Toluene	<10.0	ug/L	10.0
trans 1,2-Dichloroethene	<5.0	ug/L	5.0
Trichloroethene	<5.0	ug/L	5.0
Trichlorofluoromethane	<10.0	ug/L	10.0
Vinyl chloride	<10.0	ug/L	10.0

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606457
INVOICE NO.: 72161052
REPORT DATE: 08-29-96
REVIEWED BY:
PAGE : 1 OF 2

CLIENT SAMPLE ID : Trip Blank
SAMPLE TYPE .....: Water
SAMPLED BY .....: C. Clemen
SUBMITTED BY ....: C. Clemen
SAMPLE SOURCE ...: --
ANALYST .....: C. Warner

AUTHORIZED BY : --
CLIENT P.O. : --
SAMPLE DATE ...: 08-14-96
SUBMITTAL DATE : 08-15-96
EXTRACTION DATE: --
ANALYSIS DATE .: 08-28-96

Method 8260 - Volatile Organics

DATA TABLE

Parameter	Result	Unit	Detection Limit
1,1,1,2-Tetrachloroethane .....:	<2.5	ug/L	2.5
1,1,1-Trichloroethane .....:	<2.5	ug/L	2.5
1,1,2,2-Tetrachloroethane .....:	<2.5	ug/L	2.5
1,1,2,2-Tetrachloroethene .....:	<2.5	ug/L	2.5
1,1,2-Trichloroethane .....:	<2.5	ug/L	2.5
1,1-Dichloroethane .....:	<2.5	ug/L	2.5
1,1-Dichloroethene .....:	<2.5	ug/L	2.5
1,1-Dichloropropene .....:	<2.5	ug/L	2.5
1,2-Dibromoethane (EDB) .....:	<5.0	ug/L	5.0
1,2,3-Trichlorobenzene .....:	<2.5	ug/L	2.5
1,2,3-Trichloropropane .....:	<2.5	ug/L	2.5
1,2,4-Trichlorobenzene .....:	<2.5	ug/L	2.5
1,2,4-Trimethylbenzene .....:	<2.5	ug/L	2.5
1,2-Dichlorobenzene .....:	<5.0	ug/L	5.0
1,2-Dichloroethane .....:	<2.5	ug/L	2.5
1,2-Dichloropropane .....:	<2.5	ug/L	2.5
1,3,5-Trimethylbenzene .....:	<2.5	ug/L	2.5
1,3-Dichlorobenzene .....:	<5.0	ug/L	5.0
1,3-Dichloropropane .....:	<2.5	ug/L	2.5
1,4-Dichlorobenzene .....:	<5.0	ug/L	5.0
2,2-Dichloropropane .....:	<2.5	ug/L	2.5
2-Chlorotoluene .....:	<2.5	ug/L	2.5
4-Chlorotoluene .....:	<2.5	ug/L	2.5
4-Isopropyltoluene .....:	<2.5	ug/L	2.5
Benzene .....:	<5.0	ug/L	5.0
Bromobenzene .....:	<5.0	ug/L	5.0
Bromochloromethane .....:	<5.0	ug/L	5.0
Bromodichloromethane .....:	<5.0	ug/L	5.0
Bromoform .....:	<5.0	ug/L	5.0
Bromomethane .....:	<5.0	ug/L	5.0

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606457
INVOICE NO.: 72161052
REPORT DATE: 08-29-96
REVIEWED BY:

DATA TABLE (Cont.)

Parameter	Result	Unit	Detection Limit
Carbon tetrachloride .....:	<2.5	ug/L	2.5
Chlorobenzene .....:	<5.0	ug/L	5.0
Chloroethane .....:	<5.0	ug/L	5.0
Chloroform .....:	<2.5	ug/L	2.5
Chloromethane .....:	<5.0	ug/L	5.0
cis 1,2-Dichloroethene .....:	<2.5	ug/L	2.5
Dibromochloromethane .....:	<5.0	ug/L	5.0
Dibromochloropropane (DBCP) .....:	<5.0	ug/L	5.0
Dibromomethane .....:	<5.0	ug/L	5.0
Dichlorodifluoromethane .....:	<5.0	ug/L	5.0
Dichloromethane .....:	<2.5	ug/L	2.5
Ethylbenzene .....:	<5.0	ug/L	5.0
Hexachlorobutadiene .....:	<2.5	ug/L	2.5
Isopropylbenzene .....:	<2.5	ug/L	2.5
m,p - Xylene .....:	<5.0	ug/L	5.0
Napthalene .....:	<2.5	ug/L	2.5
n-Butylbenzene .....:	<5.0	ug/L	5.0
o-Xylene .....:	<5.0	ug/L	5.0
Propylbenzene .....:	<2.5	ug/L	2.5
sec-Butylbenzene .....:	<5.0	ug/L	5.0
Styrene .....:	<2.5	ug/L	2.5
tert-Butylbenzene .....:	<5.0	ug/L	5.0
Toluene .....:	<5.0	ug/L	5.0
trans 1,2-Dichloroethene .....:	<2.5	ug/L	2.5
Trichloroethene .....:	<2.5	ug/L	2.5
Trichlorofluoromethane .....:	<5.0	ug/L	5.0
Vinyl chloride .....:	<5.0	ug/L	5.0

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 09-05-96
REVIEWED BY:
PAGE : 1 OF 2

CLIENT SAMPLE ID : MPL-MW3-GW2-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: C. Clemen
SUBMITTED BY ....: C. Clemen
SAMPLE SOURCE ...: --
ANALYST .....: C. Warner

AUTHORIZED BY : --
CLIENT P.O. : --
SAMPLE DATE ...: 08-14-96
SUBMITTAL DATE : 08-15-96
EXTRACTION DATE: 08-20-96
ANALYSIS DATE .: 08-23-96

Method 8270: Semi Volatiles by Capillary Column GC/MS

DATA TABLE

Parameter	Result	Unit	Detection Limit
2,4,5-Trichlorophenol .....:	<10.	ug/L	10.
2,4,6-Trichlorophnol .....:	<10.	ug/L	10.
2,4-Dichlorophenol .....:	<10.	ug/L	10.
2,4-Dinitrophenol .....:	<50.	ug/L	50.
2-Chlorophenol .....:	<10.	ug/L	10.
2-Methylphenol .....:	<10.	ug/L	10.
2-Nitrophenol .....:	<10.	ug/L	10.
3-Methylphenol .....:	<20.	ug/L	20.
4-Chloro-3-methylphenol .....:	<20.	ug/L	20.
4-Methylphenol .....:	<10.	ug/L	10.
Pentachlorophenol .....:	<50.	ug/L	50.
Phenol .....:	<10.	ug/L	10.
Bis(2-chloroethoxy)methane .....:	<10.	ug/L	10.
1,2,4-Trichlorobenzene .....:	<10.	ug/L	10.
Naphthalene .....:	<10.	ug/L	10.
4-Chloroaniline .....:	<20.	ug/L	20.
Hexachlorobutadiene .....:	<10.	ug/L	10.
2-Methylnaphthalene .....:	<10.	ug/L	10.
Hexachlorocyclopentadiene .....:	<10.	ug/L	10.
2-Chloronaphthalene .....:	<10.	ug/L	10.
2-Nitroaniline .....:	<50.	ug/L	50.
Dimethyl phthalate .....:	<10.	ug/L	10.
Acenaphthylene .....:	<10.	ug/L	10.
3-Nitroaniline .....:	<50.	ug/L	50.
Acenaphthene .....:	<10.	ug/L	10.
Dibenzofuran .....:	<10.	ug/L	10.
2,4-Dinitrotoluene .....:	<10	ug/L	10
2,6-Dinitrotoluene .....:	<10.	ug/L	10.
Diethyl phthalate .....:	<10.	ug/L	10.
4-Chlorophenyl phenyl ether .....:	<10.	ug/L	10.

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 09-05-96
REVIEWED BY: [illegible]
PAGE : 2 OF 2

DATA TABLE (Cont.)

Parameter	Result	Unit	Detection Limit
Fluorene	<10.	ug/L	10.
4-Nitroaniline	<20.	ug/L	20.
2-Methyl-4,6-dinitrophenol	<30.	ug/L	30.
N-Nitrosodiphenylamine	<20.	ug/L	20.
4-Bromophenyl phenyl ether	<10.	ug/L	10.
Hexachlorobenzene	<10.	ug/L	10.
1,2-Dichlorobenzene	<10.	ug/L	10.
1,3-Dichlorobenzene	<10.	ug/L	10.
1,4-Dichlorobenzene	<10.	ug/L	10.
Phenanthrene	<10.	ug/L	10.
Anthracene	<10.	ug/L	10.
Di-n-butyl phthalate	<10.	ug/L	10.
Fluoranthene	<10.	ug/L	10.
Pyrene	<10.	ug/L	10.
Butyl benzyl phthalate	<10.	ug/L	10.
3,3'-Dichlorobenzidine	<20.	ug/L	20.
Benzo(a)anthracene	<10.	ug/L	10.
Bis(2-ethylhexyl) phthalate	<10.	ug/L	10.
Chrysene	<10.	ug/L	10.
Di-n-octyl phthalate	<10.	ug/L	10.
Benzo(b)fluoranthene	<10.	ug/L	10.
Benzo(k)fluoranthene	<10.	ug/L	10.
Benzo(a)pyrene	<10.	ug/L	10.
Indeno(1,2,3-cd)pyrene	<10.	ug/L	10.
Dibenzo(a,h)anthracene	<10.	ug/L	10.
Benzo(ghi)perylene	<10.	ug/L	10.
Benzidine	<50.	ug/L	50.
Bis(2-Chloroethyl)ether	<10.	ug/L	10.
Bis(2-Chloroisopropyl)ether	<10.	ug/L	10.
2,4-Dimethylphenol	<10.	ug/L	10.
Hexachloroethane	<10.	ug/L	10.
Isophorone	<10.	ug/L	10.
Nitrobenzene	<10.	ug/L	10.
N-Nitrosodimethylamine	<10.	ug/L	10.
Pyridine	<50.	ug/L	50.
N-Nitroso-di-n-propylamine	<10.	ug/L	10.
Aniline	<10	ug/L	10
Benzyl alcohol	<10.	ug/L	10.

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 09-06-96
REVIEWED BY:
PAGE : 1 OF 1

CLIENT SAMPLE ID : MPL-MW3-GW2-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: C. Clemen
SUBMITTED BY ....: C. Clemen
SAMPLE SOURCE ...: --
ANALYST .....: A. Skornia

AUTHORIZED BY : --
CLIENT P.O. : --
SAMPLE DATE ...: 08-14-96
SUBMITTAL DATE : 08-15-96
EXTRACTION DATE: 08-20-96
ANALYSIS DATE .: 09-04-96

Method 8080 - Pesticides & PCB'S

DATA TABLE

Parameter	Result	Unit	Detection Limit
4,4'-DDD	<0.10	ug/L	0.10
4,4'-DDE	<0.10	ug/L	0.10
4,4'-DDT	<1.0	ug/L	1.0
Aldrin	<1.0	ug/L	1.0
alpha-BHC	<1.0	ug/L	1.0
beta-BHC	<1.0	ug/L	1.0
delta-BHC	<0.5	ug/L	0.5
Chlordane	<1.5	ug/L	1.5
Dieldrin	<0.5	ug/L	0.5
Endosulfan I	<0.5	ug/L	0.5
Endosulfan II	<1.0	ug/L	1.0
Endosulfan sulfate	<0.5	ug/L	0.5
Endrin	<1.0	ug/L	1.0
Endrin aldehyde	<1.0	ug/L	1.0
Heptachor	<0.5	ug/L	0.5
Hetachlor Epoxide	<1.0	ug/L	1.0
Lindane	<0.5	ug/L	0.5
Methoxychlor	<1.0	ug/L	1.0
Toxaphene	<1.0	ug/L	1.0
PCB 1016	<2.0	ug/L	2.0
PCB 1221	<2.0	ug/L	2.0
PCB 1232	<2.0	ug/L	2.0
PCB 1242	<2.0	ug/L	2.0
PCB 1248	<2.0	ug/L	2.0
PCB 1254	<2.0	ug/L	2.0
PCB 1260	<2.0	ug/L	2.0

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BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 09-09-96
REVIEWED BY:
PAGE : 1 OF 1

CLIENT SAMPLE ID : MPL-MW3-GW2-QA
SAMPLE TYPE .....: Water
SAMPLED BY .....: C. Clemen
SUBMITTED BY ....: C. Clemen
SAMPLE SOURCE ...: --

AUTHORIZED BY : --
CLIENT P.O. : --
SAMPLE DATE ...: 08-14-96
SUBMITTAL DATE : 08-15-96
EXTRACTION DATE: --

Radiological

DATA TABLE

Parameter	Result	Unit	Detection Limit	Analysis Date	Test Method	Analyst
Radium 226 .....:	0.8+/-0.5	pCi/L	0.6		Subbed out to CEP	
Radium 228 .....:	<2.0	pCi/L	2.0	09-09-96	Subbed out CEP	CEP Labs

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ANALYTICAL REPORT

CLIENT MEVATEC CORPORATION
BLDG S-146 W
PO BOX 399
WSMR, NM 88002

SAMPLE NO. : 7606151
INVOICE NO.: 72161052
REPORT DATE: 09-09-96
REVIEWED BY:

DATA TABLE (Continue)

Parameter	Result	Unit	Detection Limit	Analysis Date	Test Method	Analyst
Total Mercury .....:	<0.001	mg/L	0.001	08-23-96	SM 3112B	N.Munir
Total Molybdenum .....:	<0.01	mg/L	0.01	09-03-96	SM 3113B	Triple Point Labs
Total Nickel .....:	<0.05	mg/L	0.05	09-03-96	SM 3111B	Triple Point Labs
Total Potassium .....:	21	mg/L	1.5	09-03-96	SM 3111B	Triple Point Labs
Total Selenium .....:	<0.005	mg/L	0.005	08-21-96	SM 3113B	N.Munir
Total Silver .....:	<0.01	mg/L	0.01	09-03-96	SM 3111B	Triple Point Labs
Total Sodium .....:	210	mg/L	40	09-03-96	SM 3111B	Triple Point Labs
Total Thallium .....:	<0.05	mg/L	0.05	09-03-96	SM 3111B	Triple Point Labs
Total Vanadium .....:	0.02	mg/L	0.01	09-03-96	SM 3113B	Triple Point Labs
Total Zinc .....:	<0.08	mg/L	0.08	09-03-96	SM 3111B	Triple Point Labs
Total Uranium .....:	0.002	mg/L	0.001	09-09-96	Subbed to CEP	CEP Labs

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Bldg. S-146W
WSMR, NM 88002
(505) 678-0263

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT NO.: 300 II-J27
PROJECT NAME: MPL-MW3-GW2-QA
SAMPLER'S SIGNATURE: Charles Clemen

DATE COLLECTED	TIME COLLECTED	SAMPLE ID	MATRIX	LAB NO.	NO. OF CONTAINERS	TPH, pH, inorganics conductivity	metals	CN	TOC	VOA	SVOA	Pest. PCB's	U Rad Rad					REMARKS preservative
8/14/96	1130	1L poly 7606151	w	—	1	X												4°C
		1L poly	w	—	1		X											HNO_3
		500 ml poly	w	—	1			X										NaOH
		250 ml glass	w	—	1				X									H_2SO_4
		40 ml glass	w	—	3					X								HCl
		1L glass	w	—	2						X							Na Thiosulfate
		1L glass	w	—	2							X						Na Thiosulfate
		1L glass	w	—	1								X					HNO_3
8/14/96	1130	1L glass	w	—	1									X				H_2SO_4
"	"	40ml GLASS TRIP BLANK 7606152	w	—	1					X								HCl

PROJECT INFORMATION			1. RELINQUISHED BY: (SIGNATURE)	2. RELINQUISHED BY: (SIGNATURE)	3. RECEIVED BY LABORATORY: (SIGNATURE)
PROJECT MANAGER: Dan Downs	SAMPLES RECEIVED		(PRINTED NAME): Charles Clemen	(PRINTED NAME)	(PRINTED NAME): W. Weberg
SHIPPING ID. NO.	TOTAL NO. OF CONTAINERS		RECEIVED BY:	RECEIVED BY:	(COMPANY): WT OFTX
VIA:	CHAIN OF CUSTODY SEALS		(TIME / DATE)	(TIME / DATE)	(TIME / DATE): 08-15-96 10:00am
	GOOD CONDITION/CHILLED		SPECIAL INSTRUCTIONS / COMMENTS:		
	CONFORMS TO RECORD				

PLEASE USE BALL POINT PEN

DISTRIBUTION: WHITE - PROJECT FILES; YELLOW - LAB; PINK - FIELD COPY

DELINEATION OF GROUNDWATER CONTAMINATION NEAR THE MAIN POST LANDFILL AND FORMER STP EFFLUENT DISCHARGE AREAS

WHITE SANDS MISSILE RANGE

Submitted to:

U.S. Army
White Sands Missile Range
National Range Directorate of Environment and Safety
White Sands Missile Range, New Mexico 88002-5048

December 1997

Submitted by:

MEVATEC Corporation
Building 126
White Sands Missile Range, New Mexico 88002

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APPENDIX A - Borehole Lithologic Logs, Well Construction Diagrams, Geophysical Logs

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LIST OF ACRONYMS

ASTM	American Society of Testing Materials
BGM	Background Groundwater Monitoring
cm	Centimeter
C	Celsius
EPA	U.S. Environmental Protection Agency
ft	Feet
GWPS	Groundwater Protection Standard
ICPES	Inductively Coupled Plasma Electron Spectrometry
IRP	Installation Restoration Program
Km	Kilometers
m	Meters
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter, equivalent to parts per million
µg/L	Micrograms per Liter, equivalent to parts per billion
µS/cm	Microsiemens per Centimeter
MSL	Mean Sea Level
MP	Measuring Point
MPL	Main Post Landfill
NA or NE	Not Applicable or Not Established
NAD	North American Datum
NASA	National Aeronautics and Space Agency
NAVD	North American Vertical Datum
ND	Not Detected
NMED	New Mexico Environment Department
NMSWMR	New Mexico Solid Waste Management Regulations
NMWQCC	New Mexico Water Quality Control Commission
NRES-E	National Range Directorate of Environment and Safety - Environmental Services Division
PCB	Polychlorinated Biphenyl
pCi/L	PicoCuries per Liter
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
REC	Record of Environmental Consideration
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RPPBA	Real Property Planning Board Action
STP	Sewage Treatment Plant
SVOC	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
sq. km	Square Kilometers
TCLP	Toxic Characteristic Leachate Procedure

LIST OF ACRONYMS (cont.)

TECOM	U.S. Army Test and Evaluation Command
UTM	Universal Transverse Mercatum
VOCs	Volatile Organic Compounds
TDS	Total Dissolved Solids
TI	Technical Inspector
TKN	Total Kjeldahl Nitrogen
USGS	United States Geological Survey
WSMR	White Sands Missile Range

EXECUTIVE SUMMARY

The results of groundwater monitoring conducted at the White Sands Missile Range (WSMR) Main Post Landfill indicated levels of cyanide in excess of New Mexico Environment Department standards. These concentrations were observed in both the upgradient and downgradient landfill monitoring wells. The objective of this study was to provide additional hydrologic information regarding the possible source area and extent of cyanide contamination first identified in June 1996 during the Main Post Landfill groundwater monitoring program. To supplement existing groundwater data, six additional monitoring wells were installed both upgradient and downgradient of the landfill. Groundwater samples were collected from the new wells, existing monitor wells and WSMR test wells. These wells are located upgradient and downgradient of the landfill, and upgradient and downgradient of the WSMR former Sewage Treatment Plant (STP) effluent drainage ditches (SWMUs 82 and 83). From 1958 to 1986, sewage effluent from the STP was discharged to these two surface drainage ditches that channeled effluent to impoundment areas which acted as evaporation and percolation beds. The Main Post Landfill is now situated near the former effluent impoundment areas.

The results of this groundwater study indicates the highest total cyanide concentrations in groundwater below the southern boundary of the Main Post Landfill, at the approximate location of the former effluent impoundment areas. Maximum concentrations of total dissolved solids, chloride, sulfate, and nitrate/nitrite were also reported from this area. Although at lesser concentrations, each of these constituents were detected from wells located significantly upgradient and sidegradient of the landfill. The nature and distribution of cyanide and other groundwater constituents suggests the former effluent drainage and impoundment areas were the source for groundwater contamination rather than leachate from the Main Post Landfill.

This study provided preliminary information regarding the presence of cyanide and other groundwater contaminants in the vicinity of the Main Post Landfill and the former effluent drainage areas. However, the study results do not reveal sufficient information to fully delineate the extent of cyanide and other groundwater contaminants. Additional groundwater characterization studies in this area should be conducted to fully delineate the contaminant plume, evaluate existing and potential exposure pathways, and provide alternative recommendations for remedial actions, if warranted.

1. INTRODUCTION

Total cyanide concentrations in groundwater at WSMR were first identified during the groundwater monitoring program at the Main Post Landfill in June 1996. The program consisted of the collection of groundwater samples from four monitoring wells (one upgradient and three downgradient) over five sampling events. Concentrations of total cyanide were detected above New Mexico Water Quality Control Commission (NMWQCC) protection standards and U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs) from each well, during all five sampling events.

This groundwater study was conducted to provide additional information regarding the possible source area and extent of cyanide contamination first identified during the Main Post Landfill groundwater monitoring program. To supplement existing groundwater data, six additional monitoring wells were installed both upgradient and downgradient of the landfill. Groundwater samples were collected from a total of twenty-two wells which included the newly installed wells, existing monitoring wells and WSMR test wells. Each sample was analyzed for total cyanide, as well as other groundwater-quality constituents including total dissolved solids (TDS), chloride, fluoride, sulfate, nitrate/nitrite, etc.

The wells included in the sampling program are also located upgradient and downgradient of the WSMR former Sewage Treatment Plant (STP) effluent drainage ditches, which are located east and upgradient of the Main Post Landfill. Sewage effluent from the STP was initially discharged to a natural surface drainage channel, and later diverted to two parallel drainage ditches. The original surface drainage channel and the two parallel drainage ditches channeled effluent to impoundment areas which acted as evaporation and percolation beds. The Main Post Landfill is now located at the position of the former effluent impoundment areas.

2. WHITE SANDS MISSILE RANGE - BACKGROUND

2.1 Location and Setting

White Sands Missile Range is under the jurisdiction of the US Army Test and Evaluation Command (TECOM). Most 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 (43.4 km) east-northeast of Las Cruces, NM and 45 miles (72.4 km) north of El Paso, TX (Figure 2-1). The WSMR headquarters and most installation support activities are located at the Main Post area. The WSMR is the largest land-area military installation in the United Sates, comprised of nearly 3,500 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 sq. km) wide.

The WSMR is an outdoor laboratory consisting of a large complex of test ranges, launch sites, impact areas and instrumentation sites required to develop and test defensive and offensive weapons. 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.

2.2 Regional Geology

The WSMR lies within the Mexican Highland Section of the Basin and Range Province, characterized by a series of tilted fault blocks forming longitudinal, asymmetric ridges or mountains and broad intervening basins (Figure 2-2). The major portion of WSMR lies within the Tularosa Basin, which is bounded on the west by the Organ, San Augustin, and San Andres Mountains. The eastern limit of the Tularosa Basin lies outside of the range, and is formed from north to south by the Jicarilla, Sierra Blanca, and Sacramento Mountains (not shown on Figure 2-1).

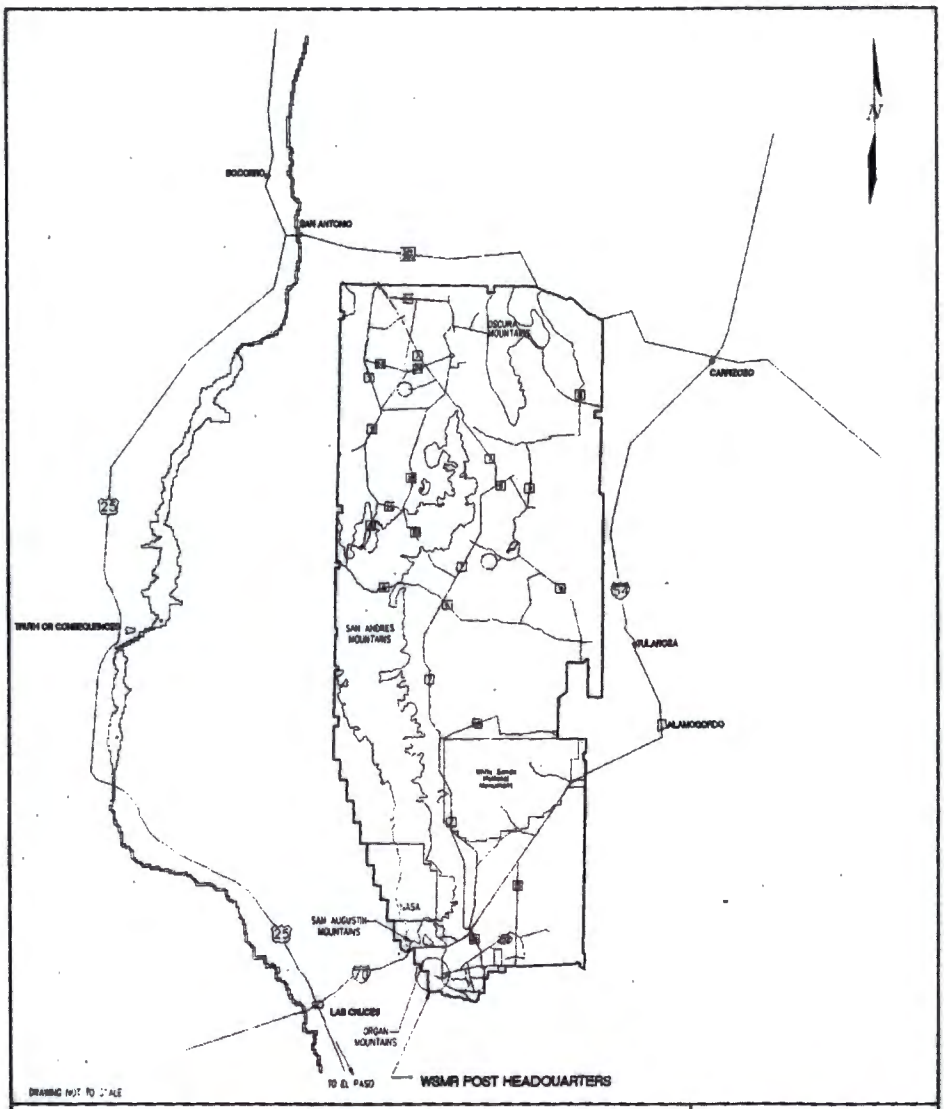
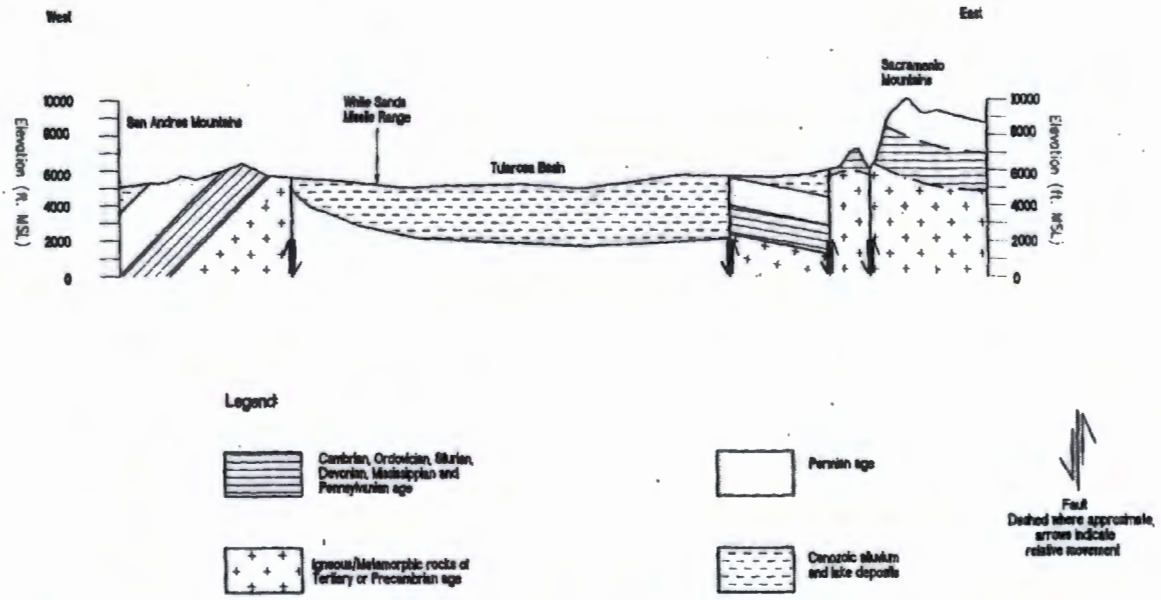


FIGURE 2-1. WHITE SANDS MISSILE RANGE LOCATION MAP
GROUNDWATER INVESTIGATION PROGRAM

MEWATER CORPORATION



DRAWING NOT TO SCALE

FIGURE 2-2. GENERALIZED EAST-WEST CROSS-SECTION ACROSS THE SOUTHERN PART OF THE TULAROSA BASIN, NORTH OF HIGHWAY 70, NEW MEXICO

MEVATEC CORPORATION

WHITE SANDS MISSILE RANGE

The Tularosa Basin contains thick sequences of Tertiary and Quaternary age alluvial and bolson fill deposits. These sediments, more than 5,000 feet (1,524 m) 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 feet above mean sea level and surface features consist of flat sandy areas, sand dunes, basalt flows, and playas or dry lake beds. Average elevation of mountains range from 5,700 feet (1,737.36 m) at St. Augustin Pass to more than 9,000 feet (2,743.2 m) at Salinas Peak, the tallest peak at WSMR.

2.3 Site Geology

Near surface geology in the vicinity of the effluent drainage ditches and the Main Post Landfill consists of unconsolidated alluvial sand, gravel, and loam up to a depth of about 15 feet (4.57 m) below ground surface. Below 15 feet (4.57 m) is older Quaternary/Tertiary alluvial material, which consists of unconsolidated discontinuous deposits of gravelly sands, sandy silt and silty sand with thin clay and occasional caliche seams. These sediments were deposited by alluvial fans extending into the Tularosa Basin from the Organ, San Augustin and San Andres Mountains.

2.4 Regional Hydrogeology

2.4.1 Surface Water

Very little surface water exists at WSMR due to the low annual precipitation, high evapotranspiration rates, and high infiltration characteristics of the soils. During the summer season when thunderstorm activity is most common, playas within the basin may contain standing water. Arroyos which drain the surrounding mountains usually contain water only following heavy precipitation events. The Tularosa Basin is a closed basin with no surface water drainage outside of WSMR. The study area is located on the eastern toe of a large alluvial fan originating from the eastern slope of the Organ Mountains. One large, and several smaller arroyos extend across the study area, from west to east.

2.4.2 Groundwater

The WSMR Main Post obtains its potable water supply from the aquifer in the upper bolson deposits. The majority of the groundwater recharge to this bolson aquifer occurs through the coarse, unconsolidated Tertiary/Quaternary alluvial fan deposits and arroyos along the eastern flank of the Organ, San Augustin and San Andres Mountains. This aquifer consists of a wedge-shaped belt of potable water more than 30 miles (48.27 km) long (from north to south). Groundwater in the vicinity of the Main Post is of sufficient quality (less than 1,000 mg/L total dissolved solids) for human consumption. Further to the east, this water becomes more mineralized, primarily with sulfate and chloride. This is probably attributed to the slow migration rate of groundwater from recharge to discharge areas, and the presence of readily soluble minerals in the bolson sediments. Approximately 5 miles east of the study area is the freshwater-saline water interface. Beyond this interface, the groundwater is not potable.

3. SITE DESCRIPTION AND BACKGROUND

The Main Post Landfill, located approximately 3 miles (4.83 km) east of the WSMR Main Post Headquarters (Figure 3-1), occupies approximately 25 acres. The landfill accepts nonhazardous waste generated from all of the 850 residential units, as well as facilities located at the Post Headquarters. This includes residential, yard, and commercial waste. The landfill has been in operation since 1983. The Main Post Landfill is divided into three sections on the basis of period of usage and material disposed. These sections consist of the original landfill, the construction and demolition (C & D) materials disposal area, and the present sanitary landfill.

The former effluent drainage areas (WSMR Solid Waste Management Units 82 and 83) consist of two parallel unlined earthen ditches located east of the WSMR sewage treatment plant and west (upgradient) of the Main Post Landfill (Figure 3-1). Both ditches channeled effluent east for approximately 1,000 feet (305 m) to natural shallow depressions, to serve as evaporation/percolation beds for sewage effluent originating from the secondary clarifiers at the treatment plant.

Prior to the excavation of these ditches (date unknown), the effluent was discharged from the STP headgate and flowed in an easterly direction, along natural drainage patterns. A 1963 WSMR aerial photograph (Figure 3-2) shows the treatment plant, and the former natural drainage ditch and impoundment areas marked by the presence of abundant vegetation. The aerial photo also shows that the discharge areas extended to the west and south of what is now the present surface of the WSMR Main Post Landfill. WSMR records indicate effluent was discharged to these areas from 1958 through 1986.

Sewage effluent is now discharged via an effluent pipeline (constructed in 1986) to Davies Tank located approximately 3 miles (4.83 km) southeast of the treatment plant. (Davies Tank is a large shallow natural depression located along the east side of Range Road 19, between Range Road 3 and Nike Avenue).

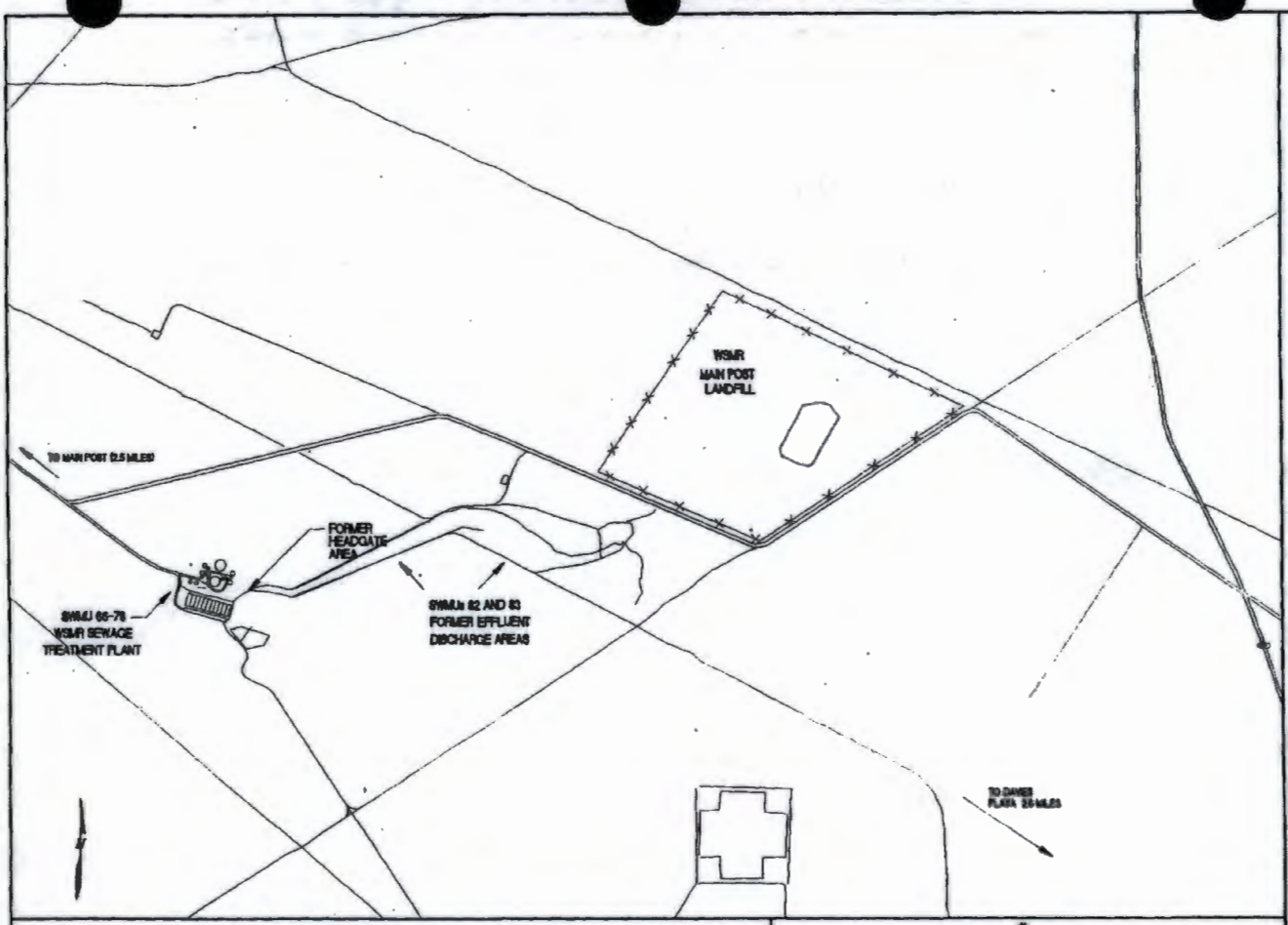


FIGURE 3-1 LOCATION OF WSMR SEWAGE TREATMENT PLANT
MAIN POST LANDFILL AND FORMER EFFLUENT DRAINAGE AREA
WHITE SANDS MISSILE RANGE

WESTAFEC CORPORATION

WHITE SANDS MISSILE RANGE

3.1 Previous Investigations

3.1.1 USGS Water-Resources Investigations

As part of the study for simulated water-level and water-quality changes in the bolson-fill aquifer at WSMR, Risser (1988), stated that the effluent discharged from the sewage treatment plant (through the drainage ditches) represented a significant source of groundwater recharge to the bolson-fill aquifer. Risser (1988, p.15) calculated that "Assuming that 30 percent of the total volume of water pumped from the Post Headquarters well field was returned to the ground by seepage from wastewater effluent, an average of 663 acre-feet of effluent per year may have recharged the aquifer from 1958 to 1982. Therefore, the total recharge by wastewater effluent during the past 25 years could have been as large as 16,000 acre-feet." The altitude of the potentiometric surface (1982 water levels) in the WSMR Main Post area wells (Figure 3-3) shows a slight groundwater rise or "mound" in the vicinity of the wastewater treatment plant. The presence of this mound is thought to be the result of the large quantity of effluent from the ditches and impoundment areas, percolating and downwards and outwards in all directions through the vadose zone, to the top of the aquifer.

3.1.2 Phase I RFI

During the Phase I RCRA Facility Investigation (RFI) (IT Corporation, 1992), forty-one soil samples were collected along the length of the parallel excavated drainage ditches and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals and total cyanide. Low levels of SVOCs (less than 1 mg/Kg) were reported from a surface soil grab sample collected near the splitter box. Concentrations of silver, arsenic, barium, chromium, mercury, and lead were detected in all surface soil samples collected. Only chromium was detected above EPA action levels at four 1-ft depth sample locations. The Phase I RFI report indicated the concentrations of these metals decreased as the sampling interval depth increased. Also, cyanide concentrations in soil were detected (ranging from 0.16 to 15 mg/Kg) in almost all of the surface, 1-foot and 2-foot samples collected along the length of the excavated drainage channels. The original natural effluent drainage channel was not investigated as part of the Phase I RFI.

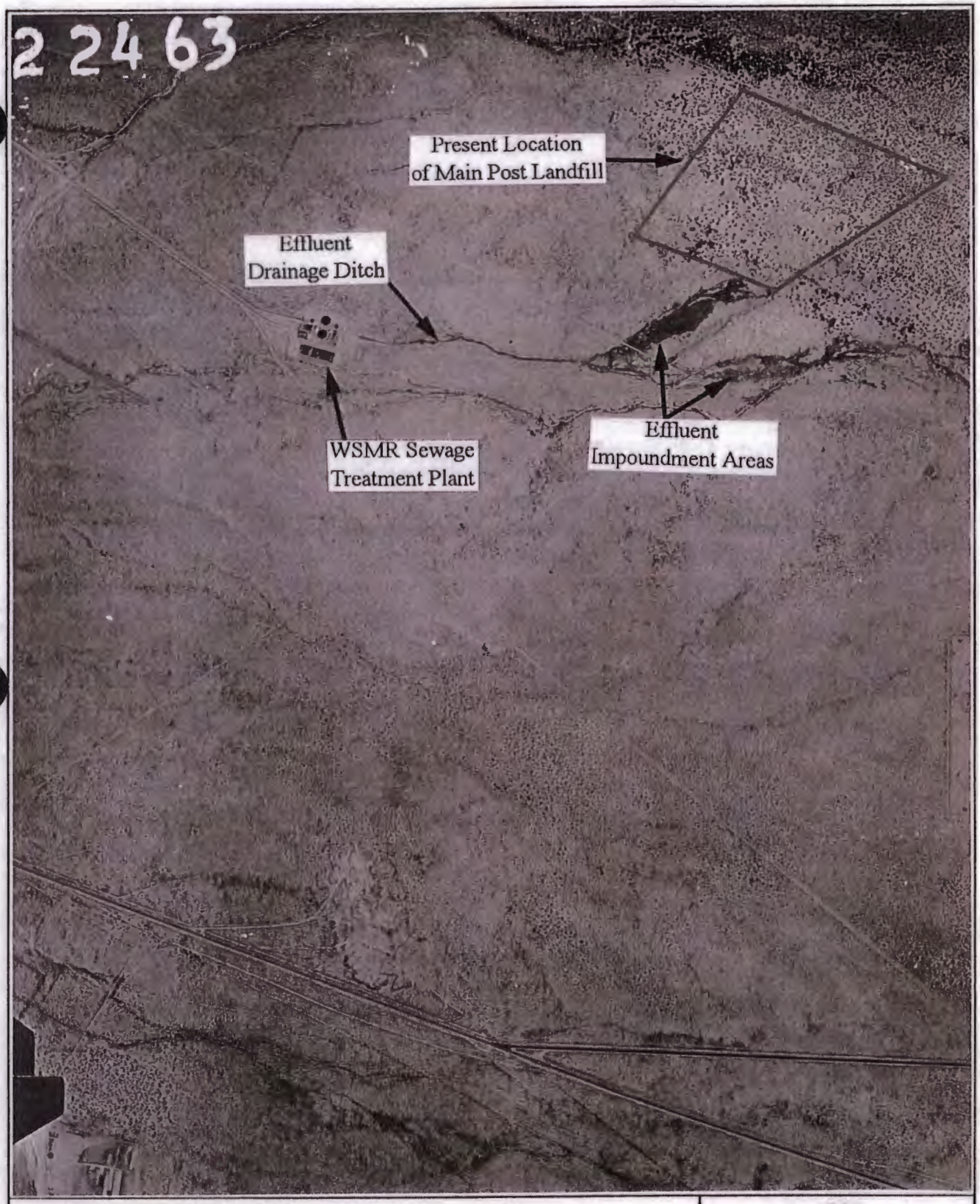


Figure 3-2 1963 WSMR aerial photograph showing location of sewage treatment plant effluent drainage ditches, and effluent impoundment areas. Main Post Landfill is now situated northeast of former northern impoundment area.

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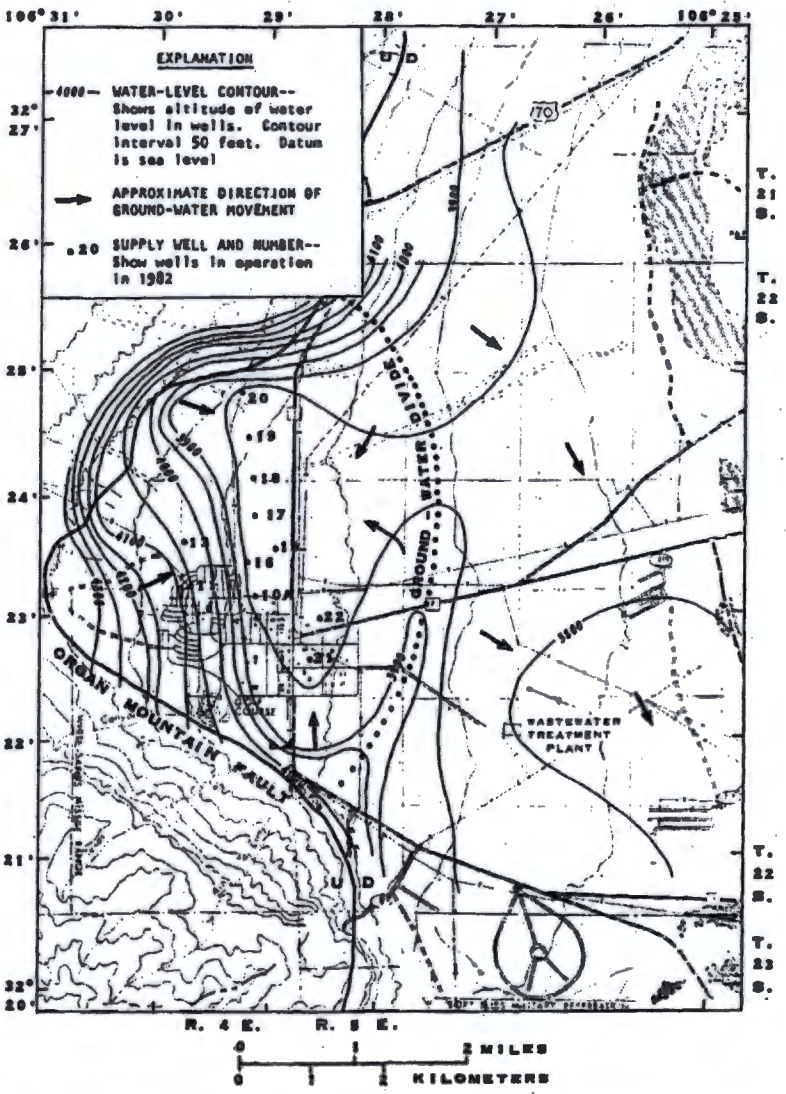


Figure 3-3. Groundwater Elevation Map, March 1982 (from Risser, 1988)

3.1.3 Phase II RFI

During the Phase II RFI, surface soil samples were collected from nine soil borings at depth intervals of approximately 0-1 ft (0-0.3 m) and 1-2 ft (0.3 - 0.61 m) along the length of the drainage ditches (Sverdrup Environmental, Inc., 1994). Samples were also collected at 0-1 ft. (0-0.3 m), 2-3 ft. (0.61-0.91 m), 4-5 ft. (1.22 -1.52 m) and 9-10 ft. (2.74 - 3.05 m) from two 10-ft. (3.05 m) borings located near the splitter box. All samples were analyzed for RCRA metals and total cyanide. Soil samples collected from the 0-1 ft. (0-0.3 m) depth were also analyzed by the Toxic Characteristic Leachate Procedure (TCLP) metals. The TCLP metals analysis represents metals concentrations following a laboratory leaching procedure to simulate groundwater leaching of soil constituents.

Concentrations of arsenic, barium, chromium, lead, mercury, and silver were detected in some or all of the samples. Only chromium was reported above the EPA Subpart S action level for hexavalent chromium (400 mg/Kg) in two surface soil samples, however, these samples did not contain detectable levels of chromium in the TCLP analysis. Total cyanide was detected in most of the surface, 1- and 2-foot soil samples at concentrations ranging from 0.73 to 8.22 mg/L. In addition, total cyanide was reported from one groundwater sample collected at well T-29 (located approximately 100 yards northeast of the drainage ditches) at a concentration of 0.229 mg/L.

During the Phase II RFI field activities, leakage from the sewage treatment plant splitter box into SWMU 83 was observed. The leakage, repaired in March 1997, created surface ponding of effluent in approximately the first 30 feet of the drainage ditch from the splitter box.

3.1.4 Groundwater Monitoring at the Main Post Landfill

From August 1996 through February 1997, groundwater monitoring was conducted from wells located at the WSMR Main Post Landfill. This study involved the collection and analysis of five independent groundwater samples from one upgradient and three downgradient monitoring wells to establish background groundwater quality at the landfill.

The results of the study detected total cyanide in the upgradient and all downgradient wells at the landfill. The reported cyanide groundwater concentrations (ranging from 0.23 to 0.64 mg/L) from each well, during all sampling events, exceed the New Mexico Water Quality Control Commission (NMWQCC) groundwater protection standard (0.2 mg/L) and the EPA MCL (0.2 mg/L). In addition, detected concentrations of total dissolved solids, chloride, sulfate, and nitrate/nitrite exceeded expected background concentrations for this part of the bolson aquifer.

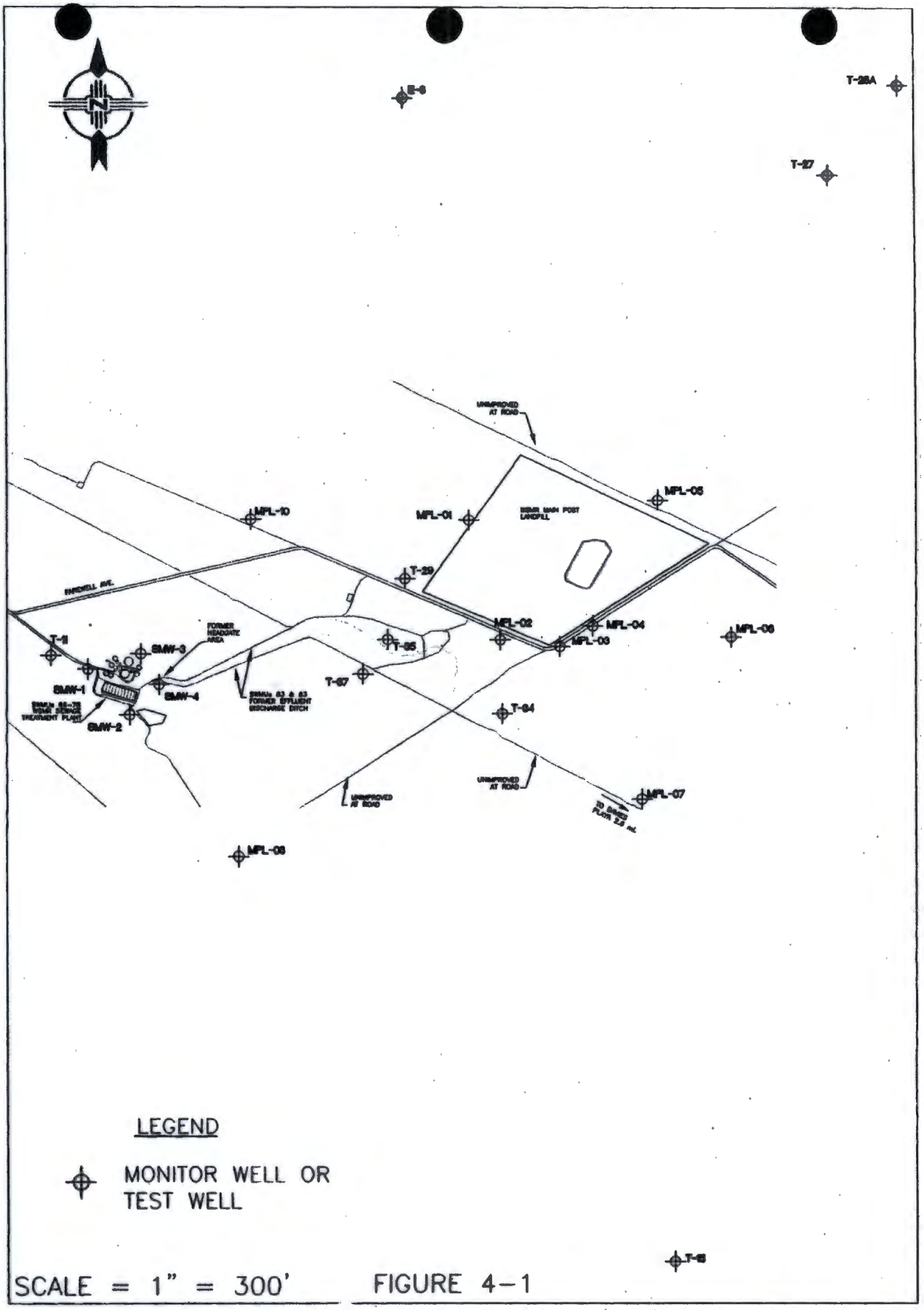
4. DESCRIPTION OF WORK

The objective of this groundwater investigation was to provide additional information regarding the the cyanide groundwater contamination identified at the Main Post Landfill. Six monitoring wells (MPL-5, MPL-6, and MPL-7 downgradient; MPL-8, MPL-9, and MPL-10 upgradient) were installed to determine the extent of impacted groundwater (Figure 4-1). Groundwater samples were collected from each of the new wells, existing monitoring wells and WSMR test wells located in the vicinity of the former drainage ditches, Main Post Landfill and sewage treatment plant to delineate the cyanide groundwater contamination. Analytical results were used to prepare isoconcentration maps of cyanide and various water quality constituents (TDS, chloride, sulfate, and nitrate/nitrite) to characterize the impacts to groundwater.

Prior to beginning field activities, a WSMR Record of Environmental Consideration (REC) and Real Property Planning Board Action (RPPBA) were prepared and submitted for approval of the proposed monitoring well locations. Well locations were also approved by the WSMR National Range Directorate of Environment and Safety - Environmental Services Division (NRES-E).

4.1 Monitoring Well Installation

Well installation activities consisted of drilling 8-inch diameter boreholes using mud-rotary drilling methods. To describe subsurface conditions, drill cuttings were collected from 5-ft. depth intervals, or upon noting a change in lithology. In addition to the general field lithologic log prepared by the site geologist, a detailed borehole lithologic log was prepared using a binocular microscope. The cuttings were examined to describe grain size, sorting, mineralogy or lithology, degree of grain roundness, color, depth below land surface and thickness intervals. Copies of the field logs and detailed lithologic logs are provided in Appendix A.



SCALE = 1" = 300'

FIGURE 4-1

LOCATION OF MONITORING WELLS & TEST WELLS
FORMER SEWAGE TREATMENT PLANT
EFFLUENT DISCHARGE AREA
WHITE SANDS MISSILE RANGE
SWMU GROUNDWATER INVESTIGATION PROGRAM

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The determination of depth of well screen interval and correlation of transmissive lithologic units was aided by the use of the following borehole geophysical logs:

1.) Long-short normal resistivity
2.) Spontaneous potential
3.) Single-point resistance
4.) Caliper
5.) Neutron
6.) Natural gamma
7.) Bulk density

The long-short normal resistivity, neutron and natural gamma logs provided the best information regarding lithology and depth to saturation in the alluvial sediments. Copies of geophysical logs for each of the boreholes are provided as part of Appendix A.

Following completion of geophysical logging, each monitoring well was constructed using 4-inch (10.16 cm) diameter, flush-threaded, 20-foot (6.1 m) length polyvinyl chloride (PVC) (ASTM-D 1785, Schedule 40), 0.010-inch (0.025 cm) slotted wire-wrap screens with a 5-foot (1.52 m) length of blank Schedule 40 PVC casing at the base to function as a well sump. Monitoring wells MPL-07, MPL-08 and MPL-10 were constructed with 30 feet (9.14 m) of screen section to accommodate possible aquifer fluctuations. Upper well casing consists of 4-inch (10.16 cm) diameter, flush-threaded, Schedule 40 PVC riser.

Clean, graded, 20-40 mesh size silica sand was added to complete each screen interval filter pack from five feet (1.52 m) above each screen to at least five feet (1.52 m) below the base of the well sump. Upper seals are constructed of five feet (1.52 m) of hydrated bentonite chips. Each borehole annulus is completed with a cement/bentonite slurry from the top of the upper seal to ground surface. Well construction information is provided as part of Appendix A and summarized in Table 4-1.

Table 4-1. Monitoring Well Construction Data

Monitoring Well No.	Total Depth Well [1]	Elevation [2]	Horizontal Location Lat./Long.	Horizontal Location UTM [3] (Y/X)	Screen Interval
MPL-05	205 ft (62.48 m)	3,991.90 ft (1,216.73 m)	32°22'25.148" 106°25'41.721"	3,582,750.238N 365637.584 E	180-200 ft (54.9- 61m)
MPL-06	190 ft (57.91 m)	3,975.97 ft (1,211.88 m)	32°22'10.006" 106°25'31.908"	3,582,280.512N 365,887.830 E	165-185 ft (50.3 - 56.4 m)
MPL-07	215 ft (65.53 m)	3,983.89 ft (1,214.14 m)	32°21'51.742" 106°25'43.266"	3,581,722.043N 365,583.480 E	180-210 ft (54.9 - 64 m)
MPL-08	275 ft (83.83 m)	4,058.48 ft (1,237.03 m)	32°21'44.588" 106°26'36.021"	3,581,520.224N 364,201.645 E	240-270 ft (73.1 - 82.3 m)
MPL-09	235 ft (71.62 m)	4045.96 ft (1233.21 m)	32°22'22.027" 106°26'32.542"	3,582,671.958N 364,308.132 E	210-230 ft (64 - 70 m)
MPL-10	275 ft (83.82 m)	4050.06 ft (1,234.46 m)	32°22'22.148" 106°26'35.009"	3,582,676.538N 364,243.692E	240-270 ft (73.1 - 82.3 m)

1. Measured from brass survey marker embedded in concrete pad
2. Elevation Datum is NAVD - 1988, measured from brass survey marker
3. Universal Transverse Mercator Coordinate System, Zone 13, NAD 1983

Each well was developed by continuously surging and bailing using a 3-inch (7.62-cm) diameter, 10-foot (3.05 m) steel bailer. Well development was considered complete when the groundwater appeared to be clear, and water temperature, specific conductance and pH remained within a ten percent variance. Following construction of the concrete pad, each well was surveyed for horizontal and vertical location at the brass survey marker embedded into the concrete pad.

The results of geophysical logging at the borehole for well MPL-09 indicated a groundwater saturation zone beginning at about 212 feet (64.6 m) below ground surface. The well was subsequently constructed with screen interval from 210 to 230 feet (64.0 - 70 m) below ground surface to monitor this perched zone. Following several episodes of well surging and bailing, no additional water was observed to enter the well. As of the date of this report, the water level in this well remains at the top of the well sump, but below the screen interval, at approximately 230 feet (70.1 m) below ground surface. As such, monitoring well MPL-09 was excluded from this investigation because the water in the well sump was not considered representative of groundwater conditions.

A second well (MPL-10) at this location was drilled and installed to screen the lower zone of saturation noted on the geophysical logs, starting at about 236 feet (71.9 m) below ground surface.

All waste drill fluids and cuttings generated during the well installation were transferred to double-lined roll-off boxes staged at each well site. The contents of each roll-off box were characterized for proper disposal. All down-hole drill tools, including drill pipe, drill bit, geophysical logging tools, measuring tape and other equipment were thoroughly decontaminated prior to and following use at each well location. All purge water and waste decontamination water was transferred to 55-gallon drums staged at the drill site and characterized for proper disposal.

4.2 Groundwater Sampling and Analysis

To delineate the extent of impacted groundwater, samples were collected from new wells and existing wells located in the vicinity of the Main Post Landfill and the former effluent drainage areas. These include the five new wells situated at the outer perimeter of the Main Post Landfill (MPL-05, MPL-06, MPL-07, MPL-08 and MPL-10), four wells at the edge of Main Post Landfill (MPL-01, MPL-02, MPL-03, and MPL-04), the four wells at the WSMR sewage treatment plant (SMW-1, SMW-2, SMW-3 and SMW-4), one well located at the Temperature Test Facility (E-3), and eight WSMR Test wells (T-11, T-15, T-27, T-28A, T-29, T-34, T-35, and T-37) situated throughout the study area. Table 4-2 and Figure 4-1 provide the locations of each of the wells.

All of the MPL- wells, SMW- wells and the E-3 well are screened at the upper portion of the aquifer, at the saturated/unsaturated zone interface. All MPL- wells, SMW-wells and the E-3 well are constructed of 4-inch (10.16 cm)diameter PVC screen and casing and were fully developed (surged and bailed) prior to sampling (ESE, 1996 and MEVATEC, 1996 and 1997). Screens are factory slotted, generally with 0.01-inch openings. Filter packs on each of these wells were specifically designed for groundwater level measurements and the collection of groundwater samples. Each of the filter packs are sealed with not less than 5 feet of hydrated bentonite and completed with cement-bentonite slurry to the surface to prevent migration of contamination.

Table 4-2. Monitoring Wells Included in the Groundwater Investigation

Well Number	Total Depth of Well[1]	Elevation[2]	Horizontal Location (UTM)[3] (X/Y)	Depth to Groundwater[1] 6/24/97
MPL-01	220 ft (67.06 m)	4,012.56 ft (1,223.03 m)	3,582,677.656 N 364,991.885 E	199.045 ft (60.67 m)
MPL-02	220 ft (67.06 m)	4,004.55 ft (1,220.59 m)	3,582,266.920 N 365,099.100 E	193.1 ft (58.86 m)
MPL-03	228.5 ft (69.65 m)	3,997.75 ft (1,218.51 m)	3,582,244.105 N 365,303.249 E	187.02 ft (57.00 m)
MPL-04	225 ft (68.58 m)	3,993.50 ft (1,217.22 m)	3,582,316.395 N 365,416.103 E	182.91 ft (55.75 m)
MPL-05	205 ft (62.48 m)	3,991.90 ft (1,216.734 m)	3,582,750.238 N 365,637.584 E	180.73 ft (55.09 m)
MPL-06	190 ft (57.91 m)	3,975.97 ft (1,211.878 m)	3,582,280.512 N 365,887.830 E	166.65 ft (50.79 m)
MPL-07	215 ft (65.53 m)	3,983.39 ft (1,214.140 m)	3,581,722.043 N 365,583.480 E	174.08 ft (53.06 m)
MPL-08	275 ft (83.82 m)	4,058.48 ft (1,237.027 m)	3,581,520.224 N 364,201.645 E	240.55 ft (73.32 m)
MPL-10	275 ft (83.82 m)	4,050.06 ft (1,234.461 m)	3,582,676.538 N 364,243.692 E	235.48 ft (71.77 m)
SMW-1	286.28 ft (87.26 m)	4,082.98 ft (1,244.49 m)	3,582,159.687 N 363,686.861 E	204.8 ft (62.42 m)
SMW-2	289.7 ft (88.30 m)	4,082.98 ft (1,244.49 m)	3,582,002.226 N 363,829.340 E	250.81 ft (76.45 m)
SMW-3	277.34 ft (84.53 m)	4,073.47 ft (1,241.59 m)	3,582,213.022 N 363,867.932 E	248.73 ft (75.81 m)
SMW-4	278.5 ft (84.89 m)	4,068.53 ft (1,240.09 m)	3,582,108.188 N 363,929.756 E	250.28 ft (76.29 m)
E-3	233 ft (71.02 m)	4,035.65 ft (1,230.07 m)	3,584,113.180 N 364,770.738 E	228.88 ft (69.76 m)
T-11	780 ft (237.74 m)	4,091.01 ft (1,246.93 m)	3,582,205.51 N 363,560.95 E	215.4 ft (65.65 m)
T-15	670 ft (204.22 m)	3,983.29 ft. (1,214.11 m)	3,580,146.80 N 365,693.53 E	181.52 ft (55.33 m)
T-27	250 ft (76.20 m)	3,973.94 ft (1,211.26 m)	3,583,857.79 N 366,220.71 E	162.945 ft (49.67 m)
T-28A	205 ft (62.48 m)	3,966.23 ft (1,208.91 m)	3,584,158.83 N 366,461.25 E	155.62 ft (47.43 m)
T-29	300 ft (91.44 m)	4,017.24 ft (1,224.45 m)	3,582,558.37 N 364,772.76 E	204.63 ft (62.37 m)
T-34	400 ft (121.92 m)	4006.03 ft (1,221.04 m)	3,582,012.51 N 365,106.26 E	195.24 ft (59.51 m)
T-35	300 ft (91.44 m)	4,024.94 ft (1,226.8 m)	3,582,266.00 N 364,714.32 E	211.34 ft (64.42 m)
T-37	313 ft (95.40 m)	4028.53 ft (1,227.89 m)	3,582,147.34 N 364,628.58 E	215.1 ft (65.56 m)

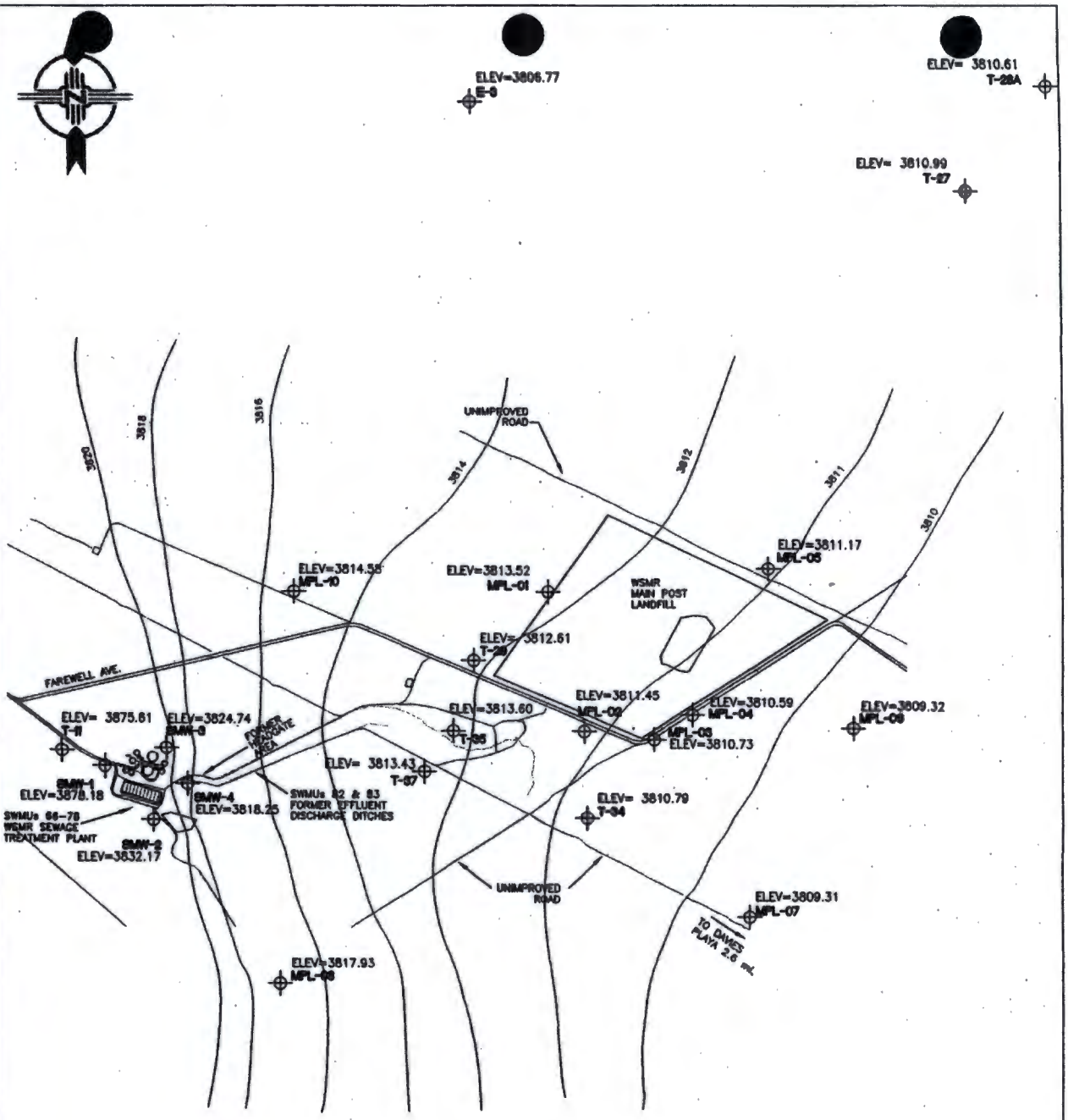
1. Measured from brass survey marker embedded in concrete pad, or northern edge of concrete pad if no marker
2. Elevation Datum - NAVD - 1988 from brass survey marker
3. Universal Transverse Mercator Coordinate System, Zone 13, NAD 1983
4. Elevation estimated from USGS Topographic Map

The WSMR T- wells were included with this investigation because they are located within the study area. The construction details for the T-wells vary from the interface wells discussed above. Six of the wells (T-27, T-28A, T-29, T-34, T-35 and T-37) are constructed of 4-inch (10.16 cm) diameter PVC but are screened at, and/or below, the groundwater interface, with more than 100 feet of screen in some cases (Cruz, 1984, Myers and Pinckley, 1985). Test wells T-11 and T-15 are constructed of 8-inch (20.32 cm) diameter carbon steel casing with screen sections below the groundwater interface.

Prior to the collection of groundwater samples, depth to groundwater and where possible, total well depth, was measured at each well site. Measurements were made from the top of the well casing and from the brass survey marker embedded into each concrete well pad, or from the concrete pad surface at wells where no survey markers are present. Surface corrections were made for concrete pads positioned well above ground surface. An electric water level probe was used to determine water levels. Figure 4-2 illustrates the groundwater potentiometric surface measured during this groundwater study.

The groundwater "mound" previously reported by Risser (1988) was expected, but not observed, in water level measurements from the monitoring wells included in this study. It is possible these wells are positioned on the mound surface, with the downward slope of the mound extending beyond the study area. However, a slight rise in the potentiometric surface was measured slightly east of the sewage treatment plant. This may be due to localized groundwater mounding below the vicinity of the plant.

Prior to sampling, each of the wells were purged in order to obtain a representative sample of formation water. All purging was conducted using decontaminated electric, submersible, portable or dedicated pumps. Purging was conducted until at least three well casing volumes were removed and the field parameters of groundwater pH, temperature and conductivity remained within a ten percent variance. Table 4-3 shows field parameters recorded at each well during sampling.



LEGEND

MONITOR WELL OR
TEST WELL
WITH POTENTIOMETRIC
SURFACE ELEVATION

3810
POTENTIOMETRIC
SURFACE CONTOUR (IN FT.)
DASHED WHERE INFERRED

SCALE = 1"=300' FIGURE 4-2

GROUNDWATER POTENTIOMETRIC SURFACE MAP
WHITE SANDS MISSILE RANGE
FORMER SEWAGE TREATMENT PLANT
EFFLUENT DISCHARGE AREA
SWMU GROUNDWATER INVESTIGATION PROGRAM

MEVATEC CORPORATION

Table 4-3. Field Water Quality Measurements at Monitoring Wells and Test Wells

Well Number	Sample Date	Temperature (°C)	pH	Conductivity (µS/cm)[1]	Comments
MPL-01	7-2-97	29.6	7.43	410	clear
MPL-02	7-1-97	25.7	7.56	472	clear
MPL-03	7-2-97	29.7	7.12	861	clear
MPL-04	7-1-97	29.0	7.36	864	clear
MPL-05	7-1-97	24.8	7.53	553	clear
MPL-06	7-2-97	25.8	7.29	349	clear
MPL-07	7-7-97	24.9	7.84	890	clear
MPL-08	7-7-97	27.9	7.39	470	clear
MPL-10	7-7-97	28.4	7.51	530	clear
SMW-1	7-9-97	23.4	7.21	245	clear
SMW-2	7-9-97	28.6	6.24	391	clear
SMW-3	7-9-97	25.7	7.58	565	cloudy
SMW-4	7-8-97	27.3	6.83	399	clear
E-3	7-15-97	27.1	8.42	310	clear
T-11	7-9-97	28.3	8.53	270	murky
T-15	7-14-97	24.8	8.63	240	clear
T-27	7-10-97	24.2	8.27	290	clear
T-28A	7-10-97	24.5	7.66	320	clear
T-29	7-8-97	24.9	8.37	470	clear
T-34	7-9-97	23.9	8.19	580	clear
T-35	7-8-97	25.6	7.60	530	clear
T-37	7-8-97	25.2	7.54	500	clear

Notes: 1. µS/cm - Microsiemens per centimeter

Groundwater samples were collected using clean, new, disposable polyethylene bailers attached to clean, new, nylon rope. All samples were placed in certified-clean bottles provided by the laboratory, placed in coolers and chilled to a temperature of not more than 4 degrees Celsius. Samples sent for analyses of dissolved components, or very turbid samples, were filtered through disposable 0.45 micron filter paper, using a peristaltic pump with clean, new tygon tubing. The samples, with completed chain-of-custody forms, were submitted to the analytical laboratory on the same day of collection. All samples were submitted for the constituents shown on Table 4-4.

Table 4-4. Analytical Requirements for Groundwater Samples

Groundwater Constituent	Analytical Method
Total and Amenable Cyanide	EPA 9010A
Physical Characteristics	
Specific Conductivity	EPA 120.1
Laboratory pH	EPA 150.1
Total Dissolved Solids	EPA 160.1
Dissolved Nutrients	
Nitrate-Nitrite as N	EPA 352.1
Total Kjeldahl Nitrogen	EPA 351.3
Dissolved Water Quality Constituents	
Sulfate	EPA 375.4
Fluoride	EPA 340.2
Chloride	EPA 325.3
Bicarbonate Alkalinity	EPA 310.1
Carbonate Alkalinity	EPA 310.1
Dissolved Anions	
Calcium Sodium	EPA 846-6010A
Magnesium Potassium	EPA 846-6010A

All samples were submitted to the following laboratory for analysis:

PDP Analytical Services
1680 Lake Front Circle, Suite B
The Woodlands, Texas 77380
Telephone: 281/363-2233

5. REGULATORY BACKGROUND

Under the EPA guidelines for groundwater classification (1986), the aquifer below the Main Post Landfill and the former effluent drainage areas is considered a Class I Groundwater (TDS concentration well below 10,000 mg/L). A Class I Groundwater is defined as special groundwater which is

1.) Highly vulnerable to contamination because of the hydrological characteristics of the areas in which it occurs and,

2.) Irreplaceable because no reasonable alternative source of drinking water is available to substantial populations.

Groundwater in New Mexico with total dissolved solids (TDS) concentrations less than 10,000 mg/L (includes EPA Class I and Class II* aquifers) is under the protection of the NMWQCC Regulations (December, 1995). The NMWQCC has established protection standards for various groundwater contaminants and are used for groundwater evaluation at WSMR. For groundwater constituents for which there are no New M protection standards, U.S. EPA Drinking Water Regulations MCLs and Health Advisories (1995) are presented.

In areas where TDS concentrations in groundwater exceed 10,000 mg/L (EPA Class III** aquifer), and the water is not used for drinking water supply, nor would it be expected to carry constituents to surface water or to a Class I or Class II aquifer, neither category of regulatory levels technically apply. Specific application of the regulations must be discussed with the New Mexico Environment Department (NMED) and the EPA. However, without an approved discharge permit, the state disallows deliberate contaminant releases to waters with TDS concentrations greater than 10,000 mg/L. The list of New Mexico groundwater standards and EPA MCLs for a number of possible groundwater constituents are provided as Table 5-1.

* EPA Class II aquifers refer to current and potential sources of drinking water and water having other beneficial uses. Class II aquifers include all groundwater that is currently used or is potentially available for drinking water, agriculture or other beneficial use.

** EPA Class III aquifers are considered groundwater which is not considered a potential source of drinking water. A Class III aquifer is of limited beneficial use, is saline (TDS concentrations greater than 10,000 mg/L), or is otherwise contaminated by naturally occurring constituents or human activity that is not associated with 1.) a particular waste disposal activity or 2.) another site beyond levels which allow remediation using methods reasonably employed in public water treatment systems. Class III also includes groundwater that is not available in sufficient quantity at any depth, to meet the needs of an average household.

Table 5-1
Selected U.S. EPA and New Mexico
Groundwater Protection Standards
White Sands Missile Range, New Mexico

Constituent	Federal MCL (mg/L)	New Mexico Groundwater Standards (mg/L)	RCRA Regulated
Inorganics			
Aluminum	NE	5.0	N
Arsenic	0.05	0.1	Y
Barium	2	1.0	Y
Beryllium	0.004	NE	Y
Boron	NE	0.75	N
Cadmium	0.005	0.01	Y
Calcium	NE	NE	N
Chromium	0.1	0.05	Y
Chromium (+6)	0.1	NE	N
Cobalt	NE	0.05	N
Copper	1.3	1.0	N
Iron	NE	1.0	N
Lead	0.015	0.05	Y
Magnesium	NE	NE	N
Manganese	NE	0.2	N
Mercury	0.002	0.002	Y
Molybdenum	NE	1.0	N
Nickel	0.1	0.2	N
Potassium	NE	NE	N
Selenium	0.05	0.05	Y
Silicon	NE	NE	N
Silver	0.05	0.05	Y
Sodium	NE	NE	N
Strontium	NE	NE	N
Tin	NE	NE	N
Vanadium	NE	NE	N
Zinc	NE	10.0	N
Water Quality			
Bicarbonate Alkalinity	NE	NE	N
Bromide	NE	NE	N
Carbonate Alkalinity	NE	NE	N
Chloride	NE	250.0	N
Fluoride	4	1.6	N
pH	6.5 - 8.5	6 - 9	Y
Nitrate	10	10	N
Nitrogen	NE	NE	N
Sulfate	NE	600	N
TDS	NE	10,000.0	N
Total Organic Carbon	NE	NE	N

Table 5-1-continued
Selected U.S. EPA and New Mexico
Groundwater Protection Standards
White Sands Missile Range, New Mexico

Constituent	Federal MCL (mg/L)	New Mexico Groundwater Standards (mg/L)	RCRA Regulated
Volatile Organic Compounds			
Acetone	NE	NE	Y
Bromomethane	NE	NE	N
2-Butanone	NE	NE	Y
Carbon Disulfide	NE	NE	Y
Chloroethane	NE	NE	N
Chloroform	0.1	0.1	Y
Chloromethane	NE	NE	N
Dichlorodifluoromethane	NE	NE	Y
1,1 - Dichloroethene	0.007	0.005	Y
1,1 - Dichloroethane	NE	0.025	Y
1,2 - Dichloroethane	0.006	0.01	Y
Methylene Chloride	0.005	0.1	Y
Trichloroethene	NE	0.1	Y
1,1,1 - Trichloroethane	0.20	0.06	Y
1,1,2 - Trichloroethane	0.005	0.01	Y
Benzene	0.005	0.01	Y
Ethylbenzene	0.7	0.75	Y
Total Xylenes	10	0.62	Y
Semi-Volatile Organic Compounds			
Acenaphthalene	NE	NE	N
Benzoic Acid	NE	NE	N
bis (2-ethylhexyl) Phthalate	0.006	NE	Y
Bromo Dichloromethane	0.1	NE	N
Fluoranthene	NE	NE	Y
Dibenzofuron	NE	NE	N
Naphthalene	NE	0.03*	Y
Phenanthrene	NE	NE	Y
Pyrene (PAH)	NE	NE	Y
Other			
Cyanide	0.2	0.2	Y
Explosive Residues	NE	NE	Y
Rad 226/228	20 pCi/L	30 pCi/L	N
PCBs	0.0005	0.001	N
Total Petroleum Hydrocarbons	NE	NE	N

Notes:
NE - Not Established
* - Combined naphthalene and monomethylnaphthalenes
Source: New Mexico Water Quality Control Commmission (1995) and U.S. EPA Drinking Water Regulations, Maximum Contaminant Levels and Health Advisories (1995).

6. SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

Groundwater sampling at the selected monitoring wells and test wells took place from 30 June to 14 July 1997. All samples were submitted to the laboratory and analyzed for the constituents shown in Table 4-4. Tabular results for all analytical constituents are shown for: 1.) Monitoring wells at the WSMR sewage treatment plant (Table 6-1), 2.) Monitoring wells associated with the Main Post Landfill (Table 6-2) and 3.) WSMR Test wells (Table 6-3).

Concentrations of total dissolved solids (TDS) in groundwater ranged from a low of 190 mg/L at well T-11 (located upgradient of the sewage treatment plant) to 710 mg/L at MPL-07 (south of the Main Post Landfill and former effluent impoundment area) (Figure 6-1). Although groundwater TDS concentrations in the bolson aquifer are known to increase with increasing distance away (to the east) from the Organ Mountain front, (3 miles west of the sewage treatment plant), this increase is much greater than that observed in background monitoring wells located outside the study area. Similarly, the highest detected chloride concentrations in groundwater were reported from well MPL-07 (118 mg/L), with the lowest concentrations from wells T-11 (12.9 mg/L) and T-15 (12.8 mg/L) as illustrated on Figure 6-2. Concentrations of sulfate ranged from 50.1 mg/L at well MPL-06 (southeast of the Main Post Landfill and effluent impoundment area) to 210 mg/L at well MPL-07 (Figure 6-3). Groundwater concentrations of dissolved calcium, magnesium and sodium in groundwater were generally similar to the distribution of sulfate, with the highest detected concentrations south and southeast of the landfill and former effluent impoundment areas. Reported concentrations of nitrate/nitrite (as N) in groundwater also generally follow this pattern (Figure 6-4), with the highest concentrations reported from wells MPL-07 (8.11 mg/L), MPL-04 (7.07 mg/L) and MPL-03 (6.48 mg/L). MPL-04 and MPL-03 are located along the southern landfill boundary line.

Concentrations of total cyanide were reported in wells MPL-01 (0.13 mg/L), MPL -02 (0.420 mg/L), MPL-03 (0.408), MPL-04 (0.515 mg/L), MPL-05 (0.329 mg/L), MPL-07 (0.399 mg/L), MPL-08 (0.05 mg/L), MPL-10 (0.285), SMW-01 (0.017 mg/L), SMW-4 (0.012 mg/L), T-29 (0.310 mg/L), T-34 (0.299 mg/L), T-35 (0.327 mg/L) and T-37 (0.276 mg/L). The New Mexico Water Quality Control Commission groundwater standard and EPA Maximum Contaminant Level (MCL) for total cyanide is 0.2 mg/L. Figure 6-5 illustrates the extent of total cyanide at concentrations above this limit.

The highest total cyanide concentrations were reported from wells MPL-02, MPL-03 and MPL-04. These wells are located along the southern boundary of the landfill. Gradually decreasing concentrations of cyanide were reported in upgradient wells west and north of the landfill. However, levels of cyanide were reported in well MPL-10 (0.285 mg/L), located almost one-half mile (0.8 km) northwest and upgradient from the landfill. The distribution and concentrations of cyanide in groundwater east and north of the landfill is not well defined. Additional sampling points are needed in this area.

All of WSMR's water supply wells are located upgradient of the cyanide contamination. The closest water supply well (No. 21) is located approximately 2.5 miles (4.02 km) northwest and upgradient of the landfill southern boundary, and approximately 1.3 miles (2.09 km) northwest of monitor well MPL-10.

It should be noted that all of the reported total cyanide concentrations in groundwater samples were speciated as "amenable cyanide", also referred to as "simple" cyanide. Amenable cyanides dissociate more readily than other species known as "complex" cyanides. Amenable cyanide species are believed to be more soluble in groundwater than complex cyanides, and as a result, potentially more toxic.

Table 6.1. Results of Groundwater Analysis for the Former STP Effluent Discharge Area Sewage Treatment Plant Monitoring Wells

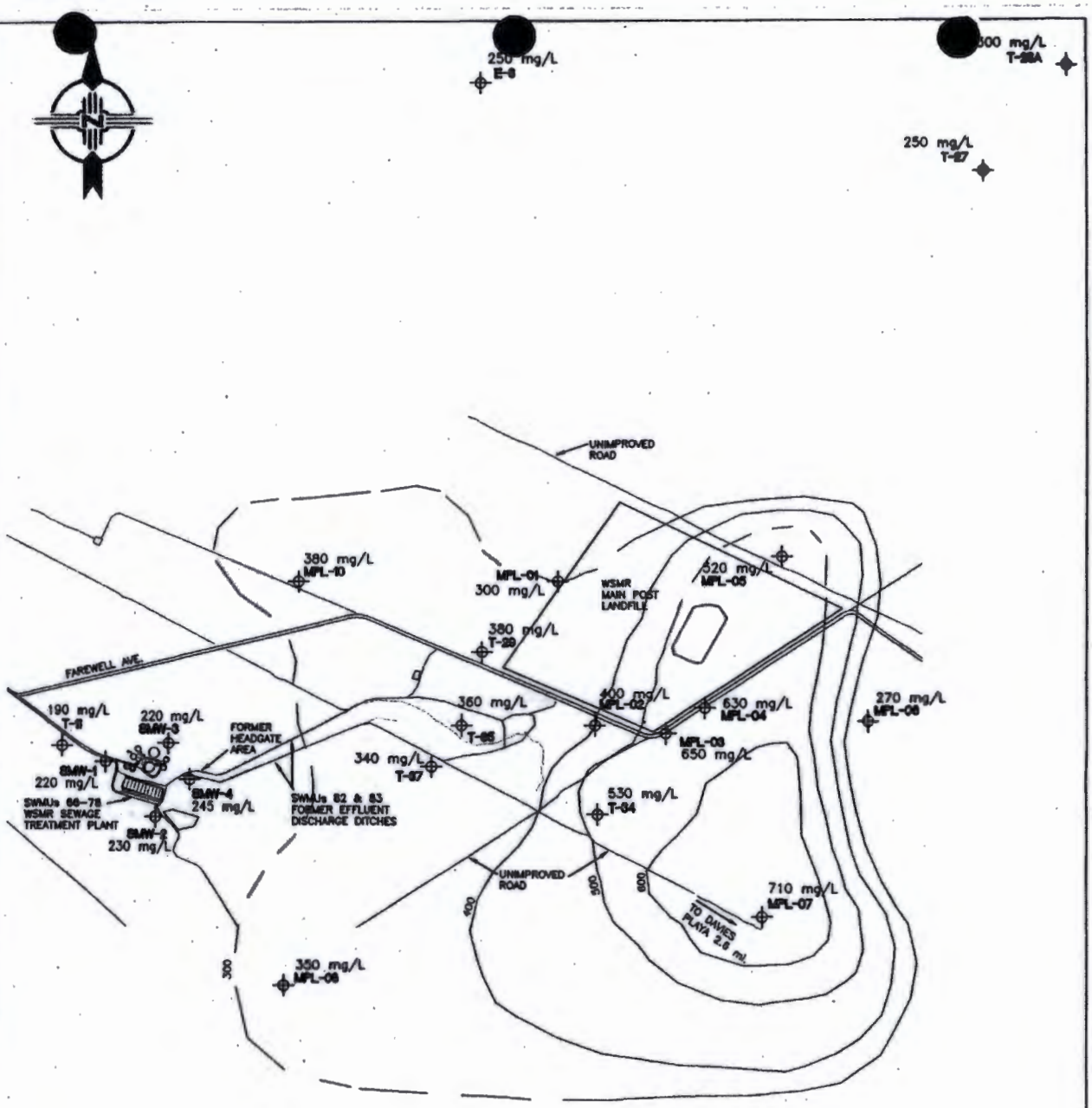
Analytical Constituent	Method	Units	SMW-1	SMW-2	SMW-3	SMW-4
Dissolved Metals						
Calcium	SW846 6010A	mg/L	31	37	38	42
Magnesium	SW846 6010A	mg/L	7.6	7.9	7.4	8.3
Potassium	SW846 6010A	mg/L	< 5	< 5	< 5	< 5
Sodium	SW846 6010A	mg/L	19	20	20	21
Water Quality Constituents						
Bicarbonate Alkalinity (HCO_3^-)	EPA 310.1	mg/L	75.6	48.8	65.9	65.9
Carbonate Alkalinity (CO_3^{--})	EPA 310.1	mg/L	< 1.2	< 1.2	< 1.2	< 1.2
Chloride	EPA 300	mg/L	14.7	24.0	19.3	22.3
Fluoride	EPA 340.2	mg/L	< 0.89	< 0.80	< 0.35	< 1.12
Nitrate/Nitrite as N	EPA 300	mg/L	2.24	2.69	2.31	3.19
Sulfate	EPA 300	mg/L	57.5	67.0	54.2	74.4
Cyanide, Amenable	SW846 9010	mg/L	0.017	< 0.01	< 0.01	0.012
Cyanide, Total	SW846 9010	mg/L	0.02	< 0.01	< 0.01	0.012
pH in Water	EPA 150.1	n/a	7.08	7.28	7.42	7.45
Total Dissolved Solids (TDS)	EPA 160.1	mg/L	220	230	220	245
Conductivity	EPA 120.1	µS/cm	350	400	390	420
Total Kjeldahl Nitrogen (TKN)	EPA 351.3	mg/L	9.6	10.9	4.6	10.3

Table 6-2. Results of Groundwater Analysis for the Former STP Effluent Discharge Area Main Post Landfill Wells

Analytical Constituent	Method	Units	MPL-01	MPL-02	MPL-03	MPL-04	MPL-05	MPL-06	MPL-07	MPL-08	MPL-10
Dissolved Metals											
Calcium	SW846 6010A	mg/L	37	56	75	84	68	39	110	50	56
Magnesium	SW846 6010A	mg/L	6.9	11	13	7.3	12	7.2	19	8.2	10
Potassium	SW846 6010A	mg/L	< 5	< 5	14	< 5	< 5	< 5	< 5	< 5	< 5
Sodium	SW846 6010A	mg/L	27	33	72	24	25	19	42	22	23
Water Quality Constituents											
Bicarbonate Alkalinity (HCO_3^-)	EPA 310.1	mg/L	51	39	85	81	41	63	80.5	46.4	43.9
Carbonate Alkalinity ($CO_3^=$)	EPA 310.1	mg/L	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chloride	EPA 300	mg/L	28.39	58.5	62.89	60.7	114	18.03	118	45.5	44.1
Fluoride	EPA 340.2	mg/L	< 0.85	< 0.70	< 0.67	< 0.77	< 1.44	< 0.83	< 0.73	< 0.79	< 0.75
Nitrate/Nitrite as N	EPA 300	mg/L	3.73	5.21	6.48	7.07	6.22	1.05	8.11	3.98	4.75
Sulfate	EPA 300	mg/L	52.8	85.9	152.3	171	86.8	50.1	210	78.9	93.7
Cyanide, Amenable	SW846 9010	mg/L	0.130	0.420	0.408	0.515	0.329	< 0.01	0.399	0.050	0.285
Cyanide, Total	SW846 9010	mg/L	0.130	0.420	0.408	0.515	0.329	< 0.01	0.399	0.050	0.285
pH in Water	EPA 150.1	n/a	7.74	7.61	7.51	7.31	7.44	7.91	7.37	7.76	7.80
Total Dissolved Solids (TDS)	EPA 160.1	mg/L	300	400	650	630	520	270	710	350	380
Conductivity	EPA 120.1	µS/cm	420	590	900	920	660	380	1000	500	550
Total Kjeldahl Nitrogen (TKN)	EPA 351.3	mg/L	7.8	2.4	15.2	1.9	2.0	14.7	10.2	9.0	8.1

Table 6-3. Results of Groundwater Analysis for the Former STP Effluent Discharge Area WSMR Test Wells

Analytical Constituent	Method	Units	T-11	T-15	T-27	T-28A	T-29	T-34	T-35	T-37	E-3
Dissolved Metals											
Calcium	SW846 6010A	mg/L	28	15	40	43	56	80	61	57	25
Magnesium	SW846 6010A	mg/L	6.2	2.2	8.6	8.6	11	13	11	9.7	8.1
Potassium	SW846 6010A	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sodium	SW846 6010A	mg/L	22	28	17	19	21	27	22	23	22
Water Quality Constituents											
Bicarbonate Alkalinity (HCO_3^-)	EPA 310.1	mg/L	68.3	34.2	80.5	70.8	46	61.0	54	49	51.2
Carbonate Alkalinity (CO_3^{--})	EPA 310.1	mg/L	12	2.4	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chloride	EPA 300	mg/L	12.9	12.8	15.8	17.2	45.4	92.7	58.2	56.8	12.8
Fluoride	EPA 340.2	mg/L	< 0.75	< 0.92	< 0.85	< 0.85	< 1.32	< 1.36	< 0.93	< 0.79	< 0.77
Nitrate/Nitrite as N	EPA 300	mg/L	1.53	< 1.00	1.87	1.58	4.00	8.46	5.5	4.56	2.18
Sulfate	EPA 300	mg/L	52.1	50.8	45.3	60.3	101	110	109	98.7	50.7
Cyanide, Amenable	SW846 9010	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	0.310	0.299	0.327	0.276	< 0.01
Cyanide, Total	SW846 9010	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	0.310	0.299	0.327	0.276	< 0.01
pH in Water	EPA 150.1	n/a	9.15	8.65	7.72	7.73	7.74	7.86	7.84	7.83	8.15
Total Dissolved Solids (TDS)	EPA 160.1	mg/L	190	200	250	300	380	530	360	340	250
Conductivity	EPA 120.1	µS/cm	400	270	380	400	530	730	560	560	340
Total Kjeldahl Nitrogen (TKN)	EPA 351.3	mg/L	15	3.0	1.2	1.3	12.5	12.7	23.2	8.3	2.0



LEGEND

MONITOR WELL OR TEST WELL WITH DETECTED TDS CONCENTRATION (mg/L)

CONCENTRATION CONTOUR (100 mg/L INTERVAL) DASHED WHERE INFERRED

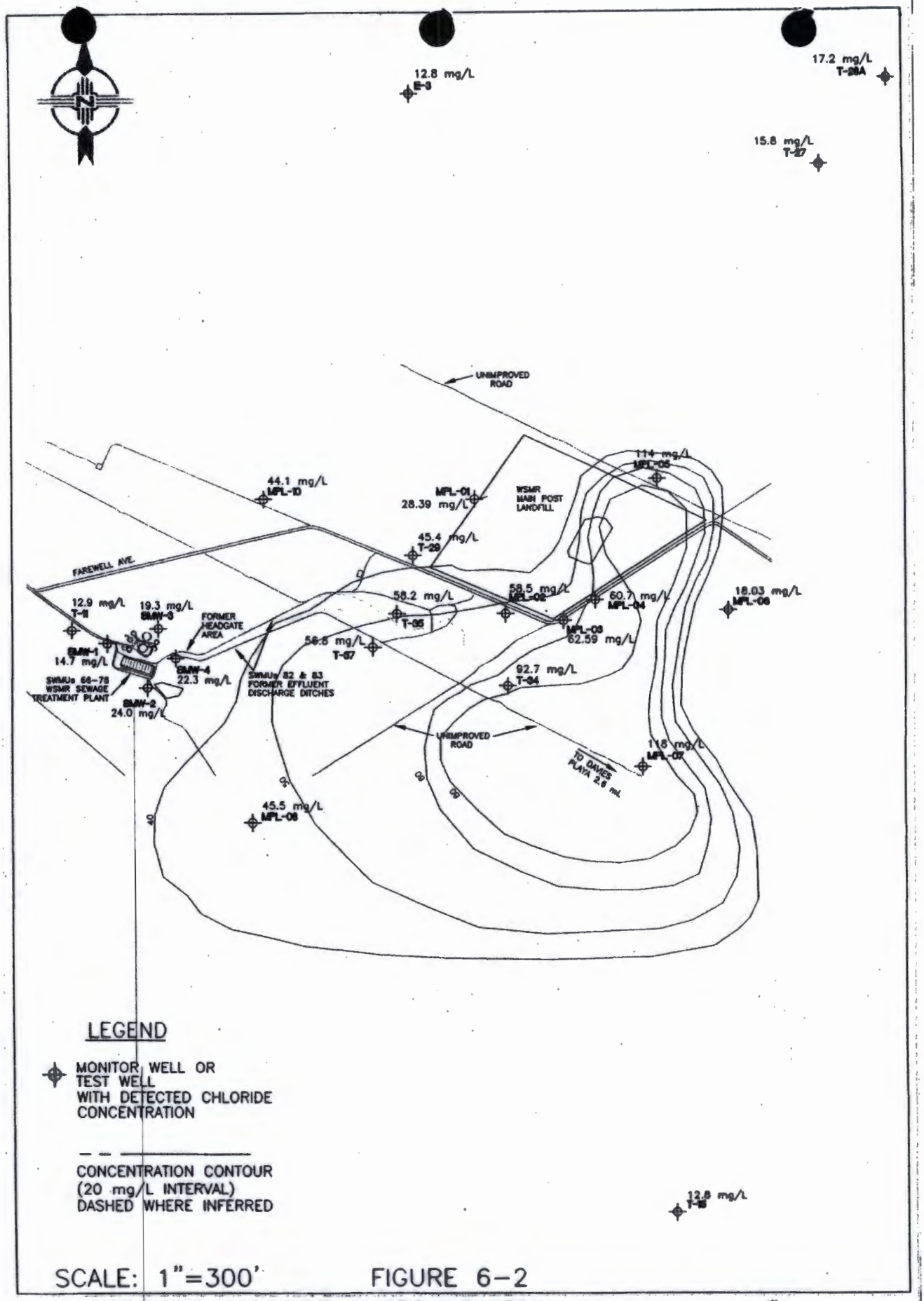
200 mg/L
T-15

SCALE: 1"=300'

FIGURE 6-1

TOTAL DISSOLVED SOLIDS IN GROUNDWATER
ISOCONCENTRATION MAP AT WHITE SANDS MISSILE RANGE
FORMER SEWAGE TREATMENT PLANT
EFFLUENT DISCHARGE AREA
SWMU GROUNDWATER INVESTIGATION PROGRAM

MEVATEC CORPORATION

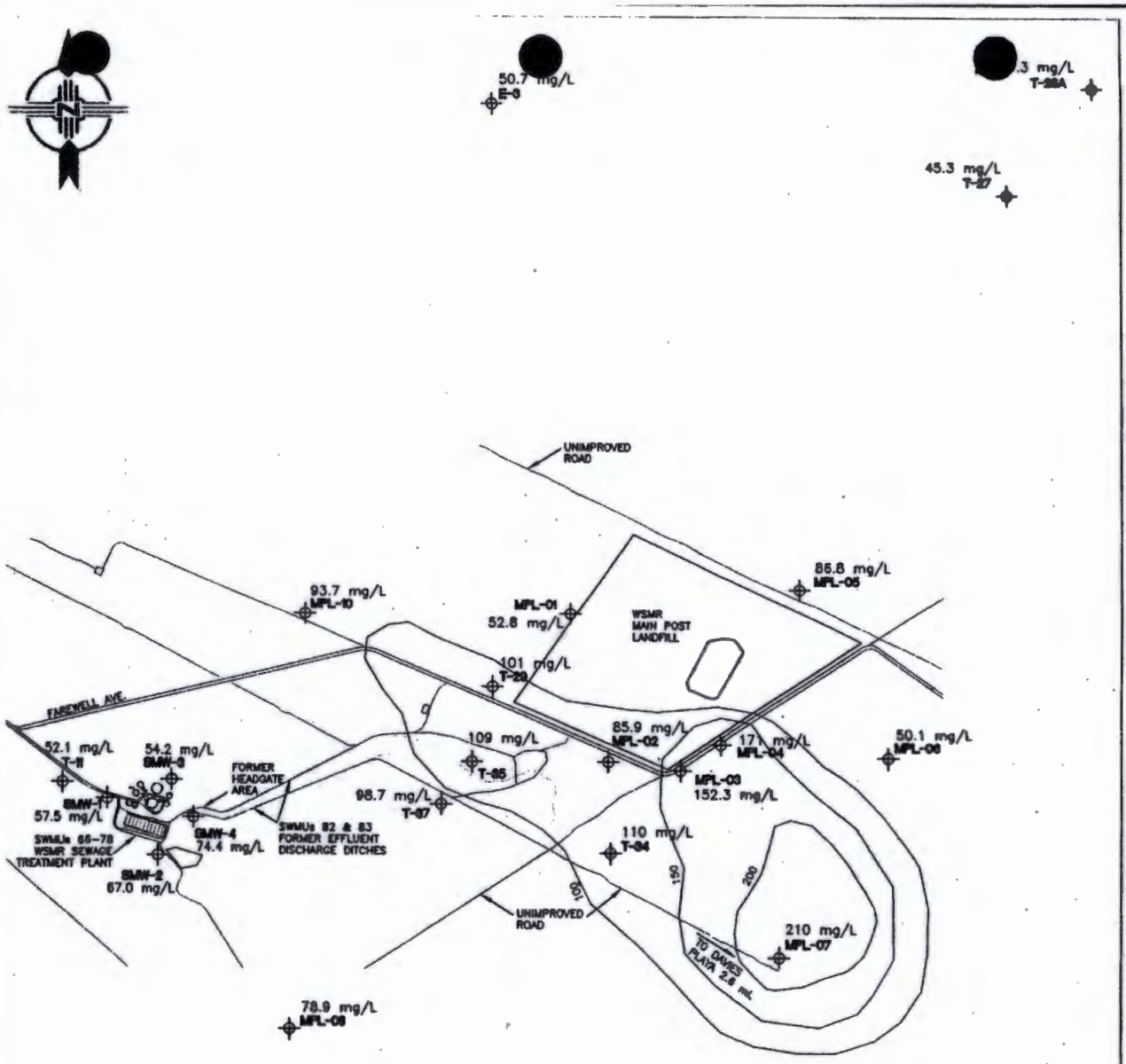


SCALE: 1"=300'

FIGURE 6-2

DISSOLVED CHLORIDE IN GROUNDWATER
ISOCONCENTRATION MAP AT WHITE SANDS MISSILE RANGE
FORMER SEWAGE TREATMENT PLANT
EFFLUENT DISCHARGE AREA
SWMU GROUNDWATER INVESTIGATION PROGRAM

MEVATEC CORPORATION



LEGEND

MONITOR WELL OR TEST WELL WITH DETECTED SULFATE CONCENTRATION (mg/L)

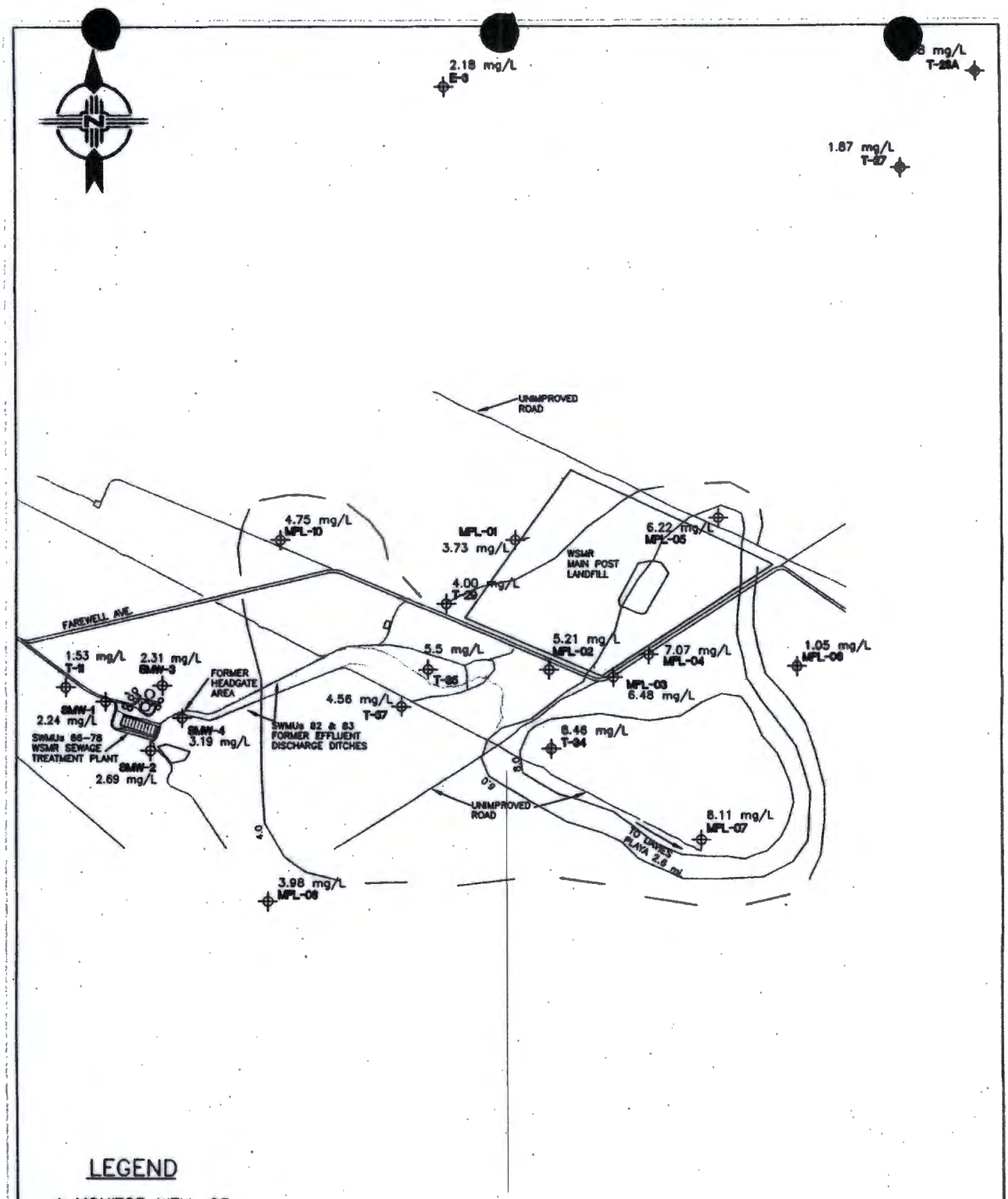
CONCENTRATION CONTOUR (50 mg/L INTERVAL) DASHED WHERE INFERRED

SCALE: 1"=300'

FIGURE 6-3

DISSOLVED SULFATE IN GROUNDWATER
ISOCONCENTRATION MAP AT WHITE SANDS MISSILE RANGE
FORMER SEWAGE TREATMENT PLANT
EFFLUENT DISCHARGE AREA
SWMU GROUNDWATER INVESTIGATION PROGRAM

MEVATEC CORPORATION



LEGEND

MONITOR WELL OR TEST WELL WITH DETECTED NITRATE/NITRITE CONCENTRATION (mg/L)

CONCENTRATION CONTOUR (2.0 mg/L INTERVAL) DASHED WHERE INFERRED

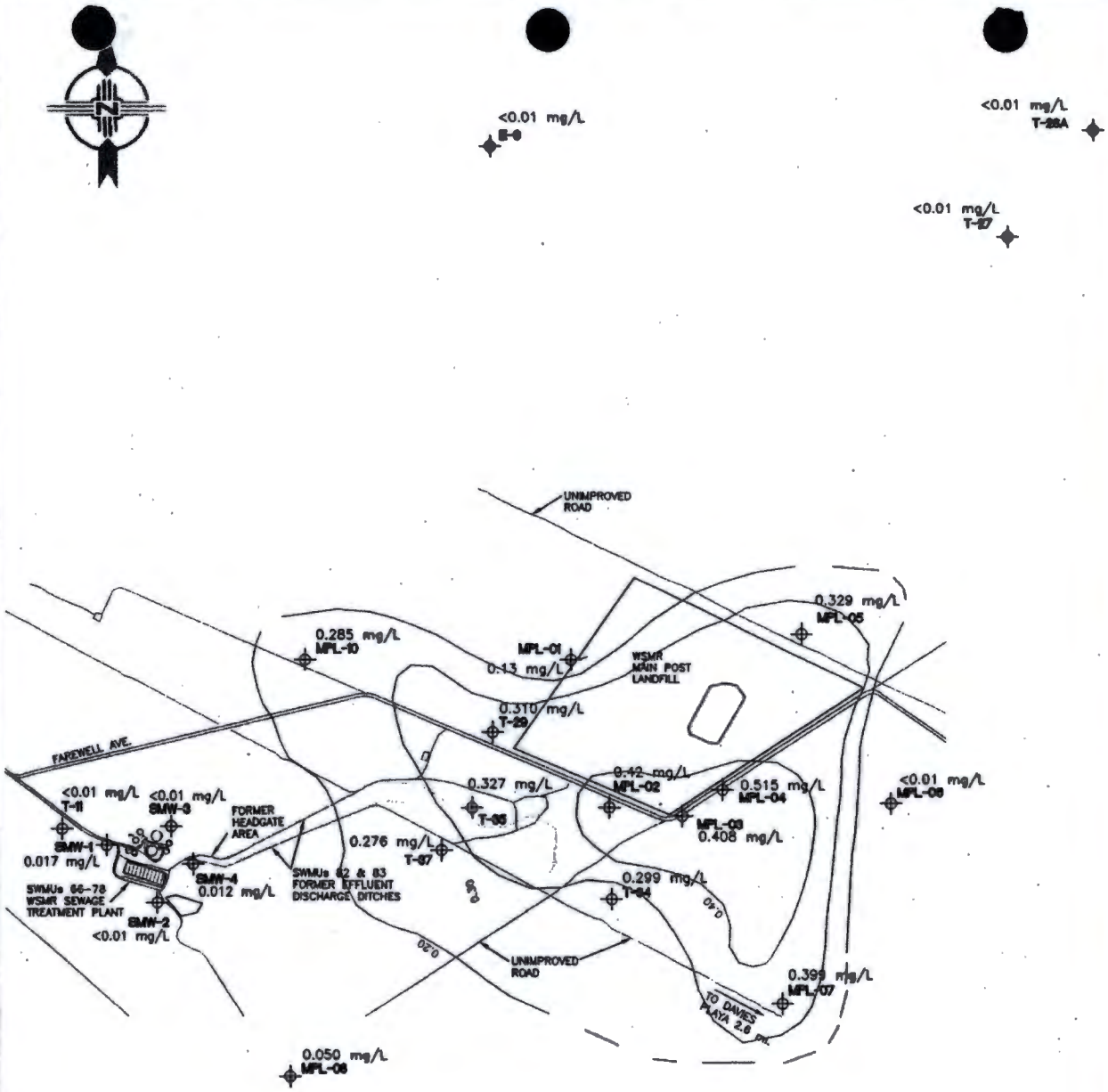
<1.00 mg/L
T-16

SCALE: 1"=300'

FIGURE 6-4

DISSOLVED NITRATE/NITRITE (AS N) IN GROUNDWATER
ISOCONCENTRATION MAP AT WHITE SANDS MISSILE RANGE
FORMER SEWAGE TREATMENT PLANT
EFFLUENT DISCHARGE AREA
SWMU GROUNDWATER INVESTIGATION PROGRAM

MEVATEC CORPORATION



SCALE: 1"–300'

FIGURE 6–5

TOTAL CYANIDE IN GROUNDWATER ISOCONCENTRATION MAP AT WHITE SANDS MISSILE RANGE FORMER SEWAGE TREATMENT PLANT EFFLUENT DISCHARGE AREA SWMU GROUNDWATER INVESTIGATION PROGRAM

MEVATEC CORPORATION

7. CONCLUSIONS

The purpose of this study was to provide additional information regarding the extent and possible source area of the cyanide groundwater concentrations first detected in monitoring wells at the Main Post Landfill. Six additional monitoring wells were installed and groundwater samples were collected from twenty-two wells located in the vicinity of the Main Post Landfill, former effluent discharge areas, and the WSMR sewage treatment plant. Groundwater samples were submitted to the laboratory and analyzed for total cyanide and various groundwater quality constituents.

The highest reported concentrations of cyanide, TDS, chloride, sulfate and nitrate in groundwater lie directly below the southern boundary of the Main Post Landfill, east and southeast of the former effluent impoundment areas, primarily in the vicinity of wells MPL-04 and MPL-07. The concentrations of each of these constituents decrease in all directions away from this area.

The nature and distribution of these constituents suggests the former effluent drainage and impoundment areas were the source for groundwater contamination rather than landfill leachate. The distribution of these constituents (upgradient and downgradient of the source area) also confirms the presence of a former groundwater rise or "mound" which originated in the vadose zone from the large volume of effluent discharged to the ponding area. While there may have been some downward percolation occurring from the drainage ditches, it appears most of the effluent percolated downwards and outwards from the impoundment areas, through the fine grained sediments of the vadose zone, before reaching the upper portion of the aquifer. The analytical data reported for wells MPL-04 and MPL-07, located near the former impoundment areas, support this conclusion. However, elevated levels of cyanide and other water quality constituents (above background concentrations) were detected in well MPL-10. This well was originally located to be the upgradient well, and expected to be outside of the contaminant plume.

The results of this study indicate a number of areas in which additional data is required to fully characterize the groundwater contamination. This work should be conducted as an Remedial Investigation followed by a Feasibility Study (RI/FS) to present alternatives for remedial action. At a minimum, the RI should include the following tasks:

- Preparation of detailed work plans (including sampling and analysis plans, and quality assurance plans) to be approved by the appropriate regulatory agencies.

- The installation and sampling of additional monitoring wells to the north, west and south of the existing well network in areas where the horizontal extent of impacted groundwater is not well defined. Strict sampling protocols should be followed to provide verifiable data.

- Surface and shallow subsurface soil sampling in the vicinity of the former impoundment areas.

- The determination of aquifer physical characteristics, followed by the evaluation of contaminant source area, including the identification of flow paths and migration patterns through computer modeling. The modeling task should include an evaluation of the aquifer area of influence for the closest WSMR water supply well No. 21 and an assessment of aquifer drawdown patterns.

- A risk assessment to evaluate any existing or potential human or ecological receptors to the groundwater contamination.

- Development of several remedial alternatives in support of the results of the risk assessment.

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APPENDIX A

BOREHOLE LITHOLOGIC LOGS, WELL CONSTRUCTION DIAGRAMS AND GEOPHYSICAL LOGS

APPENDIX A

The following appendix includes information regarding the wells (MPL-05, MPL-6, MPL-07, MPL-08, MPL-09, and MPL-10) installed as part of this project. Each section of this appendix includes a well construction diagram, the field lithologic log, the detailed lithologic log, and the geophysical logs for each well. The field log represents a general description of lithologic conditions and drilling activities for the length of the borehole. The detailed lithologic log was prepared by microscopic examination of drill cuttings.

For lithologic descriptions, grain size was determined in accordance with that described by Myers and Pinckley (1985) (see table below), and rounding was determined from comparison with the grain models shown in the Manual of Field Geology (Compton, 1962). The degree of roundness can range from very angular to well rounded. Sorting is the degree to which grains in a sample approach the same size. This value can range from very well sorted (grains all the same size) to very poorly sorted (a wide range of grain sizes with no dominant grain sizes). The colors and any accompanying code numbers in the lithologic descriptions refer to the colors from the Rock-Color Chart (Goddard, 1948) prepared by the Rock-Color Chart Committee and distributed by the Geological Society of America. Color determination was made from dry samples.

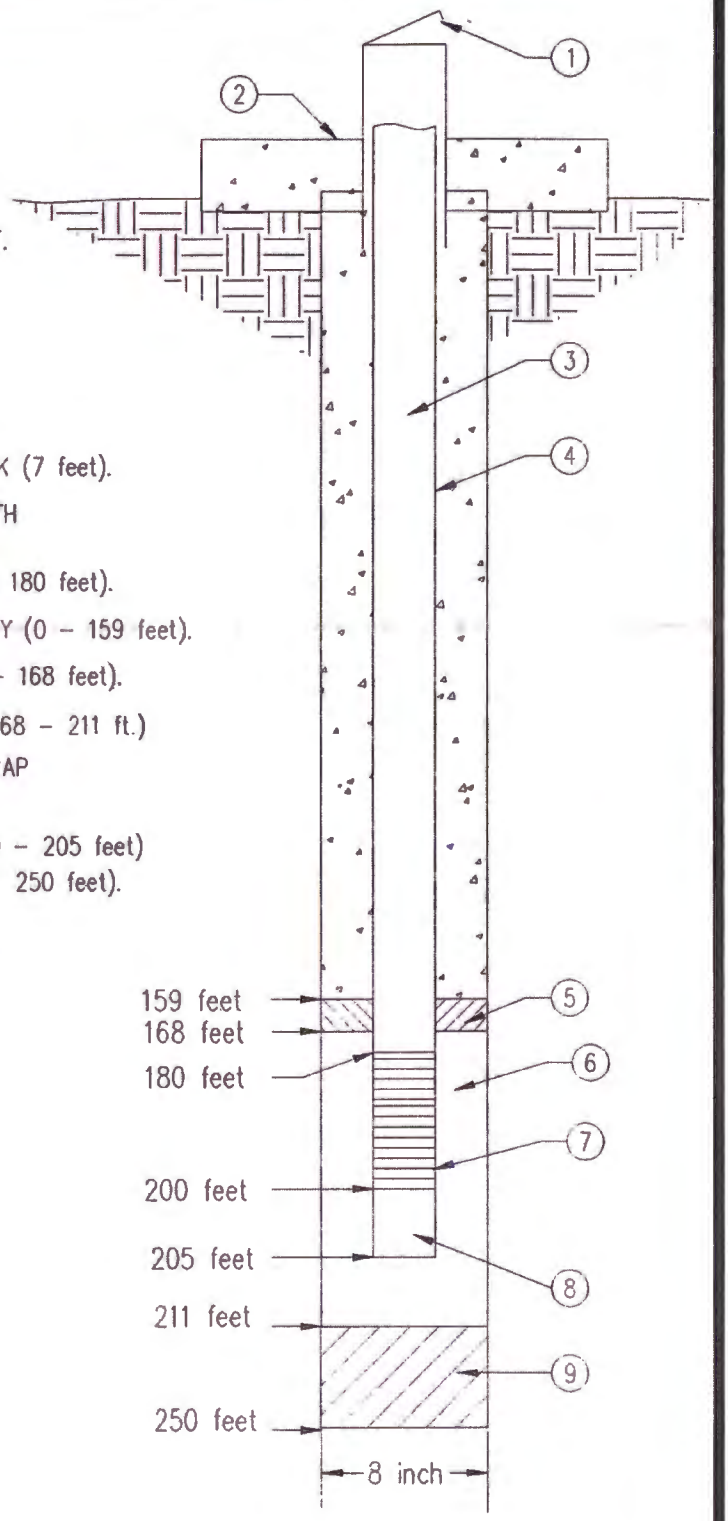
Classification of Detrital Sediments by Grain Diameter

Description	Size in mm	Size in inches
Pebbles	4-64	0.15-2.5
Granules	2-4	0.08-0.15
Very coarse sand	1.0-2.0	0.04-0.15
Coarse sand	0.5-1.0	0.02-0.04
Medium sand	0.25-0.5	0.01-0.02
Fine sand	0.125-0.25	0.005-0.01
Very fine sand	0.0625-0.125	0.0025-0.005
Silt	0.004-0.0625	0.00015-0.0025
Clay	less than 0.004	less than 0.00015

WELL CONSTRUCTION DIAGRAM

WELL NUMBER: **MPL-05**
WELL NAME: MAIN POST LANDFILL MONITORING WELL
GEOLOGIST: DANA DOWNS, P.G.

ELEVATIONS: TOP OF PVC WELL CASING: 3,993.92 FT.
AT BRASS SURVEY MARKER: 3,991.90 FT.
HORIZONTAL UTM: 3,582,750.24 N
365,637.58 E



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (7 feet).
2. CONCRETE PAD (36 inch X 36 inch X 24 inch) WITH EMBEDDED BRASS SURVEY MARKER
3. WELL CASING: 4-INCH DIAM. SCHED. 40 PVC (0 - 180 feet).
4. ANNULUS BACKFILL: CEMENT/5% BENTONITE SLURRY (0 - 159 feet).
5. UPPER SEAL: HYDRATED BENTONITE CHIPS (159 - 168 feet).
6. FILTER PACK: 20 - 40 MESH SIZE SILICA SAND (168 - 211 ft.)
7. WELL SCREEN: 4-INCH DIAM. NO. 10 SIZE WIRE WRAP SCHED. 40 PVC (180 - 200 feet)
8. WELL SUMP: 4-INCH DIAM. SCHED. 40 PVC (200 - 205 feet)
9. LOWER SEAL: HYDRATED BENTONITE CHIPS (211 - 250 feet).

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 250 feet.
2. BOREHOLE DIAMETER: 8 INCHES
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. ELEVATIONS ARE NAVD, 1988
5. UTM LOCATIONS ARE NAD, 1983
6. DRAWING NOT TO SCALE.

Field Lithologic Log
MPL-05

Project:	SWMU Groundwater Monitoring	Installation: WSMR	
Location:	Main Post Landfill/Effluent Drainage Area		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 2400
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Borehole Diameter: 8 inches	
Geologist:	J. Kyle Williams	Dates of Drilling: March 7, 1997	

Depth	Date/Time	Description of Material	Remarks
5	0922	Fine gravel, coarse-grained sand, minor medium-grained sand	
10	0924	Fine gravel, coarse- to medium-grained sand, minor silt	Between 9.5 ft. and 11 ft. was coarse gravel
15	0929	Gravelly sandy silt, fine gravel to fine-grained sand, silt mix	
20	0934	Sandy silt, fine- to coarse-grained sand	At 9:35, changed out spud, added 20' drill collar & tri-cone (7 7/8")
25	0945	Sand silt, fine- to medium-grained sand, minor coarse-grained sand and fine gravel, caliche coating on some grains	fining downward
30	0949	Sandy silt, fine- to medium-grained sand, minor gravel, caliche	
35	0951	Sandy silt, fine- to medium-grained sand, minor lean clay, caliche	
40	0955	Silt, fine-grained sand, clay (lean), caliche	

45	1001	Silty sand, fine- to medium-grained, some coarse-grained sand, minor clay, caliche	coarsening downward
50	1004	Silty sand, fine- to medium-grained, minor coarse-grained sand and clay	
55	1005	Silty sand, fine- to medium-grained, and clay	
60	1007	Silty sand, medium- to coarse-grained with fine-grained sand	
65	1013	Sand, medium- to coarse-grained	
70	1014	Sandy silt, with lean clay, medium- to fine-grained, minor gravel	At 69.5 ft. - lith break-clays with coarse materials
75	1016	Sandy silt, with lean clay, medium- to fine-grained, minor gravel	At 72 ft.- coarsening
80	1018	Sandy silty clay (lean), medium- to fine-grained	At 79.5 ft. - back into clay
85	1024	Sandy clay, fine-grained sand and silt	
90	1027	Silty clay, fine-grained sand	
95	1030	Silty clay, fine-grained sand	At 97 ft. - break into coarse
100	1033	Sandy silt, coarse- to fine-grained sand	
105	1040	Sand, coarse- to fine-grained with silt	Coarsening downward
110	1043	Sand coarse- to fine-grained, silt	
115	1045	Sand, coarse- to fine-grained, silt, fine gravel	
120	1047	Sand, coarse- to medium-grained, fine gravel	
125	1052	Gravelly sand, coarse- to medium-grained, fine gravel	At 128 ft. - silt/clay
130	1056	Sandy silt, fine-grained sand, minor clay	
135	1106	Silt-clay, with fine-grained sand	
140	1115	Silt-clay with fine-grained sand	At 143 ft. - gravel lens

145	1122	Silt-clay with fine-grained sand, minor coarse-grained sand	
150	1125	Silt-clay, with fine-grained sand	
155	1127	Silt with coarse- to fine-grained sand	At 154-155 ft. - gravel lens
160	1134	Silt-clay, with fine-grained sand	At 159-159.5 - gravel lens
165	1142	Silty sand, fine-grained sand, with minor clay	"Tight sand" Bit chatter
170	1144	Fine-grained sand, minor silt	
175	1146	Sand, fine-grained with minor silt and clay	
180	1150	Silty sand, fine-grained sand	At 174-179 ft. - gravel lens
185	1155	Silty fine-grained sand with coarse-grained sand and fine gravel	
190	1158	Sand, fine- to medium-grained, with silt	
195	1201	Sand, fine- to medium-grained with silt	At 197 ft. - gravel layer
200	1204	Sandy silt, minor gravel	
205	1211	Sand, fine-grained with silt and lean clay	
210	1215	Silt, with fine-grained sand and lean clay	Silt
215	1219	Silt with fine-grained sand and lean clay, minor coarse-grained sand	
220	1230	Clay, with fine-grained sand and silt	At 221 ft.- sand
225	1234	Sand, fine-grained with silt and clay	
230	1236	Sand, fine- to medium-grained, silt, clay	
235	1242	Sand, fine- to medium-grained with lean clay	
240	1248	Silt, with fine-grained sand and lean clay	
245	1257	Sand, fine-grained with silt	

250	1300	Silt/clay with fine-grained sand, lean clay, hard	Total Depth Borehole

Detailed Lithologic Log for MPL - 05

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, very fine-grained to pebble; angular to sub-rounded, poorly sorted; composed of granite, feldspar, and quartz.	10	0-10
Sand, very fine-grained to pebble, angular to sub-rounded, poorly sorted; composed of granite, feldspar, quartz, hornblende, and biotite; and moderate orange-pink (5YR 8/4) silt.	5	10-15
Sand, very fine-grained to pebble, sub-rounded to rounded, moderately to well sorted; composed of granite, feldspar, quartz, hornblende, chert, biotite, and muscovite; and moderate orange-pink (5YR 8/4) silt, white (N9) chert, and very pale orange (10YR 8/2) caliche coating grains; from 20 to 25 feet moderate orange-pink (5YR 8/4) silt increases.	10	15-25
Silt, moderate orange-pink (5YR 8/4), very fine- to medium-grained sand; angular to sub-rounded, moderately well sorted; composed of feldspar, quartz, hornblende, biotite and muscovite; very pale orange (10YR 8/2) caliche containing very fine- to fine-grained sand, and white (N9) caliche.	5	25-30
Silt, moderate orange-pink (5YR 8/4), very fine- to coarse-grained sand; angular to sub-rounded, moderately sorted; composed of feldspar, quartz, granite, hornblende, chert, biotite and muscovite; white (N9) caliche and very pale orange (10YR 8/2) caliche; from 35 to 40 feet, sand increases and is poorly sorted.	10	30-40
Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, feldspar, hornblende, chert, biotite, and muscovite; moderate orange-pink (5YR 8/4) silt, very pale orange (10YR 8/2) caliche, white (N9) caliche, and a small amount of pale reddish-brown (10R 5/4) clay.	10	40-50

Sand, very fine- to medium-grained, sub-angular to rounded, moderately sorted; composed of quartz, feldspar, hornblende, chert, and muscovite; moderate orange-pink (5YR 8/4) silt, very pale orange (10YR 8/2) caliche, and white (N9) caliche; from 55 to 60 feet a very minor amount of moderate orange-pink (10YR 7/4) clay is present.	10	50-60
Sand, very fine- to very coarse-grained; sub-angular to sub-rounded, poorly sorted; composed of quartz, feldspar, hornblende, chert, and muscovite, and light gray (N7) (sedimentary) rock; moderate orange-pink (5YR 8/4) silt, very pale orange (10YR 8/2) caliche containing very fine to fine-grained sand, and white (N9) caliche.	5	60-65
Clay, moderate orange-pink (10YR 7/4) poorly cemented with calcite, very fine- to very coarse-grained sand; angular to rounded, poorly sorted, and composed of quartz, feldspar, hornblende, and granite; moderate orange-pink (5YR 8/4) silt, grayish orange-pink (10R 8/2) caliche, and white N9) caliche.	5	65-70
Clay, moderate orange-pink (10YR 7/4) poorly cemented with calcite, moderate orange-pink (5YR 8/4) silt, very fine- to medium-grained sand; sub-angular to rounded, poorly sorted, and composed of quartz, feldspar, hornblende, and granite; grayish orange-pink (10R 8/2) caliche, and white (N9) caliche.	5	70-75
Silt, moderate orange-pink (5YR 8/4), pale brown (5YR 5/2) clay, very fine- to medium-grained sand; sub-angular to rounded, poorly sorted; composed of quartz, feldspar, hornblende, chert, and granite; grayish orange-pink (10R 8/2) caliche and white (N9) caliche; pale brown (5YR 5/2) clay contains a minor amount of organic matter and is poorly cemented with calcite.	5	75-80
Silt, moderate orange-pink (5YR 8/4), very fine-grained to pebble sand; angular, moderately sorted; composed of quartz, feldspar, chert, and hornblende; pale brown (5YR 5/2) clay, very pale orange (10YR 8/2) caliche, and white (N9) caliche.	5	80-85

Clay, pale brown (5YR 5/2), moderate orange-pink (5YR 8/4) silt, very fine-grained to pebble sand; angular, moderately sorted; composed of quartz, feldspar, chert, and hornblende and white (N9) caliche.	10	85-95
Sand, very fine-grained to pebble; sub-angular to well rounded, poorly sorted; composed of quartz, feldspar, granite, chert, and hornblende; moderate orange-pink (5YR 8/4) silt, pale brown (5YR 5/2) clay; poorly cemented with calcite.	5	95-100
Sand, very fine-grained to pebble; sub-angular to rounded, poorly to moderately sorted; composed of quartz, feldspar, granite, chert, hornblende, and medium gray (N5) (sedimentary) rock; pale brown (5YR 5/2) clay, and moderate orange-pink (5YR 8/4) silt; poorly cemented with calcite.	5	100-105
Sand, very fine-grained to pebble; sub-angular to rounded, poorly to moderately sorted; composed of quartz, feldspar, granite, chert, hornblende, and medium gray (N5) (sedimentary) rock; poorly cemented with calcite; pale brown (5YR 5/2) clay, moderate orange-pink (10YR 7/4) clay, and moderate orange-pink (5YR 8/4) silt.	5	105-110
Sand, very fine-grained to pebble; sub-angular to rounded, poorly to moderately sorted; composed of quartz, feldspar, granite, chert, hornblende, medium gray (N5) (sedimentary) rock, moderate greenish-yellow (10Y 7/4) rock, and moderate pink (5R 7/4) (sedimentary) rock; poorly cemented with calcite; pale brown (5YR 5/2) clay, moderate orange-pink (10YR 7/4) clay, and moderate orange-pink (5YR 8/4) silt.	5	110-115
Sand, very fine-grained to pebble; sub-angular to rounded, poorly to moderately sorted; composed of quartz, feldspar, granite, chert, hornblende, medium gray (N5) (sedimentary) rock; poorly cemented with calcite; pale brown (5YR 5/2) clay, moderate orange-pink (10YR 7/4) clay, and moderate orange-pink (5YR 8/4) silt, and very pale orange (10YR 8/2) caliche; from 115 to 120 feet, moderate orange-pink (5YR 8/4) silt decreases, very pale orange (10YR 8/2) caliche increases slightly and partially coats some grains.	5	115-120

Sand, very fine-grained to granule; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, and hornblende; well cemented with calcite; grayish orange-pink (10R 8/2) silt, and very pale orange (10YR 8/2) caliche.	5	120-125
Silt, grayish orange-pink (10R 8/2), very fine- to medium-grained sand; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, hornblende, and a very minor amount of biotite; moderate reddish-orange (10R 6/6) clay, and a very minor amount of very pale orange (10YR 8/2) caliche; from 130 to 135 feet, moderate reddish-orange (10R 6/6) clay increases.	10	125-135
Clay, light brown (5YR 6/4), grayish orange-pink (10R 8/2) silt, and a very minor amount of very fine- to fine-grained sand; angular, well sorted and composed of quartz, feldspar, chert, and a very minor amount of granite; moderately cemented with calcite.	5	135-140
Sand, very fine- to coarse-grained; rounded and well sorted; composed of quartz, feldspar, chert, and a very minor amount of granite; poorly to moderately cemented with calcite; grayish orange-pink (10R 8/2) silt, white (N9) caliche, and a very minor amount of moderate reddish-orange (10R 6/6) clay.	10	140-150
Silt, grayish orange-pink (10R 8/2), moderate brown (5YR 4/4) clay, very fine- to medium-grained sand; sub-angular to sub-rounded and well sorted; composed of quartz, feldspar, chert, hornblende, and granite; moderate orange-pink (10R 7/4) caliche and very pale orange (10YR 8/2) caliche, some coating grains; from 155 to 160 feet, moderate brown (5YR 4/4) clay and grayish orange-pink (10R 8/2) silt increase.	10	150-160
Sand, very fine- to medium-grained; sub-angular, well sorted; composed of quartz, chert, feldspar, hornblende, and granite; grayish orange-pink (10R 8/2) silt, moderate reddish-orange (10R 6/6) clay, and very minor amounts of white (N9) caliche and very pale orange (10YR 8/2) caliche, some coating grains.	15	160-175

Clay, moderate reddish-orange (10R 6/6), very fine- to coarse-grained sand; angular to rounded, well sorted; composed of quartz, feldspar, and chert; moderate orange-pink (5YR 8/4) silt and very pale orange (10YR 8/2) caliche.	5	175-180
Sand very fine-grained to pebble; sub-angular to rounded, poorly sorted; composed of quartz, granite, chert, feldspar, and a very minor amount of hornblende; grayish orange (10YR 7/4) silt, minor amounts of light brown (5YR 6/4) clay, very pale orange (10YR 8/2) caliche and white (N9) caliche; from 185 to 190 feet, grayish orange (10YR 7/4) silt increases; poorly cemented with calcite.	10	180-190
Sand, very fine- to medium-grained with a very minor amount of coarse-grained to granule size, angular to sub-rounded, well sorted, composed of quartz, granite, chert, feldspar, and very minor amounts of hornblende, biotite and muscovite	10	190-200
Sand very fine- to medium-grained with a very minor amount of coarse-grained to granule size; angular to sub-rounded; composed of quartz, chert, feldspar, hornblende, granite, biotite, and muscovite; grayish orange (10YR 7/4) silt, white (N9) caliche.	5	200-205
Silt, grayish orange (10YR 7/4), very fine- to medium-grained sand; sub-rounded to rounded, well sorted; composed of quartz, feldspar, chert, and a minor amount of hornblende; white (N9) caliche, and a very minor amount of light brown (5YR 5/6) clay; from 210 to 215 feet, sand and light brown (5YR 5/6) clay increase; moderately cemented with calcite.	10	205-215
Silt, grayish orange (10YR 7/4), very fine- to fine-grained sand; sub-rounded to rounded, well sorted; composed of quartz, feldspar, chert, and hornblende; white (N9) caliche, and moderate brown (5YR 4/4) clay; from 215 to 220 feet, poorly cemented with calcite.	5	215-220

Silt, grayish orange (10YR 7/4), very fine- to medium-grained sand; sub-angular to rounded, well sorted; composed of quartz, feldspar, chert, hornblende, and granite; moderate brown (5YR 4/4) clay, and very pale orange (10YR 8/2) caliche; from 225 to 230 feet, moderate brown (5YR 4/4) clay increases, and sand fines to very fine- to fine-grained and is sub-rounded to rounded.	10	220-230
Silt, grayish orange (10YR 7/4) very fine- to medium-grained sand with a very minor amount of coarse-grained to pebble sand; rounded, well sorted; composed of quartz, feldspar, chert, hornblende, and granite; white (N9) caliche and moderate brown (5YR 4/4) clay; moderately well cemented with calcite; from 235 to 240 feet, cement increases slightly.	10	230-240
Silt, grayish orange (10YR 7/4) very fine- to medium-grained sand with a very minor amount of coarse-grained to pebble sand; rounded, well sorted; composed of quartz, feldspar, chert, hornblende, and granite; white (N9) caliche, very pale orange (10YR 8/2) caliche, and pale brown (5YR 5/2) clay; from 245 to 250 feet, very pale orange (10YR 8/2) caliche increases.	10	240-250

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG: CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY	PERM. DATUM: GROUND LEVEL LOG MEASURED FROM: GL ELEVATION:	OTHER SERVICES: ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL WSMR, NM
WELL: MPL-MW-05
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

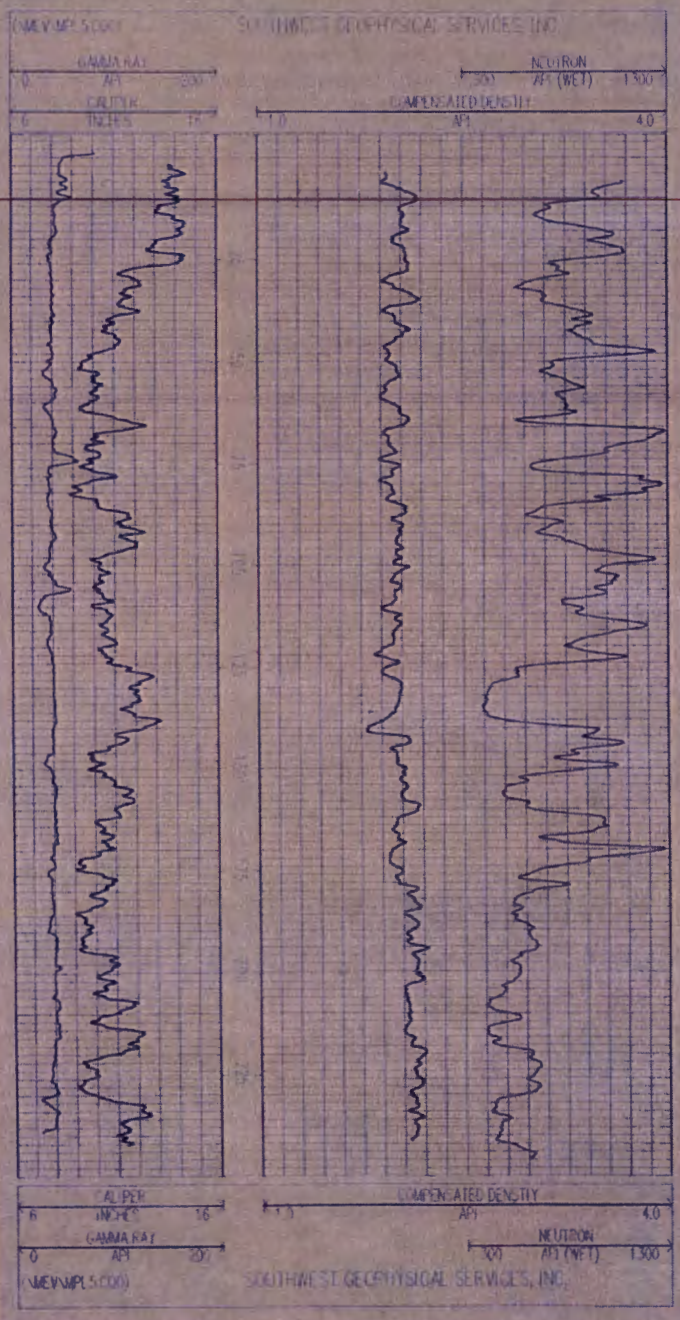
	RUN NO. 1		RUN NO. 1
DATE	3/7/97	FLUID LEVEL	FULL
DEPTH DRILLER	250 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	248 FT	FLUID VISCOSITY	
BOTTOM LOGGED	245 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	COMBO/CD2048
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR.
10 FT/MIN.

THANK YOU

COMPANY: MEVATEC
WELL: MPL-MW-05



Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG: 16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	PERM. DATUM: GROUND LEVEL LOG MEASURED FROM: GL ELEVATION:	OTHER SERVICES: CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSMR, NM
WELL: MPL-MW-05
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

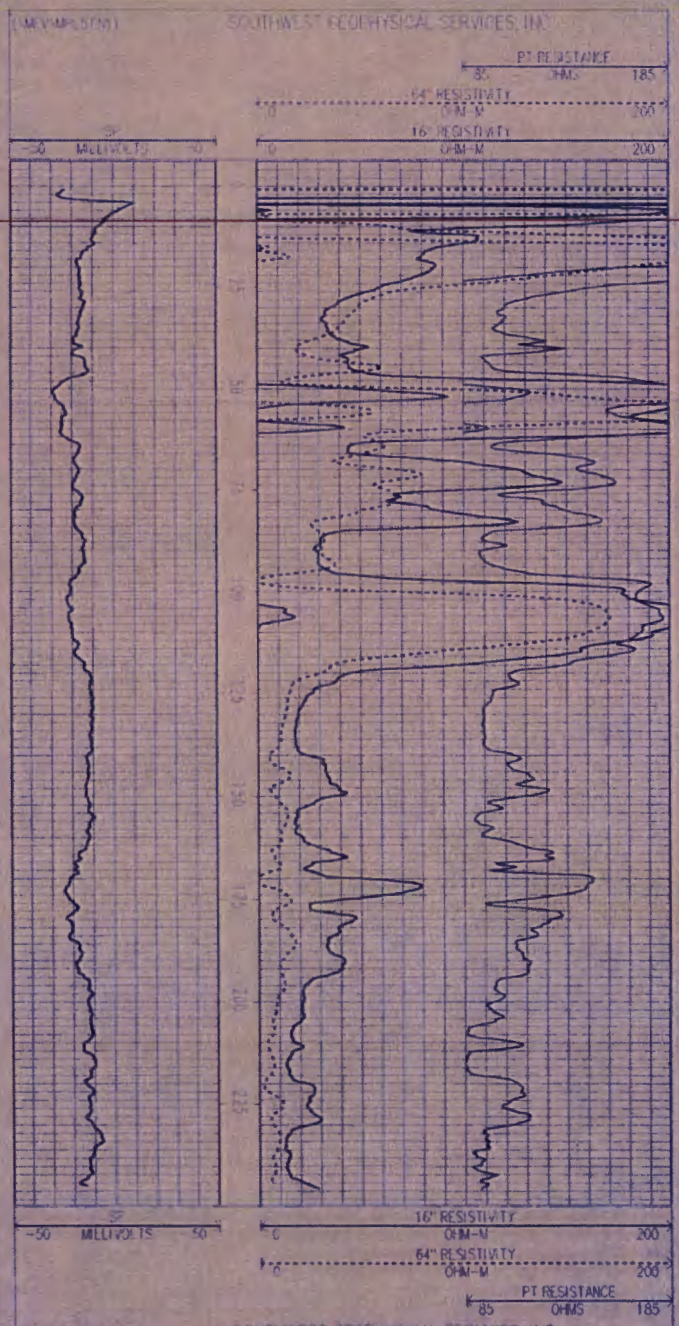
	RUN NO. 1		RUN NO. 1
DATE	3/7/97	FLUID LEVEL	FULL
DEPTH DRILLER	250 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	246.5 FT	FLUID VISCOSITY	
BOTTOM LOGGED	246.0 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	ELOG
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR.
20 FT/MIN.

THANK YOU

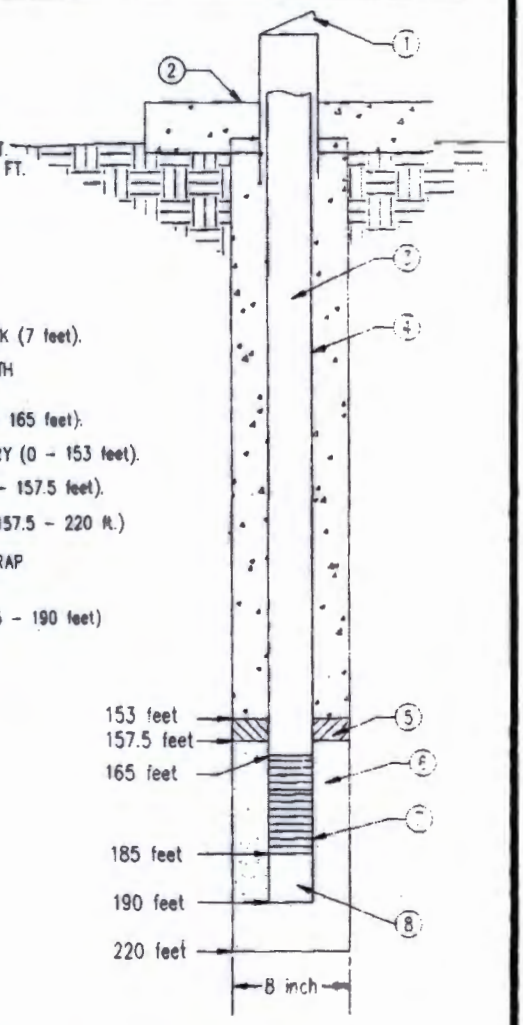
COMPANY: MEVATEC
WELL: MPL-MW-05



WELL CONSTRUCTION DIAGRAM

WELL NUMBER: **MPL-06**
WELL NAME: MAIN POST LANDFILL MONITORING WELL
GEOLOGIST: DANA DOWNS, P.G.

ELEVATIONS: TOP OF PVC WELL CASING: 3,978.07 FT.
AT BRASS SURVEY MARKER: 3,975.97 FT.
HORIZONTAL UTM: 3,582,280.51 N
365,887.83 E



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (7 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) WITH EMBEDDED BRASS SURVEY MARKER
3. WELL CASING: 4-INCH DIAM. SCHED. 40 PVC (0 - 165 feet).
4. ANNULUS BACKFILL: CEMENT/5% BENTONITE SLURRY (0 - 153 feet).
5. UPPER SEAL: HYDRATED BENTONITE CHIPS (153 - 157.5 feet).
6. FILTER PACK: 20 - 40 MESH SIZE SILICA SAND (157.5 - 220 ft.)
7. WELL SCREEN: 4-INCH DIAM. NO. 10 SIZE WIRE WRAP SCHED. 40 PVC (165 - 185 feet)
8. WELL SUMP: 4-INCH DIAM. SCHED. 40 PVC (185 - 190 feet)

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH 220 feet.
2. BOREHOLE DIAMETER: 8 INCHES
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. ELEVATIONS ARE NAVD, 1988
5. UTM LOCATIONS ARE NAD, 1983
6. DRAWING NOT TO SCALE.

Field Lithologic Log
MPL-06

Project:	SWMU Groundwater Monitoring	Installation: WSMR	
Location:	Main Post Landfill/Effluent Drainage Area		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 2400
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Borehole Diameter: 8 inches	
Geologist:	J. Kyle Williams	Dates of Drilling: March 10, 1997	

Depth	Date/Time	Description of Material	Remarks
5	1217	Sandy silt, fine- to coarse-grained sand, minor clay	
10	1222	Sandy silt, fine- to coarse-grained sand, caliche	At 11 ft. - gravel layer
15	1227	Gravel, fine, with coarse- to fine-grained sand, caliche coated grains	
20	1236	Silty sand, coarse- to fine-grained sand, caliche	Install 20 ft. drill collar.
25	1250	Silty sand, coarse- to fine-grained sand, caliche	
30	1252	Silty sand, fine-grained sand, caliche, minor coarse-grained sand	
35	1255	Silty sand, fine-grained sand, caliche, minor coarse-grained sand	
40	1258	Sandy silt, fine-grained sand	
45	1305	Sandy silt, fine-grained sand with minor coarse-grained sand	
50	1308	Sandy silt, fine-grained sand	

55	1310	Silty sand, coarse- to fine-grained sand with minor fine gravel	
60	1312	Gravel and coarse-grained sand, minor silt	At 63 ft., drilling into finer material
65	1319	Clayey silt, with fine-grained sand, hard, dry	
70	1321	Clayey silt, with fine-grained sand	
75	1324	Clayey silt, with fine-grained sand, minor gravel and coarse-grained sand	
80	1328	Silty sand, fine-grained sand with minor coarse-grained sand and gravel	
85	1336	Silty sand, fine- to medium-grained sand with minor fine gravel	
90	1339	Silt, sand, fine- to medium-grained sand with minor fine gravel	
95	1342	Sandy silt, fine- to medium-grained sand	
100	1350	Sandy silt, fine- to medium-grained sand	
105	1358	Sandy silt, fine- to medium-grained sand with minor caliche	
110	1402	Sandy silt, fine- to medium-grained sand	
115	1410	Sandy silt, fine-grained sand, minor clay	
120	1414	Sandy silt, fine-grained sand, minor clay	
125	1426	Silty sand, fine-grained sand with minor clay	
130	1428	Silty sand, fine- to medium-grained sand, minor clay	
135	1431	Silty sand, fine- to medium-grained sand	Gravel lens at 136 ft.
140	1434	Silty sand, fine- to medium-grained sand, minor fine gravel	

145	1439	Sandy silt, fine-grained sand, minor fine gravel	
150	1443	Sandy silt, fine-grained sand	Gravelly lense at 150ft. Fine-grained, hard sand at 152 ft.
155	1447	Silty sand, fine-grained sand, minor fine gravel	
160	1449	Silty sand, fine-grained sand	
165	1457	Sand, medium- to coarse-grained sand, minor fine gravel	
170	1459	Sand, medium- to coarse-grained sand, minor fine gravel	At 170 ft.- drilled core barrel sample (10 ft) Sample 171 ft. to 178 ft (10 ft X 4 inch recovered) layers of dry clay, wet sand, saturated sand, wet moist clay
175		Split barrel sample: clay and sand	
180		Split barrel sample: clay and sand	
185	1625	Sand, fine- to medium-grained, minor silt	
190	1626	Sand, fine- to medium-grained, silt	
195	1628	Silt, with fine-grained sand	
200	1640	Silt, with fine-grained sand	Between 202 ft. and 204ft. gravel
205	1649	Silty clay, lean, minor sand	
210	1657	Silty clay, lean, minor sand	
215	1702	Clayey silt, minor sand	
220	1707	Silt, with lean clay and fine-grained sand	Total Depth Borehole

Detailed Lithologic Log for MPL - 06

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, very fine-grained to granule; angular to sub-rounded, poorly sorted; composed of quartz, granite, feldspar, hornblende, chert, muscovite, and biotite grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche coating some grains.	5	0-5
Sand, very fine-grained to pebble, angular to sub-rounded, poorly sorted, and composed of granite, quartz, feldspar, hornblende, and muscovite.	5	5-10
Sand, very fine-grained to pebble; angular to sub-rounded, poorly sorted; composed of granite, quartz, feldspar, hornblende, and muscovite; and a minor amount of grayish-orange (10YR 7/4) silt; a small amount of calcite cement is present.	10	10-20
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular to rounded, moderately sorted; composed of quartz, feldspar, granite, hornblende, and chert; very pale orange (10YR 8/2) caliche and moderate orange-pink (5YR 8/4) caliche coating some grains.	5	20-25
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular, well sorted and composed of quartz, feldspar, granite, hornblende, and chert; and white (N9) caliche.	15	25-40
Sand, very fine-grained to granule; angular to sub-rounded, poorly to moderately sorted; composed of quartz, feldspar, hornblende, granite, chert, a minor amount of biotite, and a very minor amount of muscovite; grayish-orange (10YR 7/4) silt, and a very minor amount of white (N9) caliche.	5	40-45

Silt, grayish-orange (10YR 7/4), very fine-grained to pebble sand; angular to sub-rounded, moderately well sorted; composed of quartz, chert, feldspar, hornblende, granite and very minor amounts of biotite and muscovite; and very pale orange (10YR 8/2) caliche containing very fine- to fine-grained sand and grayish-orange (10YR 7/4) silt; from 50 to 55 feet, coarse-grained to pebble fraction increases and very pale orange (10YR 8/2) caliche increases.	10	45-55
Sand, very fine-grained to pebble; angular to rounded, poorly sorted; composed of quartz, chert, granite, feldspar, and hornblende; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche, and moderate orange-pink (5YR 8/4) caliche.	5	55-60
Clay, light brown (5YR 6/4), very fine- to fine-grained sand; angular to sub-angular, well sorted; composed of quartz, chert, feldspar, and hornblende; grayish-orange (10YR 7/4) silt, and white (N9) caliche.	5	60-65
Clay, moderate brown (5YR 4/4), grayish-orange (10YR 7/4) silt, very fine- to fine-grained sand; angular to sub-angular, well sorted; composed of quartz, chert, feldspar, granite and mafic minerals; grayish orange-pink (10YR 8/2) caliche and white (N9) caliche.	15	65-80
Silt, grayish-orange (10YR 7/4), light brown (5YR 6/4) clay, and very fine- to very coarse-grained sand; angular to rounded, poorly sorted; composed of quartz, feldspar, granite and mafic minerals; poorly cemented with calcite.	5	80-85
Silt, grayish-orange (10YR 7/4), and very fine- to very coarse-grained sand; angular to rounded, moderately sorted; composed of quartz, feldspar, granite, and hornblende; very pale orange (10YR 8/2) caliche and moderate orange-pink (5YR 8/4) caliche.	5	85-90

Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular to rounded, moderately sorted; composed of quartz, feldspar, chert, granite, and minor amounts of hornblende and biotite and a very minor amount of muscovite; very pale orange (10YR 8/2) caliche and moderate orange-pink (5YR 8/4) calichemoderately cemented with calcite.	10	90-100
Sand, very fine- to medium-grained; angular to sub-rounded, moderately well sorted; composed of quartz, chert feldspar, hornblende, and a minor amount of mafic minerals; grayish-orange (10YR 7/4) silt poorly cemented with calcite, a minor amount of white (N9) caliche, and a very minor amount of moderate reddish-orange (10R 6/6) clay.	5	100-105
Silt, grayish-orange (10YR 7/4), very fine- to fine-grained sand; angular, well sorted; composed of quartz, feldspar, chert, granite, and a very minor amount of biotite; grayish orange-pink (10R 8/2) caliche, very pale orange (10YR 8/2) caliche, and a minor amount of pale brown (5YR 5/2) clay; from 110 to 120 feet, sand coarsens to very fine- to medium-grained and pale brown (5YR 5/2) clay increases; from 120 to 125 feet, very fine- to medium-grained sand and grayish-orange (10YR 7/4) silt increase; sand is angular to rounded and poorly sorted.	20	105-125
Silt, grayish-orange (10YR 7/4), very fine- to fine-grained sand; angular to sub-rounded, moderately well sorted, and composed of quartz, feldspar, chert, granite, and very minor amounts of biotite, hornblende and muscovite; grayish orange-pink (10R 8/2) caliche, very pale orange (10YR 8/2) caliche, and a minor amount of pale brown (5YR 5/2) clay; from 130 to 135 feet, sand increases, and white (N9) caliche is present; poorly cemented with calcite.	10	125-135
Sand, very fine- to coarse-grained; sub-rounded to well-rounded, moderately sorted; composed of quartz, feldspar, chert, hornblende, and granite; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche, moderate orange-pink (5YR 8/4) caliche coating grains, and a minor amount of light brown (5YR 6/4) clay.	5	135-140

Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular to sub-rounded, moderately well sorted; composed of quartz, chert, granite, feldspar, and hornblende; poorly cemented with calcite; moderate orange-pink (5YR 8/4) caliche, a minor amount of light brown (5YR 5/6) clay and a very minor amount of white (N9) caliche.	5	140-145
Silt, grayish-orange (10YR 7/4), very fine- to fine-grained sand with a very minor amount of medium-grained to pebble sand; angular, well sorted; composed of quartz, chert, granite, feldspar; poorly cemented with calcite; moderate orange-pink (5YR 8/4) caliche, and very minor amounts of light brown (5YR 5/6) clay and white (N9) caliche.	5	145-150
Sand, very fine- to medium-grained; angular to sub-rounded, moderately sorted; composed of quartz, chert, granite, feldspar, hornblende and a minor amount of biotite; grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche coating some grains; from 155 to 160 feet, grayish-orange (10YR 7/4) silt increases slightly, and sand is sub-angular to rounded and well sorted.	10	150-160
Sand, very fine- to medium-grained; angular to sub-rounded, moderately sorted; composed of quartz, chert, granite, feldspar, hornblende and a minor amount of biotite; poorly cemented with calcite; grayish-orange (10YR 7/4) silt, and grayish orange-pink (10R 8/2) and white (N9) caliche.	5	160-165
Sand, very fine- to very coarse-grained; sub-angular to rounded, and poorly to moderately sorted, composed of quartz, chert, granite, feldspar, hornblende and a minor amount of biotite; poorly cemented with calcite; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche, and a very minor amount of light brown (5YR 6/4) clay.	5	165-170

Sand, very fine- to medium-grained; sub-angular to rounded, and poorly to moderately sorted, composed of quartz, chert, granite, feldspar, hornblende, and very minor amounts of biotite and muscovite; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche, and a minor amount of light brown (5YR 6/4) clay; from 175 to 180 feet, granite, biotite, and muscovite increase, and light brown (5YR 6/4) clay increases.	10	170-180
Sand, very fine- to coarse-grained; sub-angular to rounded, moderately sorted, and composed of quartz, granite, feldspar, chert, hornblende, biotite, and muscovite; grayish-orange (10YR 8/2) silt, grayish orange-pink (10R 8/2) caliche and very pale orange (10YR 8/2) caliche and a very minor amount of light brown (5YR 6/4) clay; from 185 to 190 feet, sand is very fine- to medium-grained, well sorted, chert increases, granite, biotite and muscovite decrease; grayish-orange (10YR 7/4) silt increases, very pale orange (10YR 8/2) caliche coats some grains.	10	180-190
Silt, grayish-orange (10YR 7/4) very fine- to fine-grained sand; angular to sub-rounded, well sorted; composed of quartz, feldspar, granite, chert, and hornblende; very minor amounts of light brown (5YR 6/4) clay and grayish orange-pink (10R 8/2) caliche; from 195 to 200 feet, light brown (5YR 6/4) clay increases; from 200 to 205 feet, sand increases; from 205 to 210 feet, grayish orange-pink (10R 8/2) caliche increases slightly; and sand is poorly to moderately cemented with calcite.	20	190-210
Sand, very fine- to coarse-grained; sub-angular to rounded, moderately well sorted; composed of quartz, chert, feldspar, granite, hornblende, biotite, and a minor amount of muscovite; grayish-orange (10YR 7/4) silt, and a very minor amount of light brown (5YR 6/4) clay; from 215 to 220 feet, grayish-orange (10YR 7/4) silt increases, sand is very fine- to medium-grained and decreasing, and light brown (5YR 6/4) clay decreases.		210-220

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GROUND LEVEL	OTHER SERVICES:
CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSMR, NM
WELL: MPL-MW-06
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

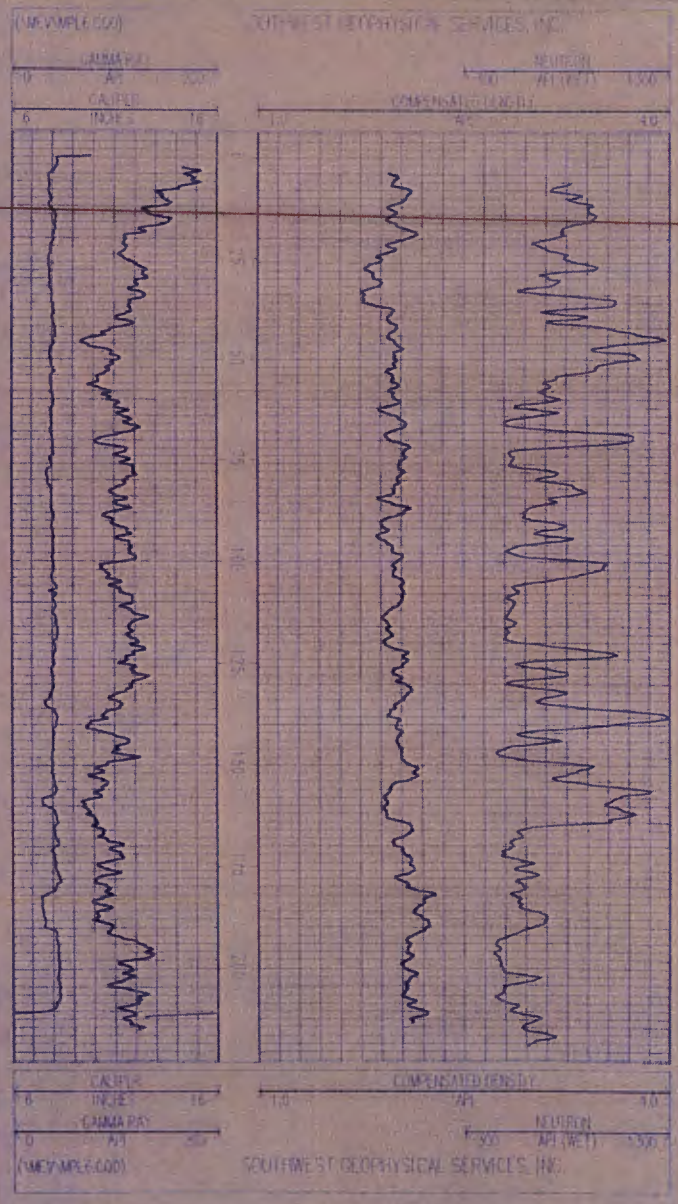
	RUN NO. 1		RUN NO. 1
DATE	3/10/97	FLUID LEVEL	FULL
DEPTH DRILLER	220 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	220 FT	FLUID VISCOSITY	
BOTTOM LOGGED	217 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	COMBO/CD2048
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MAGIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR
10 FT/MIN

THANK YOU

COMPANY: MEVATEC
WELL: MPL-MW-06



Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GROUND LEVEL	OTHER SERVICES:
16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	LOG MEASURED FROM: GL ELEVATION:	CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL WSMR, NM
WELL: MPL-MW-06
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

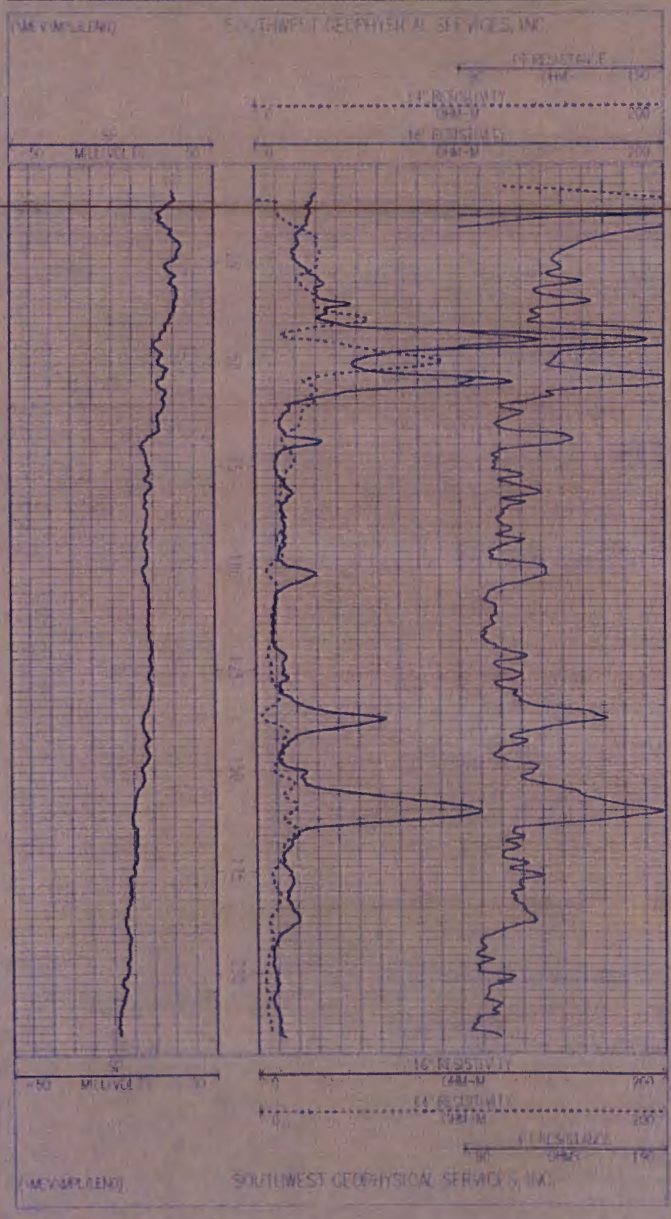
COMPANY: MEVATEC
WELL: MPL-MW-06

	RUN NO. 1		RUN NO. 1
DATE	3/10/97	FLUID LEVEL	FULL
DEPTH DRILLER	220 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	216.5 FT	FLUID VISCOSITY	
BOTTOM LOGGED	216.0 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	ELOG
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR
20 FT/MIN

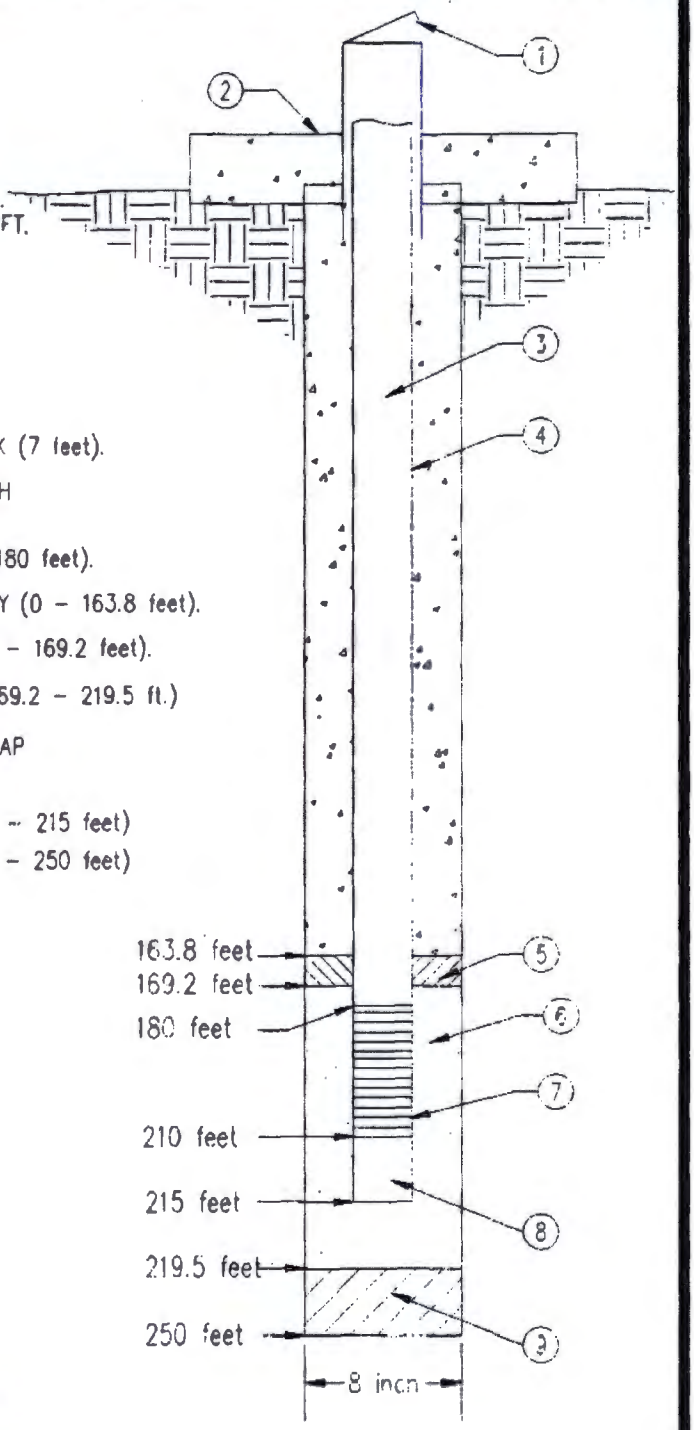
THANK YOU



WELL CONSTRUCTION DIAGRAM

WELL NUMBER: **MPL-07**
WELL NAME: MAIN POST LANDFILL MONITORING WELL
GEOLOGIST: DANA DOWNS, P.G.

ELEVATIONS: TOP OF PVC WELL CASING: 3,985.48 FT.
AT BRASS SURVEY MARKER: 3,983.39 FT.
HORIZONTAL UTM: 3,581,722.04 N
365,583.48 E



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (7 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) WITH EMBEDDED BRASS SURVEY MARKER .
3. WELL CASING: 4-INCH DIAM. SCHED. 40 PVC (0 - 180 feet).
4. ANNULUS BACKFILL: CEMENT/5% BENTONITE SLURRY (0 - 163.8 feet).
5. UPPER SEAL: HYDRATED BENTONITE CHIPS (163.8 - 169.2 feet).
6. FILTER PACK: 20 - 40 MESH SIZE SILICA SAND (169.2 - 219.5 ft.)
7. WELL SCREEN: 4-INCH DIAM. NO. 10 SIZE WIRE WRAP SCHED. 40 PVC (180 - 210 feet)
8. WELL SUMP: 4-INCH DIAM. SCHED. 40 PVC (210 - 215 feet)
9. LOWER SEAL: HYDRATED BENTONITE CHIPS (219.5 - 250 feet)

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 250 feet.
2. BOREHOLE DIAMETER: 8 INCHES
3. ALL DEPTHS MEASURED FROM GROUND SURFACE
4. ELEVATIONS ARE NAVD, 1988
5. UTM LOCATIONS ARE NAD, 1983
6. DRAWING NOT TO SCALE.

Field Lithologic Log
MPL-07

Project:	SWMU Groundwater Monitoring	Installation: WSMR	
Location:	Main Post Landfill/Effluent Drainage Area		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Borehole Diameter: 8 inches	
Geologist:	J. Kyle Williams	Dates of Drilling: March 5, 1997	

Depth	Date/Time	Description of Material	Remarks
5	0855	Sand, medium- to coarse-grained, poorly sorted	Drill to 20 ft. with kelly
10	0900	Sand, very fine- to fine-grained	Added polymer for drilling
15	0907	Sand, very fine- to fine-grained with caliche	
20	0911	Sand, fine- to medium-grained with caliche	Added 20ft. bit stabilizer
25	0920	Sand, medium-grained with small amount of coarse-grained sand	
30	0925	Sand, fine- to medium-grained with caliche	Going into finer-grained materials, slower drilling
35	0928	Sand, fine- to medium-grained with caliche and small amount coarse sand	
40	0933	Good sand, gravel (sand- coarse-grained, rounded)	
45	0935	Silt and fine-grained sand with caliche	Entering finer-grained materials
50	0943	Silt and fine-grained sand with caliche	

55	0951	Silt and fine-grained sand with caliche	
60	0955	Silt and fine-grained sand	
65	1002	Sand, fine-grained with caliche	
70	1006	Sand, fine-grained with silt and caliche	Steady drilling
75	1010	Silt and fine-grained sand with caliche	
80	1014	Silt and fine-grained sand with caliche	
85	1018	Silt and fine-grained sand	
90	1022	Silt and fine-grained sand with caliche	Gravel at 93 ft. Enter clayey material at 96 ft.
95	1026	Gravel and coarse sand	
100	1032	Silt and fine-grained sand with small amount of clay	Sand and gravel- 103 ft. to 107 ft. gravel
105	1041	Sand, coarse-grained, with gravel	
110	1044	Sand, fine-grained with small amount of silt	
115	1049	Sand, fine-grained with small amount of silt	Entering clayey material, slower drilling
120	1052	Sand, fine-grained with small amount of silt/silty clay	
125	1100	Sand, medium- to fine-grained	
130	1104	Sand medium- to fine-grained	More clay
135	1115	Silt and silty clay	
140	1118	Sand and silt, no clay	
145	1125	Sand and silt	At 148 ft. enter clay, slow drilling
150	1133	Silty sand with clay	
155	1145	Silty sand with small amount of clay	
160	1148	Sand with silt with small amount of clay	
165	1155	Sand, medium to fine-grained	Back into sand

170	1158	Sand, medium- to coarse- grained	
175	1202	Sand, medium- and fine-grained	
180	1206	Sand, fine- to medium- and coarse-grained	
185	1214	Sand, fine- to medium-grained with silt and caliche	
190	1217	Sand, fine- to medium-grained with silt	
195	1220	Sand with silt and caliche	
200	1230	Silty clay with fine-grained sand	
205	1240	Sand, fine- to medium-grained	Sandy zone
210	1242	Sand, fine- to medium-grained with small amount of coarse-grained material	Thinly interbedded layers of fine-grained sand, silt and silty clay
215	1245	Sand, fine- to medium-grained with small amount of coarse-grained material	Clay at 218 ft. (Silt)
220	1246	Silty sand with caliche	
225	1250	Silt and silty-clay	Sand at 227 ft.
230	1255	Sand, fine- to medium-grained	
235	1315	Silt and silty clay with fine-grained sand	Slower drilling
240	1320	Silty sand with small amount of clay	
245	1330	Silty sand with small amount of clay	
250	1340	Silty sand with small amount of clay	Total Depth Borehole

Detailed Lithologic Log for MPL - 07

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, very fine-grained to pebble; angular, well sorted; composed of granite, quartz, feldspar, hornblende, chert, and muscovite.	5	0-5
Sand, very fine-grained to pebble; angular to subrounded, moderately sorted; composed of quartz, granite, feldspar, hornblende, chert, biotite, and muscovite; and light brown (5YR 5/6) silt.	5	5-10
Sand, very fine-grained to pebble; angular to sub-rounded, poorly sorted; composed of quartz, granite, feldspar, hornblende, chert, biotite, and muscovite; pale yellowish-orange (10YR 8/6) silt, and very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand; from 15 to 30 feet white (N9) caliche is present as a grain coat; from 20 to 30 feet sand size decreases to very coarse-grained and grains become sub-angular to rounded.	20	10-30
Sand, very fine- to very coarse-grained; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, chert, granite, and biotite; grayish orange-pink (5YR 7/2) silt, and very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and coating grains.	5	30-35
Sand, fine-grained to granule, sub-angular to rounded, well sorted; composed of granite, quartz, chert, feldspar, hornblende, and biotite.	5	35-40
Sand, very fine- to medium-grained; sub-angular to rounded, well sorted; composed of quartz, granite, chert, feldspar, and hornblende; and pale reddish brown (10R 5/4) clay.	5	40-45

Silt, grayish orange (10YR 7/4), very fine- to fine-grained sand; angular to sub-rounded, well sorted; composed of quartz, feldspar, hornblende, and chert; very pale orange (10YR 8/2) caliche, and light brown (5YR 6/4) clay containing a small amount of organic matter; from 50 to 55 feet, sand and light brown (5YR 6/4) clay increase, sand coarsens to very fine- to medium-grained.	10	45-55
Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, chert, feldspar, hornblende, and very minor amounts of biotite, and muscovite; grayish-orange (10YR 7/4) silt, and light brown (5YR 6/4) clay.	5	55-60
Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, hornblende, biotite and muscovite; grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche.	5	60-65
Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, hornblende; grayish-orange (10YR 7/4) silt, and a very minor amount of very pale orange (10YR 8/2) caliche.	5	65-70
Sand, very fine- to medium-grained; sub-angular to rounded, well sorted; composed of quartz, feldspar, chert, hornblende, biotite, and muscovite; grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche; from 75 to 80 feet, sand is angular to sub-angular and decreasing.	10	70-80
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; sub-angular to rounded, well sorted; composed of quartz, chert, feldspar, hornblende; moderately well cemented with calcite; and a very minor amount of very pale orange (10YR 8/2) caliche, some coating grains; from 85 to 90 feet, grayish-orange (10YR 7/4) silt is moderately well cemented with calcite, and biotite and muscovite are absent.	5	80-85

Sand, very fine-grained to pebble; angular to rounded, poorly sorted; composed of quartz, chert, granite, and feldspar; grayish-orange (10YR 7/4) silt, moderately well cemented with calcite, and very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and coating some grains.	5	90-95
Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, chert, granite, feldspar, and hornblende; grayish-orange (10YR 7/4) silt, moderately well cemented with calcite, very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and coating some grains, and moderate brown (5YR 3/4) clay.	10	95-105
Sand, very fine- to very coarse-grained; sub-angular to rounded, moderately sorted; composed of quartz, chert, granite, feldspar, hornblende, and very minor amounts of muscovite and biotite; and very pale orange (10YR 8/2) silt.	5	105-110
Sand, very fine to medium-grained; sub-angular to rounded, moderately sorted;composed of quartz, feldspar, chert, and minor amounts of hornblende and other mafic minerals; and very pale orange (10YR 8/2) silt.	10	110-120
Sand, very fine to medium-grained; angular to sub-rounded, very well sorted; composed of quartz, chert, feldspar, and a minor amount of hornblende; a minor amount of grayish-orange (10YR 7/4) silt, and white (N9) caliche; from 125 to 130 feet, a very minor amount of white (N9) caliche is present, some coating grains.	10	120-130
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular to sub-rounded, very well sorted; composed of quartz, feldspar, chert, a minor amount of hornblende, and a very minor amount of muscovite; grayish-brown (5YR 3/2) clay, and a minor amount of white (N9) caliche; from 135 to 140 feet, grayish-orange (10YR 7/4) silt increases, very fine-to medium-grained sand increases, is angular to rounded, and moderately sorted, and grayish-brown (5YR 3/2) clay decreases.	10	130-140

Sand, very fine- to medium-grained; sub-angular to rounded, well sorted; composed of quartz, chert, granite, and feldspar; grayish-orange (10YR 7/4) silt, moderate brown (5YR 3/4) clay, and very pale orange (10YR 8/2) caliche, some coating grains.	5	140-145
Silt, grayish-orange (10YR 7/4), moderate orange-pink (5YR 8/4) caliche, pale yellowish-brown (10YR 6/2) clay, and very fine- to medium-grained, moderately well calcite cemented sand; angular to sub-rounded, well sorted.	5	145-150
Clay, moderate brown (5YR 4/4), grayish-orange (10YR 7/4) silt, and very fine- to fine-grained sand; sub-angular to sub-rounded, very well sorted, with a minor amount of calcite cement; composed of quartz, chert, feldspar, and hornblende.	5	150-155
Sand, very fine- to medium-grained; sub-angular to rounded, well sorted; composed of quartz, chert, granite, feldspar, and hornblende; grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche coating grains.	5	155-160
Sand, very fine- to medium-grained; sub-angular to rounded, well sorted; composed of quartz, chert, granite, feldspar, and hornblende; grayish-orange (10YR 7/4) silt, pale yellowish-orange (10YR 6/2) clay, and very pale orange (10YR 8/2) caliche coating some grains.	5	160-165
Sand, very fine- to very coarse-grained; sub-angular to rounded, poorly sorted; composed of quartz, granite, chert, feldspar, hornblende and a minor amount of light gray (N7) (sedimentary) rock; grayish-orange (10YR 7/4) silt, and moderate brown (5YR 3/4) clay.	5	165-170
Sand, very fine- to very coarse-grained; sub-angular to rounded, poorly sorted; composed of quartz, granite, chert, feldspar, hornblende and a minor amount of light gray (N7) (sedimentary) rock; and grayish-orange (10YR 7/4) silt.	10	170-180

Sand, very fine- to very coarse-grained; sub-angular to rounded, poorly sorted; composed of quartz, granite, chert, feldspar, hornblende and a minor amount of light gray (N7) (sedimentary) rock; some sand is very poorly cemented with calcite; grayish-orange (10YR 7/4) silt and a very minor amount of moderate brown (5YR 3/4) clay.	5	180-185
Sand, very fine- to medium-grained; sub-angular to rounded, poor to moderately sorted; composed of quartz, chert, granite, feldspar, and hornblende; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche coating some grains, and moderate orange-pink (5YR 8/4) caliche; from 190 to 195 feet, moderate orange-pink (5YR 8/4) caliche is absent.	10	185-195
Clay, moderate brown (5YR 4/4), moderately cemented with calcite, very fine- to medium-grained sand; sub-angular to rounded, poor to moderately sorted; composed of quartz, chert, granite, feldspar, and hornblende; grayish-orange (10YR 7/4) silt, and moderate orange-pink (5YR 8/4) caliche containing a minor amount of very fine- to fine-grained sand and grayish-orange (10YR 7/4) silt.	5	195-200
Sand, very fine- to coarse-grained; sub-angular to sub-rounded, poorly to moderately sorted; composed of quartz, chert, granite, feldspar, and light gray (N7) (sedimentary) rock; grayish-orange (10YR 7/4) silt, and moderate brown (5YR 4/4), calcite cemented clay.	5	200-205
Sand, very fine- to coarse-grained; sub-angular to sub-rounded, poorly to moderately sorted; composed of quartz, chert, granite, feldspar, light gray (N7) (sedimentary) rock, and hornblende; and grayish-orange (10YR 7/4) silt.	5	205-210
Sand, very fine- to medium-grained; sub-angular to sub-rounded, poorly to moderately sorted; composed of quartz, chert, granite, feldspar, and light gray (N7) (sedimentary) rock; grayish-orange (10YR 7/4) silt, moderate brown (5YR 4/4), calcite cemented clay, and very pale orange (10YR 8/2) caliche coating grains.	10	210-220

Clay, light brown (5YR 5/6), poorly cemented with calcite, grayish-orange (10YR 7/4) silt, very fine- to medium-grained sand; sub-angular to sub-rounded, moderately sorted; composed of quartz, chert, granite, feldspar, and hornblende; and very pale orange (10YR 8/2) caliche coating grains.	5	220-225
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; sub-angular to rounded, moderately sorted; composed of quartz, chert, granite, feldspar, and hornblende; very poorly cemented with calcite; moderate brown (5YR 4/4) clay, and moderate orange-pink (5YR 8/4) caliche.	5	225-230
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, chert, feldspar, hornblende, and granite; very poorly cemented with calcite; and moderate brown (5YR 4/4) clay.	5	230-235
Silt, grayish-orange (10YR 7/4) some poorly cemented with calcite, moderate brown (5YR 4/4) clay, very fine- to medium-grained sand; sub-angular to rounded, moderately sorted; composed of quartz, chert, granite, feldspar, and hornblende; and white (N9) caliche.	15	235-250

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GROUND LEVEL	OTHER SERVICES:
CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSMR, NM
WELL: MPL-MW-07
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

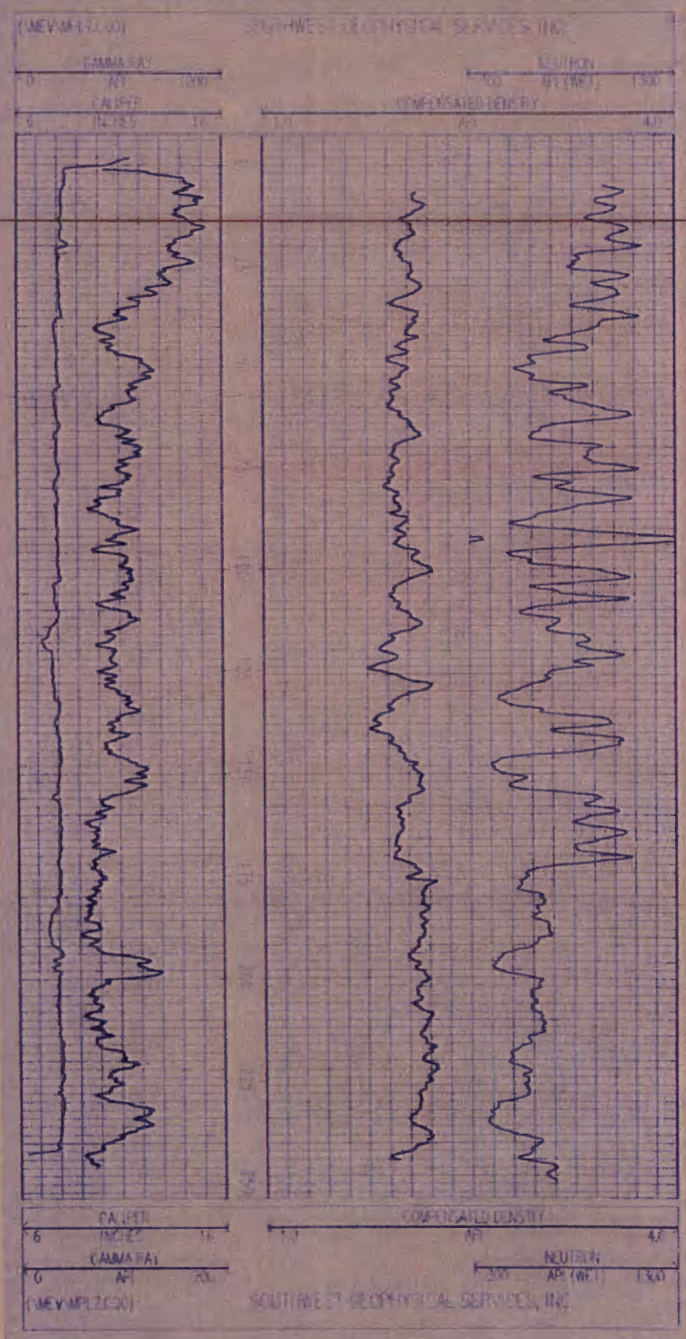
	RUN NO. 1		RUN NO. 1
DATE	3/5/97	FLUID LEVEL	FULL
DEPTH DRILLER	250 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	251 FT	FLUID VISCOSITY	
BOTTOM LOGGED	248 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	COMBO/CD2048
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INT'L

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR.
10 FT/MIN.

THANK YOU

COMPANY: MEVATEC
WELL: MPL-MW-07



Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG: 16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	PERM. DATUM: GROUND LEVEL LOG MEASURED FROM: GL ELEVATION:	OTHER SERVICES: CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSNR, NM
WELL: MPL-MW-07
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

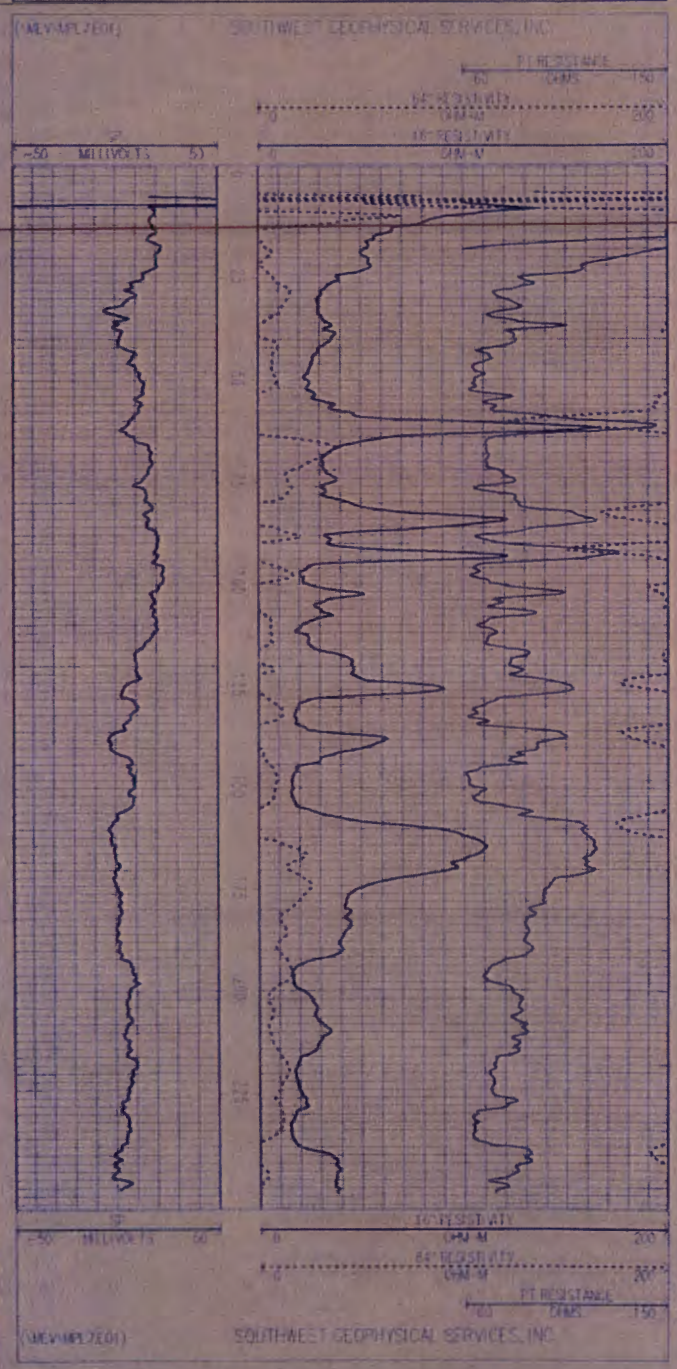
COMPANY: MEVATEC
WELL: MPL-MW-07

	RUN NO. 1		RUN NO. 1
DATE	3/5/97	FLUID LEVEL	FULL
DEPTH DRILLER	250 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	249.5 FT	FLUID VISCOSITY	
BOTTOM LOGGED	249.0 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	ELOG
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR.
20 FT/MIN.

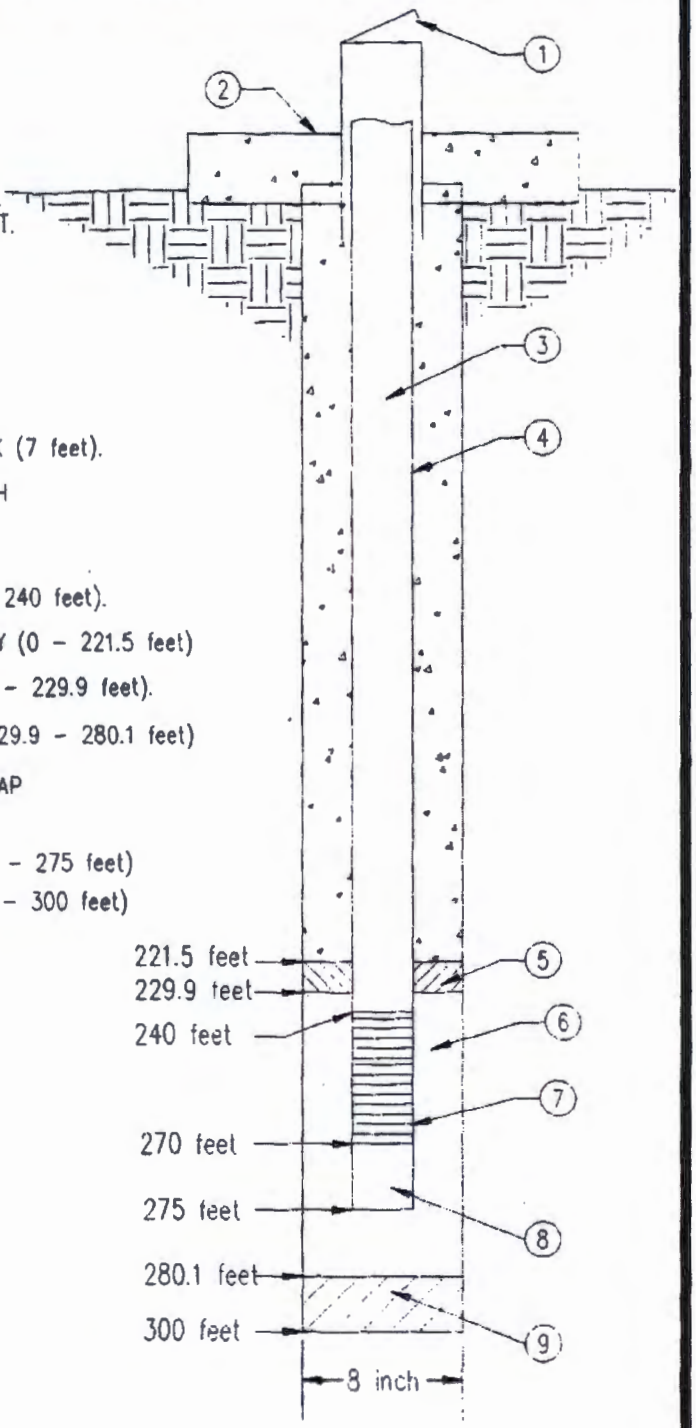
THANK YOU



WELL CONSTRUCTION DIAGRAM

WELL NUMBER: **MPL-08**
WELL NAME: MAIN POST LANDFILL MONITORING WELL
GEOLOGIST: DANA DOWNS, P.G.

ELEVATIONS: TOP OF PVC WELL CASING: 4,060.47 FT.
AT BRASS SURVEY MARKER: 4,058.48 FT.
HORIZONTAL UTM: 3,581,520.22 N
364,201.65 E



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (7 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) WITH EMBEDDED BRASS SURVEY MARKER.
3. WELL CASING: 4-INCH DIAM. SCHED. 40 PVC (0 - 240 feet).
4. ANNULUS BACKFILL: CEMENT/5% BENTONITE SLURRY (0 - 221.5 feet)
5. UPPER SEAL: HYDRATED BENTONITE CHIPS (221.5 - 229.9 feet).
6. FILTER PACK: 20 - 40 MESH SIZE SILICA SAND (229.9 - 280.1 feet)
7. WELL SCREEN: 4-INCH DIAM. NO. 10 SIZE WIRE WRAP SCHED. 40 PVC (240 - 270 feet)
8. WELL SUMP: 4-INCH DIAM. SCHED. 40 PVC (270 - 275 feet)
9. LOWER SEAL: HYDRATED BENTONITE CHIPS (280.1 - 300 feet)

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 300 feet.
2. BOREHOLE DIAMETER: 8 INCHES
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. ELEVATIONS ARE NAVD, 1988
5. UTM LOCATIONS ARE NAD, 1983
6. DRAWING NOT TO SCALE.

Field Lithologic Log
MPL-08

Project:	SWMU Groundwater Monitoring	Installation:	WSMR
Location:	Main Post Landfill/Effluent Drainage Area		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 2400
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Borehole Diameter: 8 inches	
Geologist:	Dana V. Downs	Dates of Drilling: February 23 - 24, 1997	

Depth	Date/Time	Description of Material	Remarks
5	2/23/97 1533	Sand, medium- to coarse-grained	No polymer added
10	1535	Sand, medium- to coarse-grained	Drilled in to 20' with kelly
15	1536	Sand, medium- to coarse-grained	Easy, smooth drilling
20	1539	Sand, medium- to coarse-grained	Added 20 ft. drill collar
25	1555	Sand, medium- to coarse-grained	Easy smooth drilling
30	1600	Sand, medium- to coarse-grained	Losing much water to formation
35	1605	Sand, medium- to coarse-grained	38.5 to 39 ft. gravel zone
40	1608	Sand, medium- to coarse-grained	
45	1616	Sand, medium- to coarse-grained	Not seeing fine-grained material; going through sieve
50	1617	Sand, medium- to coarse-grained	Losing water at 53.5 ft,. cobbles
55	1620	Sand, medium- to coarse-grained	

60	1623	Sand, fine- to medium- to coarse-grained	Not seeing fine-grained sand through strainer
65	1631	Sand, fine- to medium- to coarse-grained	Drilling through thin gravel zones (coarse sand)
70	1634	Sand, fine- to medium- to coarse-grained	Fining gradually with depth
75	1637	Sand, fine- to medium- to coarse-grained	
80	1640	Sand, fine- to medium- to coarse-grained	
85	1645	Sand, fine- to medium- to coarse-grained	Poorly sorted
90	1647	Sand, fine- to coarse-grained	
95	1651	Sand, medium- to coarse-grained	
100	1653	Sand, medium- to coarse-grained	
105	1702	Silt and sand, medium- to coarse-grained	
110	1704	Silt and clay	
115	1705	Silt and sand, medium- to coarse-grained	
120	1709	Clayey silt and sand - medium- to coarse-grained	
125	1716	Silt, silty clay and sand	Enter clay zone at 126.5 slower drilling. At 128 ft. out of clay
130	1720	Clay and silty clay	
135	1724	Sand (medium-grained) with silt and clay	
140	1725	Silt and sand with clay	Tripped out drill pipe, Stop for the day
145	2/24/97 0753	Silt and sand with small amount of clay	Tripped back into borehole

150	0758	Silt and sand, medium- to coarse-grained with clay	
155	0802	Sandy silt	Smooth easy drilling
160	0806	Sandy silt with clay	
165	0823	Clayey silt with fine-grained sand	
170	0830	Sandy silt with clay	At 172 ft. - good sand
175	0832	Sand with silt	
180	0836	Silty sand	
185	0848	Silt and sand with small amount of clay	
190	0855	Sand, medium- to coarse-grained with silt	
195	0859	Sand, medium- to coarse-grained with silt	
200	0901	Sand, medium- to coarse-grained with silt	At 200 ft. to 203 ft.
205	0912	Clayey silt with sand and caliche	Slow drilling times,finer gravel material
210	0919	Sandy silt with small amount of clay and caliche	
215	0921	Sandy silt with small amount of clay with caliche	
220	0928	Silt with fine-grained sand and small amount of clay with caliche	
225	0937	Silt with fine-grained sand and small amount of clay with caliche	
230	0940	Silt with fine-grained sand and small amount of clay with caliche	
235	0954	Sandy silt and sand, coarse-grained with caliche	
240	0956	Sandy silty with caliche	Thinning down mud, adding water, emptied pit

245	1011	Sandy silt with caliche	Slow drilling, fine-grained compacted material
250	1023	Silt and clay	
255	1036	Silt and fine-grained sand with clay with caliche	
260	1052	Sandy silt with small amount of clay and caliche	263 ft. to 264 ft. small sand layer
265	1106	Silt with fine-grained sand and caliche	
270	1113	Silt with fine-grained sand and caliche	
275	1117	Sandy silt with caliche	
280	1122	Silty sand with caliche	
285	1128	Silty sand with caliche	
290	1129	Sand, medium- to coarse-grained with silt	
295	1132	Sand, medium- to coarse-grained	
300	1136	Sand, medium- to coarse-grained	Total Depth Borehole

Detailed Lithologic Log for MPL - 08

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, very fine-grained to granule; angular to sub-rounded, poor to moderately sorted; composed of granite, quartz, feldspar, hornblende, and a minor amount of biotite; and grayish-orange (10YR 7/4) silt.	5	0-5
Sand, very fine-grained to granule; angular to sub-rounded, poor to moderately sorted; composed of granite, quartz, feldspar, hornblende, and minor amounts of muscovite and biotite; grayish-orange (10YR 7/4) silt, and a minor amount of moderate orange-pink (5YR 8/4) caliche.	15	5-20
Sand, very fine-grained to granule; angular to sub-rounded, moderately to well sorted; composed of granite, quartz, feldspar, hornblende, medium dark gray (N4) (sedimentary) rock, muscovite, and biotite; grayish orange-pink (5YR 7/2) caliche and very light gray (N8) caliche.	10	20-30
Sand, very fine-grained to granule; angular to sub-rounded, moderately to well sorted; composed of granite, quartz, feldspar, hornblende, muscovite, biotite, and very minor amounts of chert and medium gray (N5) (sedimentary) rock; moderate orange-pink (5YR 8/4) caliche, and light brown (5YR 6/4) caliche, and a minor amount of grayish-orange (10YR 7/4) silt.	5	30-35
Sand, fine-grained to granule; angular to sub-rounded, moderately well sorted; composed of quartz, granite, feldspar, hornblende, and a minor amount of biotite; light brown (5YR 6/4) silt, and grayish orange-pink (5YR 7/2) caliche coating grains.	5	35-40

Sand, coarse-grained to pebble,with a very minor amount of very fine- to medium-grained sand; angular to sub-rounded, well sorted; composed of granite, feldspar, quartz, hornblende, and very minor amounts of biotite and chert; minor amounts of light brown (5YR 6/4) silt, and very pale orange (10YR 8/2) caliche coating grains.	5	40-45
Sand, coarse-grained to pebble; angular to sub-rounded, well sorted; composed of granite, feldspar, quartz, hornblende; minor amounts of light brown (5YR 6/4) silt, very pale orange (10YR 8/2) caliche coating grains, and a very minor amount of white (N9) caliche; from 55 to 65 feet, a minor amount of very fine- to medium-grained sand is present and contains minor amounts of biotite and chert.	20	45-65
Sand, fine-grained to pebble; angular to sub-angular, poorly sorted; composed of granite, feldspar, quartz, hornblende and a minor amount of medium dark gray (N3) (sedimentary) rock; a minor amount of grayish-orange (10YR 7/4) silt, and a very minor amount of very pale orange (10YR 8/2) caliche coating grains.	5	65-70
Sand, coarse-grained to pebble; angular, moderately to well sorted; composed of granite, quartz, feldspar, hornblende, and minor amounts of chert and dark gray (N3) (sedimentary) rock; minor amounts of grayish-orange (10YR 7/4) silt, and moderate orange-pink (5YR 8/4) caliche coating some coarse-grained to pebble sand.	5	70-75
Sand, fine-grained to pebble; sub-angular to sub-rounded, moderately to well sorted; composed of granite, quartz, feldspar, medium dark gray (N4) (sedimentary) rock, and minor amounts of hornblende, muscovite, and biotite; very pale orange (10YR 8/2) caliche, and dark yellowish-orange (10YR 6/6) silt.	5	75-80
Sand, fine-grained to granule; angular to sub-rounded, moderately sorted; composed of granite, quartz, feldspar, medium dark gray (N4) (sedimentary) rocks, hornblende, and a very minor amount of chert; minor amounts of light brown (5YR 6/4) silt and very pale orange (10YR 8/2) caliche, some coating grains.	5	80-85

Sand, very fine-grained to pebble, dark yellowish-orange (10YR 7/4) silt, moderate brown (5YR 4/4) clay, and a minor amount of moderate orange-pink (5YR 8/4) caliche some coating grains; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, granite, hornblende, and a very minor amount of pinkish-gray (5YR 8/1) (sedimentary) rock.	5	85-90
Sand, very fine-grained to pebble; angular to sub-rounded, moderately to well sorted; composed of granite, quartz, feldspar, hornblende, medium dark gray (N4) (sedimentary) rock, and minor amounts of biotite and muscovite; dark yellowish-orange (10YR 5/4) silt, light brown (5YR 5/6) silt, grayish orange-pink (5YR 7/2) clay, and very pale orange (10YR 8/2) caliche some coating grains; from 95 to 100 feet, dark yellowish-orange (10YR 5/4) silt is absent.	10	90-100
Sand, very fine-grained to pebble; sub-angular to rounded, well sorted; composed of granite, quartz, feldspar, hornblende, biotite, and dark gray (N3) (sedimentary) rock; light brown (5YR 6/4) silt, light brown (5YR 5/6) clay, and very pale orange (10YR 8/2) caliche, some coating grains.	5	100-105
Sand, fine-grained to pebble; angular to sub-angular, moderately well sorted; composed of granite, quartz, feldspar, horneblende, and minor amounts of chert, biotite, and muscovite; pale reddish-brown (10R 5/4) clay, moderate orange-pink (5YR 8/4) silt, and very pale orange (10YR 8/2) caliche, some coating grains.	5	105-110
Sand, very fine-grained to pebble; sub-angular to rounded, moderately to well sorted; composed of quartz, feldspar, granite, horneblende, and minor amounts of chert, biotite, and muscovite; pale reddish-brown (10R 8/4) clay, and grayish orange-pink (5YR 7/2) silt.	5	110-115
Sand, fine-grained to pebble; angular to sub-rounded, poorly to moderately sorted; composed of quartz, feldspar, granite, horneblende, chert, and minor amounts of biotite and muscovite; light brown (5YR 6/4) silt, and pale reddish-brown (10R 8/4) clay.	5	115-120

Clay, pale reddish-brown (10R 5/4) with a small amount of organic matter, grayish-orange (10YR 7/4) silt, and very fine- to very coarse-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, hornblende, granite, and muscovite.	5	120-125
Clay, pale red (10R 6/2), poorly cemented with calcite, grayish-orange (10YR 7/4) silt, and very fine- to very coarse-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, hornblende, granite, biotite, and muscovite; and a minor amount of very pale orange (10YR 8/2) caliche coating some grains.	5	125-130
Sand, very fine-grained to pebble; angular to round, poorly sorted; composed of quartz, feldspar, granite, hornblende and muscovite; moderate brown (5YR 4/4) clay, poorly cemented with calcite, and light brown (5YR 6/4) silt.	5	130-135
Sand, very fine-grained to pebble; sub-angular to sub-rounded, poorly sorted; composed of quartz, feldspar, granite, moderate reddish-orange (10R 6/6) (sedimentary) rock, and minor amounts of hornblende and chert; pale yellowish-brown (10YR 6/2) silt, grayish-red (10R 4/2) clay, and very pale orange (10YR 8/2) caliche, some coating grains.	5	135-140
Silt, light brown (5YR 6/4), very fine-grained to pebble sand; angular to sub-rounded, poorly sorted; composed of quartz, feldspar, granite, hornblende, and chert; moderate orange-pink (5YR 8/4) caliche, some coating grains, and light brown (5YR 6/4) clay.	5	140-145
Silt, light brown (5YR 6/4), very fine-grained to pebble sand; angular to sub-rounded, poorly sorted; composed of quartz, feldspar, granite, hornblende, and minor amounts of biotite and muscovite; moderate orange-pink (5YR 8/4) caliche, some coating grains, and pale brown (5YR 5/2) clay containing a small amount of calcite cement.	5	145-150

Clay, grayish-brown (5YR 3/2), grayish-orange (10YR 7/4) silt, and very fine-grained to pebble sand; sub-angular to sub-rounded, poorly sorted; composed of quartz, feldspar, hornblende, granite, biotite, and muscovite; from 155 to 160 feet, clay contains a minor amount of calcite cement, sand is sub-angular to sub-rounded and poorly sorted, granite and muscovite are absent;	10	150-160
Clay, grayish-brown (5YR 3/2), moderate yellowish-brown (10YR 5/4) silt, very fine- to coarse-grained sand; angular, well sorted; composed of quartz, feldspar, hornblende, and minor amounts of muscovite, and biotite; from 165 to 170 feet, grayish-brown (5YR 3/2) clay decreases and contains a small amount of organic matter, hornblende, biotite, and muscovite are absent, and a minor amount of chert is present.	10	160-170
Silt, grayish-orange(10YR 7/4); very fine- to very coarse-grained sand; sub-rounded, poorly sorted; composed of granite, quartz, feldspar, and a minor amount of blackish-red (5R 2/2) (sedimentary) rock; and light brown (5YR 5/6) clay.	5	170-175
Sand, very fine-grained to granule; angular to sub-rounded, poorly sorted; composed of granite, quartz, feldspar, hornblende, blackish-red (5R 2/2) and medium dark gray (N4) (sedimentary) rock; grayish-orange (10YR 7/4) silt, moderate brown (5YR 4/4) clay, and very pale orange (10YR 8/2) caliche coating some grains.	5	175-180
Clay, pale reddish-brown (10R 5/4), very fine-grained to pebble sand; angular to sub-rounded, moderately sorted; composed of quartz, granite, feldspar, biotite, hornblende, muscovite, and olive gray (5Y 4/1) (sedimentary) rock; and moderate yellowish-brown (10YR 7/4) silt.	5	180-185
Sand, very fine-grained to pebble; sub-angular to rounded, poorly sorted; composed of quartz, granite, and feldspar; light brown (5YR 6/4) clay, dark yellowish-orange (10YR 6/6) silt, and a minor amount of very pale orange (10YR 8/2) caliche, some coating grains.	5	185-190

Sand, very fine-grained to pebble; sub-rounded to rounded, well sorted; composed of granite, quartz, feldspar, and minor amounts of medium light gray (N6) and olive-gray (5Y 4/1) (sedimentary) rocks; grayish-orange (10YR 7/4) silt, and a minor amount of light brown (5YR 6/4) clay.	5	190-195
Sand, very fine-grained to granule; angular to rounded, well sorted; composed of granite, quartz, feldspar, medium light gray (N6) and dusky yellow-green (5GY 5/2) (sedimentary) rock; light brown (5YR 6/4) clay, and dark yellowish-orange (10YR 6/6) silt.	5	195-200
Silt, grayish-orange (10YR 7/4), very fine-grained to fine pebble sand; angular to sub-rounded, moderately well sorted; composed of quartz, granite, feldspar, and minor amounts of muscovite and biotite; light brown (5YR 6/4) clay, and minor amounts of very pale orange (10YR 8/2) caliche coating some grains.	5	200-205
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; sub-angular to rounded, well sorted; composed of quartz, feldspar, granite, and hornblende; light brown (5YR 6/4) clay, very pale orange (10YR 8/2) caliche coating some grains, and white (N9) caliche.	5	205-210
Silt, grayish-orange (10YR 7/4), very fine-grained to granule sand; sub-angular to well rounded, well sorted; composed of quartz, granite, hornblende, feldspar, and very minor amounts of biotite and muscovite; a minor amount of light brown (5YR 5/6) clay, very pale orange (10YR 8/2) caliche coating some grains, and white (N9) caliche; from 215 to 220 feet, sand fines to very fine- to medium-grained, light brown (5YR 5/6) clay decreases, biotite and muscovite increase.	10	210-220
Silt, grayish-orange (10YR 7/4), very pale orange (10YR 8/2) caliche; very fine-grained to pebble sand; angular to sub-rounded, poorly sorted; composed of quartz, granite, feldspar, and hornblende; and a minor amount of moderate brown (5YR 4/4) clay.	5	220-225

Clay, moderate brown (5YR 4/4), very fine-grained to granule sand; angular to sub-rounded, poorly sorted; composed of quartz, granite, feldspar, and a minor amount of hornblende; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche and white (N9) caliche.	5	225-230
Clay, light brown (5YR 6/4), light brown (5YR 6/4) silt, very fine-grained to pebble sand; angular to sub-rounded, poorly to moderately sorted; composed of quartz, feldspar, granite, hornblende, and a minor amount of biotite; and very pale orange (10YR 8/2) caliche coating grains.	5	230-235
Sand, very fine- to coarse-grained; angular to sub-rounded, well sorted; composed of quartz, feldspar, hornblende, and granite; grayish-orange (10YR 7/4) silt, moderate orange-pink (5YR 8/4) caliche, very pale orange (10YR 8/2) caliche, and a very minor amount of light brown (5YR 5/6) clay.	5	235-240
Silt, pale yellowish-orange (10YR 8/6), very fine- to very coarse-grained sand; sub-angular to rounded, poorly to moderately sorted; composed of quartz, granite, feldspar, hornblende and biotite; moderate brown (5YR 4/4) clay, and very pale orange (10YR 8/2) caliche, some coating grains.	5	240-245
Clay, moderate brown (5YR 4/4), pale yellowish-orange (10YR 8/6) silt, very fine- to coarse-grained sand; sub-angular to rounded, moderately sorted; composed of quartz, granite, feldspar, hornblende and aminor amount of biotite; very pale orange (10YR 8/2) caliche, some coating grains, grayish orange-pink (10R 8/2) caliche, some coating grains.	5	245-250
Clay, moderate brown (5YR 4/4), very fine- to coarse-grained sand; sub-angular to rounded, moderately well sorted; composed of quartz, granite, feldspar, hornblende and a minor amount of biotite; pale yellowish-orange (10YR 8/6) silt, very pale orange (10YR 8/2) caliche, some coating grains; from 255 to 260 feet, moderate brown (5YR 4/4) clay increases, sand decreases and is very fine-grained to granule.	10	250-260

Silt, grayish-orange (10YR 7/4), very fine- to very coarse-grained sand, moderate orange-pink (5YR 8/4) caliche containing very fine- to medium-grained sand; sub-angular to rounded, well sorted; composed of quartz, feldspar, granite, hornblende and minor amounts of muscovite and biotite; and pale reddish-brown (10R 5/4) clay containing a minor amount of calcite cement.	5	260-265
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; sub-rounded to rounded, and well sorted; composed of quartz, hornblende, granite, feldspar, muscovite and biotite; white (N9) caliche, moderate orange-pink (5YR 8/4) caliche, and a minor amount of light brown (5YR 6/4) clay.	5	265-270
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; sub-rounded to rounded, moderately well sorted; composed of quartz, granite, feldspar, hornblende, biotite, and muscovite; white (N9) caliche, moderate orange-pink (5YR 8/4) caliche, and dark yellowish-brown (10YR 4/2) clay with a minor amount of calcite cement; from 275 to 280 feet, sand fines to very fine- to medium-grained, and biotite and muscovite decrease.	10	270-280
Silt, grayish-orange (10YR 7/4), very fine-grained to granule sand; composed of quartz, feldspar, granite, hornblende, muscovite, and biotite; light brown (5YR 5/6) clay, moderate orange-pink (5YR 8/4) caliche coating some grains, and very pale orange (10YR 8/2) caliche; sub-angular to rounded, poorly to moderately sorted; from 285 to 290 feet, sand is very fine-grained to pebble, sub-rounded to rounded, and poorly sorted; very pale orange (10YR 8/2) caliche and light brown (5YR 5/6) clay are absent.	5	280-285
Silt, grayish-orange (10YR 7/4), very fine-grained to pebble sand; sub-rounded to rounded, poorly sorted; composed of quartz, granite, hornblende, muscovite, and biotite; moderate orange-pink (5YR 8/4) caliche coating some grains, and very pale orange (10YR 8/2) caliche.	5	285-290

Sand, very fine-grained to pebble; sub-angular to rounded, poorly to moderately sorted; composed of quartz, feldspar, hornblende, granite, and a very minor amount of muscovite; grayish-orange (10YR 7/4) silt, moderate orange-pink (5YR 8/4) caliche coating some grains, and very pale orange (10YR 8/2) caliche, and a very minor amount of light brown (5YR 6/4) clay with minor calcite cement.	10	290-300

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GROUND LEVEL	OTHER SERVICES:
CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSMR, NM
WELL: MPL-MW-OB
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

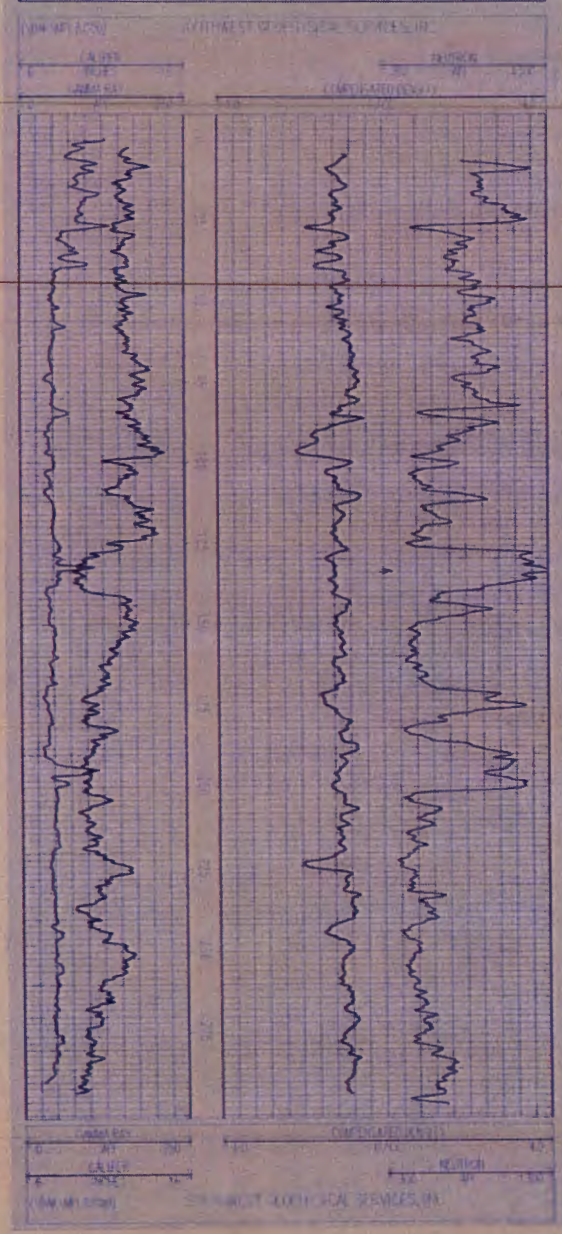
COMPANY: MEVATEC
WELL: MPL-MW-OB

	RUN NO. 1		RUN NO. 1
DATE	2/24/97	FLUID LEVEL	FULL
DEPTH DRILLER	300 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	295 FT	FLUID VISCOSITY	
BOTTOM LOGGED	297 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	CUMMS/CDZ048
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INT'L.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR.
10 FT/MIN.

THANK YOU



Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG: 16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	PERM. DATUM: GROUND LEVEL LOG MEASURED FROM: GL ELEVATION:	OTHER SERVICES: CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSNR, NM
WELL: MPL-MW-08
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

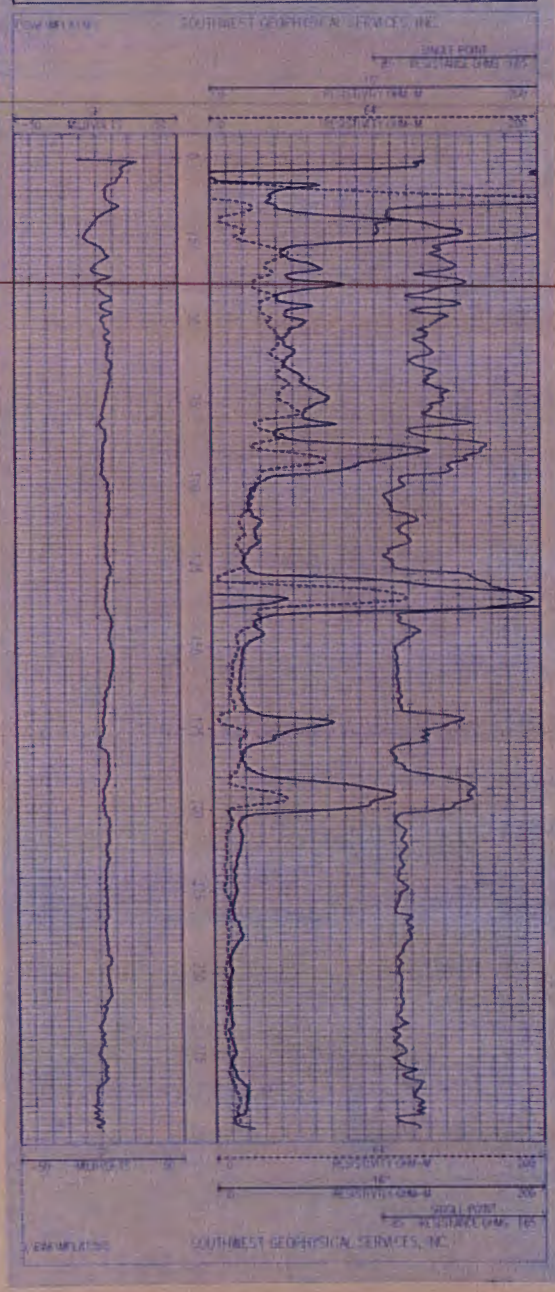
COMPANY: MEVATEC
WELL: MPL-MW-08

	RUN NO. 1		RUN NO. 1
DATE	2/24/97	FLUID LEVEL	FULL
DEPTH DRILLER	300 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	299 FT	FLUID VISCOSITY	
BOTTOM LOGGED	298 FT	FL. RESISTIVITY	
TOP LOGGED INT	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	ELOG
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL

THIS HOLE WAS LOGGED HALF AS FAST
AS LAST YEAR
20 FT/MIN.

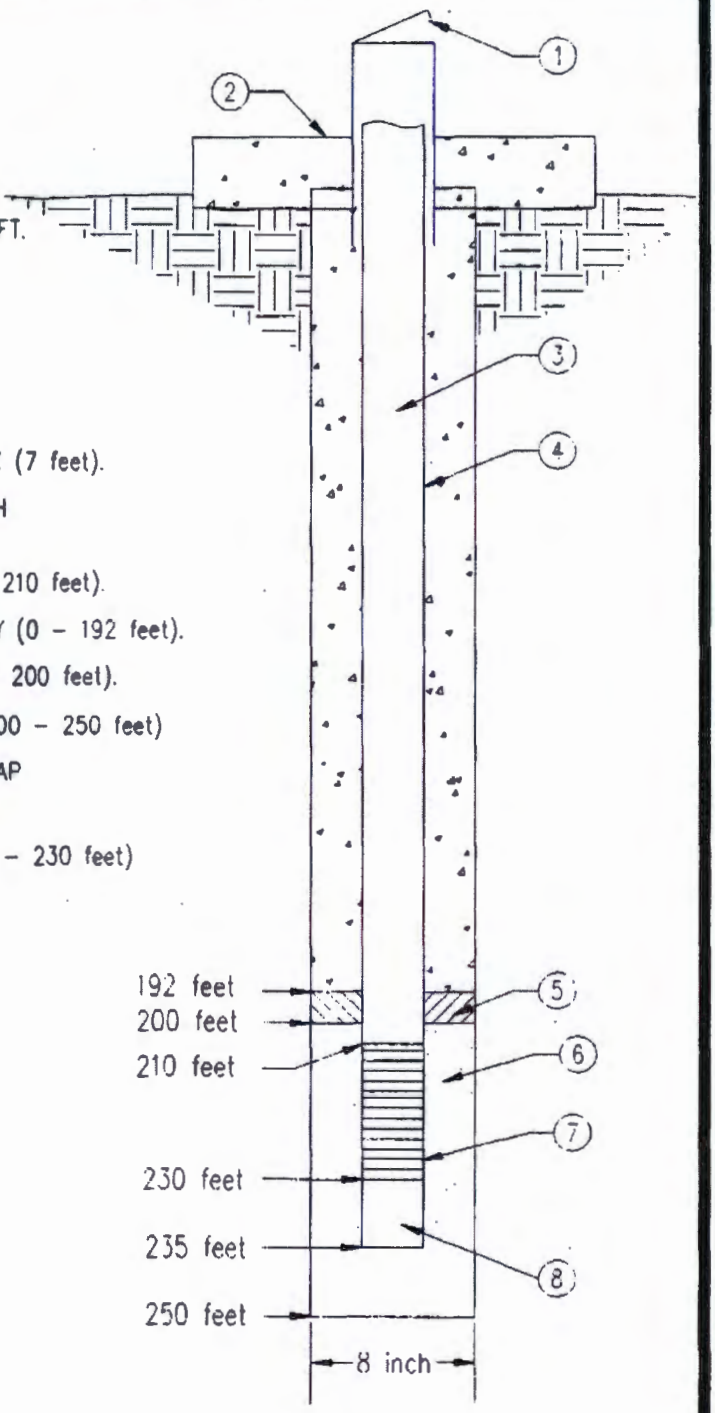
THANK YOU



WELL CONSTRUCTION DIAGRAM

WELL NUMBER: **MPL-09**
WELL NAME: MAIN POST LANDFILL MONITORING WELL
GEOLOGIST: DANA DOWNS, P.G.

ELEVATIONS: TOP OF PVC WELL CASING: 4,048.41 FT.
AT BRASS SURVEY MARKER: 4,045.96 FT.
HORIZONTAL UTM: 3,582,671.96 N
364,308.13 E



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (7 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) WITH EMBEDDED BRASS SURVEY MARKER
3. WELL CASING: 4-INCH DIAM. SCHED. 40 PVC (0 - 210 feet).
4. ANNULUS BACKFILL: CEMENT/5% BENTONITE SLURRY (0 - 192 feet).
5. UPPER SEAL: HYDRATED BENTONITE CHIPS (192 - 200 feet).
6. FILTER PACK: 20 - 40 MESH SIZE SILICA SAND (200 - 250 feet)
7. WELL SCREEN: 4-INCH DIAM. NO. 10 SIZE WIRE WRAP SCHED. 40 PVC (210 - 230 feet)
8. WELL SUMP: 4-INCH DIAM. SCHED. 40 PVC (210 - 230 feet)

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 250 feet.
2. BOREHOLE DIAMETER: 8 INCHES
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. ELEVATIONS ARE NAVD, 1988
5. UTM LOCATIONS ARE NAD, 1983
6. DRAWING NOT TO SCALE.

Field Lithologic Log
MPL-09

Project:	SWMU Groundwater Monitoring	Installation:	WSMR
Location:	Main Post Landfill/Effluent Drainage Area		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 2400
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Borehole Diameter:	8 inches
Geologist:	Dana V. Downs	Dates of Drilling:	February 21-22, 1997

Depth	Date/Time	Description of Material	Remarks
5	1620	Sand, fine-grained to coarse-grained with caliche, with a few cobbles at 5.5 ft. to 6.5 ft. Cobbles at 9 ft. also	Fluid loss at surface plugged with bentonite, cobbles near surface. Drill stem wobbling
10	1632	Sand, fine- to medium-grained	
15	1640	Sand, fine- to medium-grained	
20	1642	Sand, medium- to coarse-grained, lightly cemented	Added 20 ft. Collar tri-cone bit. (7 7/8 inch)
25	1655	Sand, fine- to medium-grained	Drill stem chattering-cobbles at bottom of borehole
30	1657	Gravel and coarse-grained sand	
35	1700	Sand, fine- to coarse-grained	Fluid emerging ~ 10 ft. from borehole around surface. Stop here to plug hole with bentonite. Will drill through tomorow Stopped for the day

40	2/22/97 0810	No sample	
45	0815	Sand, medium- to coarse-grained	
50	0820	Sand, fine-grained (fine-grained), well-sorted	
55	0822	Sand, medium- to coarse-grained	Stopped to clean bentonite out of spud. Resumed.
60	0840	Sand, medium- to coarse-grained	Easy, smooth drilling
65	0842	Sand, coarse-grained	
70	0845	Sand, fine-grained, and silt	
75	0846	Sand, very fine-grained	
80	0850	Silt and small amount of sand, fine-grained	
85	0855	Sand, very fine- to medium-grained	
90	0900	Sand, medium- to coarse-grained	
95	0903	Silt and small amount of clay	
100	0910	Silt and very fine-grained sand	
105	0913	Sand, medium-grained	
110	0915	Sand, medium-grained to coarse-grained to pebble size	110 ft. Drill stem chattering
115	0917	Sand, medium- to coarse-grained, clean	Chattering stopped at 114 ft. Smooth easy drilling
120	0920	Silt and very fine-grained sand	
125	0925	Silt and very fine-grained sand	Enter clay at 125 ft.
130	0940	Silt and silty clay	Added polymer
135	0950	Silty and fine-grained sand	Cuttings and drill behavior indicated interbedded sands, silts and silty clays, (thin layers) slower drilling
140	0951	Sand, fine to medium-grained	
145	1002	Silt and very fine-grained sand	

150	1010	Silt and very fine-grained sand	Clayey silt at 152 ft. - 156 ft.
155	1012	Silt and very fine-grained sand	
160	1015	Silt and silty clay, with fine-grained sand	
165	1035	Silt and fine-grained sand	
170	1045	Silt and silty clay	Interbedded (thinly) silts and sands
175	1046	Silt and very fine-grained sand	
180	1048	Silt and very fine grained sand	
185	1100	Silt and silty clay	Slower drilling, more small clay layers, silty clay
190	1110	Silty clay with fine-grained sand	
195	1115	Silt and fine-grained sand with clay	
200	1117	Silt and fine-grained sand with clay	
205	1120	Sand, fine-grained, moderately sorted	Sand, easy drilling. Gravel at 207-208 ft.
210	1128	Sand, fine-grained, moderately sorted	
215	1135	Sand, fine-grained, with silt	At 214 ft. silty clay
220	1141	At 217 ft. clay, silt and fine-grained sand	At 220 ft. slower drilling
225	1144	Silt and fine-grained sand	
230	1148	Silt and fine-grained sand	
235	1150	Sand, fine- to medium-grained	At 237 ft - gravel
240	1155	Sand, medium- to coarse- grained	At 241 ft. back into clayey material
245	1205	Silt and silty clay	
250	1215	Silt and fine-grained sand with small amount of clay	Total depth borehole

Detailed Lithologic Log for MPL - 09

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, medium-grained to pebble size; angular to sub-rounded, poorly sorted; composed of quartz, feldspar, hornblende, biotite, and muscovite; poorly cemented with calcite; pale reddish-brown (10YR 5/4) clay, and light brown (5YR 6/4) silt.	5	0-5
Sand, very fine-grained to pebble size; sub-angular to sub-rounded, moderately well sorted; composed of quartz, chert, granite, hornblende, muscovite, and biotite; poorly cemented with calcite; and light brown (5YR 5/6) silt.	5	5-10
Sand, very fine- to very coarse-grained with a minor amount of pebbles; angular to sub-rounded, moderately sorted; composed of quartz, chert, feldspar, granite, biotite, and muscovite; dark yellowish-orange (10YR 6/6) silt, and a minor amount of white (N9) caliche containing fine-grained sand and coating grains.	5	10-15
Sand, very fine-grained to pebble size; angular to sub-rounded, poorly to moderately well sorted; composed of quartz, chert, granite, feldspar, hornblende, biotite, and muscovite; moderate yellowish-brown (10YR 5/4) silt, and moderate orange-pink (5YR 8/4) caliche containing very fine- to fine-grained sand and coating grains; from 20 to 25 feet, moderate orange-pink (5YR 8/4) caliche is absent, very pale orange (10YR 8/2) caliche is present as grain coating, and a minor amount of sand is calcite cemented.	10	15-25
Sand, very coarse-grained to pebble size; angular to sub-rounded, moderately to well sorted; composed of granite and quartz; light brown (5YR 8/4) silt, and pinkish-gray (5YR 8/1) caliche partially coating grains.	5	25-30

Sand, very fine-grained to pebble size; angular to sub-rounded, well sorted; composed of quartz, chert, granite, and pale reddish-brown (10R 5/4) (sedimentary) rock; grayish-orange (10YR 7/4) silt, grayish orange-pink (10R 8/2) caliche containing very fine- to medium-grained sand and grayish- orange (10YR 7/4) silt and partially coating larger grains, and a minor amount of grayish-orange (10YR 7/4) silt.	5	30-35
Sand, fine-grained to pebble size; sub-angular to sub-rounded, poorly sorted; composed of quartz, chert, granite, hornblende, and feldspar; very pale yellowish-orange (10YR 8/4) caliche containing grayish-orange (10YR 7/4) silt and very fine- to medium-grained sand and coating grains.	5	35-40
Sand, very fine-grained to pebble size; sub-angular to rounded, poorly to moderately sorted; composed of quartz, chert, hornblende, biotite, and muscovite; pale yellowish-brown (10YR 6/2) silt, and grayish-orange (10YR 7/4) caliche cementing very fine- to medium-grained sand and coating grains.	5	40-45
Sand, very fine-grained to granule; angular to sub-rounded, moderately to well sorted; composed of quartz, chert, hornblende, biotite, and muscovite; moderate yellow-brown (10YR 6/4) silt, poorly cemented with calcite, and a minor amount of white (N9) caliche.	5	45-50
Sand, fine-grained to pebble size; sub-angular to rounded, moderately sorted; composed of quartz, granite, chert, hornblende, feldspar, biotite, and muscovite; light brown (5YR 6/4) silt, poorly cemented with calcite, and a minor amount of very pale orange (10YR 8/2) caliche coating grains.	5	50-55
Silt, grayish-orange (10YR 7/4), poorly cemented with calcite, fine-grained to pebble size sand; angular to sub-rounded, poorly to moderately sorted; composed of quartz, chert, granite and hornblende; and a minor amount of very pale orange (10YR 8/2) caliche coating grains.	5	55-60

Sand, very fine-grained to pebble size; sub-angular to well-rounded, moderately well sorted; composed of quartz, chert, feldspar, hornblende, and biotite; and white (N9) caliche containing very fine- to medium-grained sand and coating pebbles.	5	60-65
Sand, very fine-grained to pebble size; angular to sub-rounded, poorly sorted; composed of quartz, granite, feldspar, hornblende, muscovite, biotite, and chert; and moderate yellow-brown (10YR 5/4) silt.	5	65-70
Sand, very fine-grained to granule; sub-angular to sub-rounded, moderately to well sorted; composed of quartz, granite, hornblende, feldspar, chert, biotite, and muscovite; moderate gray-brown (10YR 6/4) silt, and a minor amount of grayish-orange (10YR 7/4) caliche containing moderate gray-brown (10YR 6/4) silt to fine-grained sand and coating grains.	5	70-75
Clay, moderate brown (5YR 4/4), and very fine- to coarse-grained sand; sub-angular, moderately well sorted; composed of quartz, chert, feldspar, and hornblende; a minor amount of calcite cement is present.	5	75-80
Sand, very fine-grained to pebble size; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, chert, hornblende, biotite, and muscovite; moderate yellow-brown (10YR 5/4) silt, and dark yellowish-orange (10YR 6/6) clay.	5	80-85
Sand, fine-grained to pebble size; angular to sub-rounded, poorly sorted; composed of quartz, granite, chert, feldspar, biotite, and muscovite; and very minor amounts of moderate yellowish-brown (10YR 5/4) silt and moderate brown (5YR 4/4) clay.	5	85-90
Sand, very fine-grained to granule; sub-angular to rounded, moderately to well sorted; composed of quartz, granite, hornblende, feldspar, chert, and biotite; moderate yellowish-brown (10YR 5/4) silt, and a minor amount of moderate red-orange (10R 6/6) clay; from 95 to 100 feet a very minor amount of grayish-orange (10YR 7/4) caliche is present and coats some grains.	10	90-100

Sand, fine-grained to pebble size; sub-angular to rounded, moderately sorted; composed of quartz, granite, feldspar, hornblende, and chert; grayish-orange (10YR 7/4) silt, and minor amounts of very pale orange (10YR 8/2) caliche containing fine-grained sand and grayish-orange (10YR 7/4) silt and coating grains, moderate brown (5YR 5/6) clay, and organic matter.	5	100-105
Sand, medium-grained to pebble size; sub-angular to well rounded, poorly sorted; composed of granite, quartz, feldspar, chert, and hornblende; moderate yellowish-brown (10YR 5/4) silt, and minor amounts of very pale orange (10YR 8/2) caliche cementing some medium-grained to pebble size sand and coating grains, and light brown (5YR 5/6) clay.	5	105-110
Sand, medium-grained to pebble size; sub-angular to rounded, poorly to moderately sorted; composed of quartz, granite, chert, hornblende, and feldspar; moderate brown (5YR 3/4) clay, pale yellowish-orange (10YR 8/6) silt, and a minor amount of very pale orange (10YR 8/2) caliche coating grains.	5	110-115
Sand, fine- to medium-grained; angular to sub-rounded, moderately to well sorted; composed of quartz, feldspar, chert, and hornblende; dark reddish-brown (10R 3/4) clay, moderate yellowish-brown (10YR 5/4) silt, and a minor amount of dark yellowish-orange (10YR 6/6) caliche coating grains.	5	115-120
Sand, very fine-grained to pebble size; sub-angular to rounded, moderately to very well sorted; composed of quartz, feldspar, hornblende, chert, and muscovite; and very dusky red (10R 2/2) clay.	5	120-125
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; sub-angular to rounded, moderately to well sorted; composed of quartz and chert; medium brown (5YR 4/4) clay, with a minor amount of calcite cement; from 130 to 135 feet, sand coarsens, is more rounded and well sorted, medium brown (5YR 4/4) clay fraction increases, and cement is absent; from 135 to 140 feet, grayish-orange (10YR 7/4) silt fraction increases, sand is angular to sub-rounded, and muscovite is present.	15	125-140

Silt, moderate yellowish-brown (10YR 5/4), moderate brown (5YR 3/4) clay, and a very minor amount of coarse-grained to pebble size sand; sub-angular to rounded, well sorted; composed of quartz and chert.	5	140-145
Sand, very fine- to medium-grained; sub-angular to well rounded, well sorted; composed of quartz and chert; light brown (5YR 6/4) silt, and a minor amount of grayish-brown (5YR 3/2) clay; a minor amount of sand and light brown (5YR 6/4) silt is calcite cemented.	5	145-150
Clay, moderate brown (5YR 4/4), grayish-orange (10YR 7/4) silt, very fine- to coarse-grained sand; angular to rounded, poorly to moderately sorted; composed of quartz, chert, and feldspar; cemented with pale yellow-orange (10YR 8/6) caliche; and grayish-pink (5R 8/2) caliche containing very fine- to medium-grained sand; from 155 to 160 feet, sand is very fine- to medium-grained, poorly sorted, and poorly cemented with calcite, pale yellow-orange (10YR 8/6) caliche is absent, and grayish pink (5R 8/2) caliche is present coating grains.	10	150-160
Silt, grayish-orange (10YR 7/4), moderate brown (5YR 4/4) clay, cemented with calcite, fine- to medium-grained sand; sub-angular to rounded, moderately sorted; composed of quartz, feldspar and chert; and grayish orange-pink (10YR 8/2) caliche containing fine- to medium-grained sand and grayish-orange (10YR 7/4) silt and coating grains.	5	160-165
Clay, moderate brown (5YR 4/4), poorly cemented with calcite, moderate yellowish-brown (10YR 5/4) silt, very pale orange (10YR 8/2) caliche, and fine- to coarse-grained sand; angular to sub-angular, moderately sorted; composed of quartz, feldspar, chert, biotite, and a minor amount of hornblende.	10	165-175
Silt, grayish orange-pink (5YR 7/2), very-fine to medium-grained sand; angular to rounded, well sorted; composed of quartz, chert, and very minor amounts of feldspar and hornblende; grayish orange-pink (10R 8/2) caliche cementing very fine- to medium-grained sand and grayish orange-pink (5YR 7/2) silt and coating grains, and a minor amount of pale reddish-brown (10R 5/4) clay.	5	175-180

Clay, light brown (5YR 5/4), moderately cemented with calcite, grayish orange-pink (10R 8/2) silt, very fine- to coarse-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, chert, and very minor amounts of mafic minerals; and grayish-pink (5R 8/2) caliche containing sand.	10	180-190
Sand, fine- to coarse-grained; angular to sub-angular, poorly sorted; composed of quartz, feldspar, chert, hornblende, and biotite; moderately well cemented with calcite, light brown (5YR 6/4) silt, grayish-red (10R 4/2) clay, and grayish-pink (5R 8/2) caliche.	5	190-195
Silt, grayish-orange (10YR 7/4), dark yellowish-brown (10YR 4/2) clay, very fine- to medium-grained sand; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, and hornblende; very pale orange (10YR 8/2) caliche, and minor amounts of organic matter and calcite cement.	5	195-200
Sand, fine-grained to granule; sub-angular to sub-rounded, well sorted; composed of quartz, chert, hornblende, and moderate orange-pink (10YR 7/4) (sedimentary) rock; grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and grayish-orange (10YR 7/4) silt.	5	200-205
Silt, pale yellow-brown (10YR 6/2), fine-grained to pebble size sand; angular to rounded, poorly to moderately sorted; composed of quartz, chert, and medium dark gray (N4) (sedimentary) rock, granite, and hornblende; grayish-orange (10YR 7/4) caliche containing pale yellow-brown (10YR 6/2) silt, fine- to coarse-grained sand, and partially coating grains, and a minor amount of moderate yellow-brown (10YR 5/4) clay.	5	205-210
Silt, pale yellow-orange (10YR 8/6); fine-grained sand to granule; angular to sub-rounded, poor to moderately sorted; composed of quartz, chert, hornblende, and feldspar; very pale orange (10YR 8/2) caliche cementing sand and pale yellow-orange (10YR 8/6) silt, and light brown (5YR 5/6) clay, poorly cemented with calcite.	5	210-215

Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; angular to sub-rounded, moderately well sorted; composed of quartz, hornblende, chert, and feldspar; light brown (5YR 5/6) clay, very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and grayish-orange (10YR 7/4) silt; grayish-orange (10YR 7/4) silt and light brown (5YR 5/6) clay are moderately cemented with calcite; from 220 to 225 feet sand fraction increases, is very fine- to medium-grained, well sorted, and a minor amount of organic matter is present.	10	215-225
Clay, moderate brown (5YR 4/4), grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand, and very fine- to coarse-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, chert, hornblende, and muscovite; from 225 to 230 feet sand is moderately well sorted and poorly cemented with calcite; from 230 to 235 feet, sand fraction increases, is fine- to medium-grained, well sorted, and moderately well cemented with calcite, and moderate brown (5YR 4/4) clay fraction decreases; from 235 to 240 feet, grayish-orange (10YR 7/4) silt is major constituent, sand coarsens to medium-grained to pebble size, is well sorted, and contains dark gray (N3) (sedimentary) rock.	15	225-240
Silt, grayish-orange (10YR 7/4), pale reddish-brown (10R 5/4) clay, very fine- to coarse-grained sand; angular to sub-rounded, well sorted; composed of quartz, chert, feldspar, medium dark gray (N4) (sedimentary) rock, and a very minor amount of muscovite; and very pale orange (10YR 8/2) caliche; from 240 to 245 feet, pale reddish-brown (10R 5/4) clay and a minor amount of grayish-orange (10YR 7/4) silt to fine-grained sand is cemented with hematite.	10	240-250

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG:	PERM. DATUM: GROUND LEVEL	OTHER SERVICES:
CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY	LOG MEASURED FROM: GL ELEVATION:	ELOG

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSMR, NM
WELL: MPL-MW-09
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

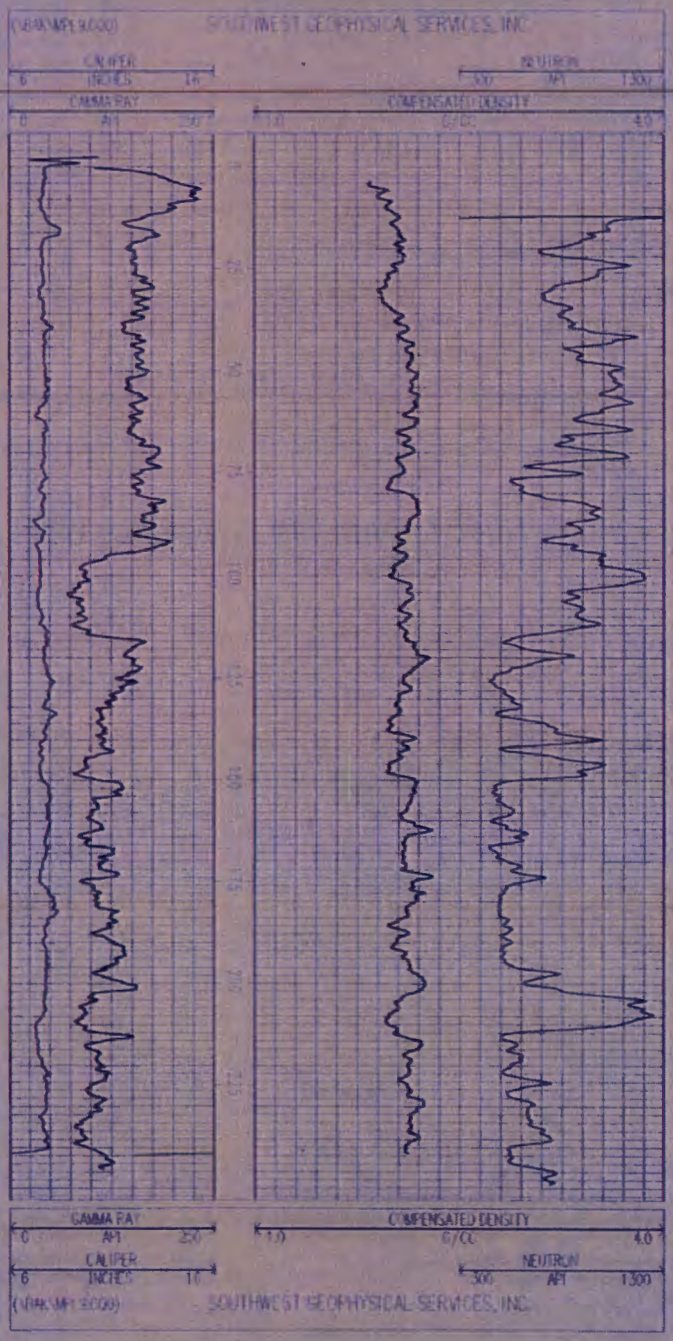
	RUN NO. 1		RUN NO. 1
DATE	2/22/97	FLUID LEVEL	13 FT
DEPTH DRILLER	250 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	250 FT	FLUID VISCOSITY	
BOTTOM LOGGED	249 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	COMBO/CD2048
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA BOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR.
10 FT/MIN.

THANK YOU

COMPANY: MEVATEC
WELL: MPL-MW-09



Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG: 16" & 64" RESISTIVITIES SP SINGLE PT RESISTANCE	PERM. DATUM: GROUND LEVEL LOG MEASURED FROM: GL ELEVATION:	OTHER SERVICES: CALIPER GAMMA RAY NEUTRON COMPENSATED DENSITY

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSMR, NM
WELL: MPL-MW-09
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

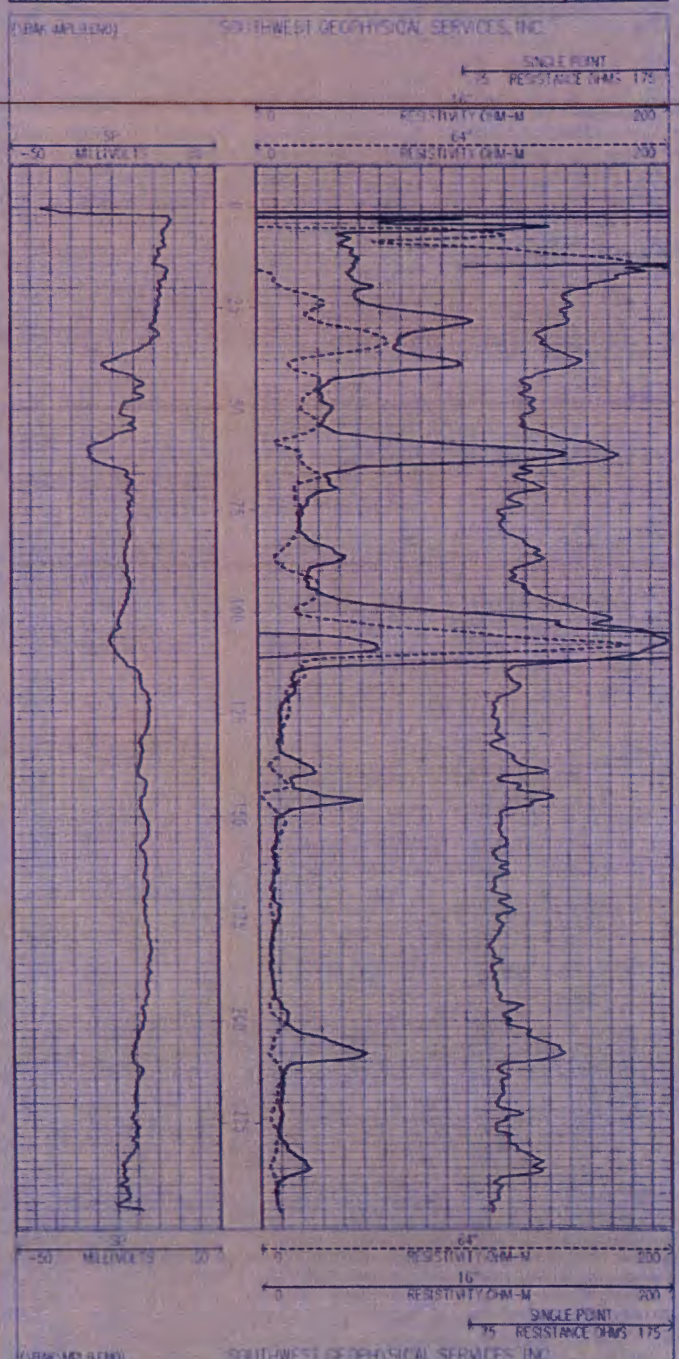
COMPANY: MEVATEC
WELL: MPL-MW-09

	RUN NO. 1		RUN NO. 1
DATE	2/22/97	FLUID LEVEL	15 FT
DEPTH DRILLER	250 FT	FLUID NATURE	FRESH MUD
DEPTH LOGGER	248 FT	FLUID VISCOSITY	
BOTTOM LOGGED	247 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ B.H.T.	
CASING LEVEL	NONE	CIRCULATION TEMP.	
CASING SIZE		BOT HOLE TEMP.	
CASING SIZE		TOOL #	ELOG
BIT SIZE	7 & 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY:	DANA DOWNS

REMARKS:
DRILLED BY GEOPROJECTS, INTL.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR.
20 FT/MIN.

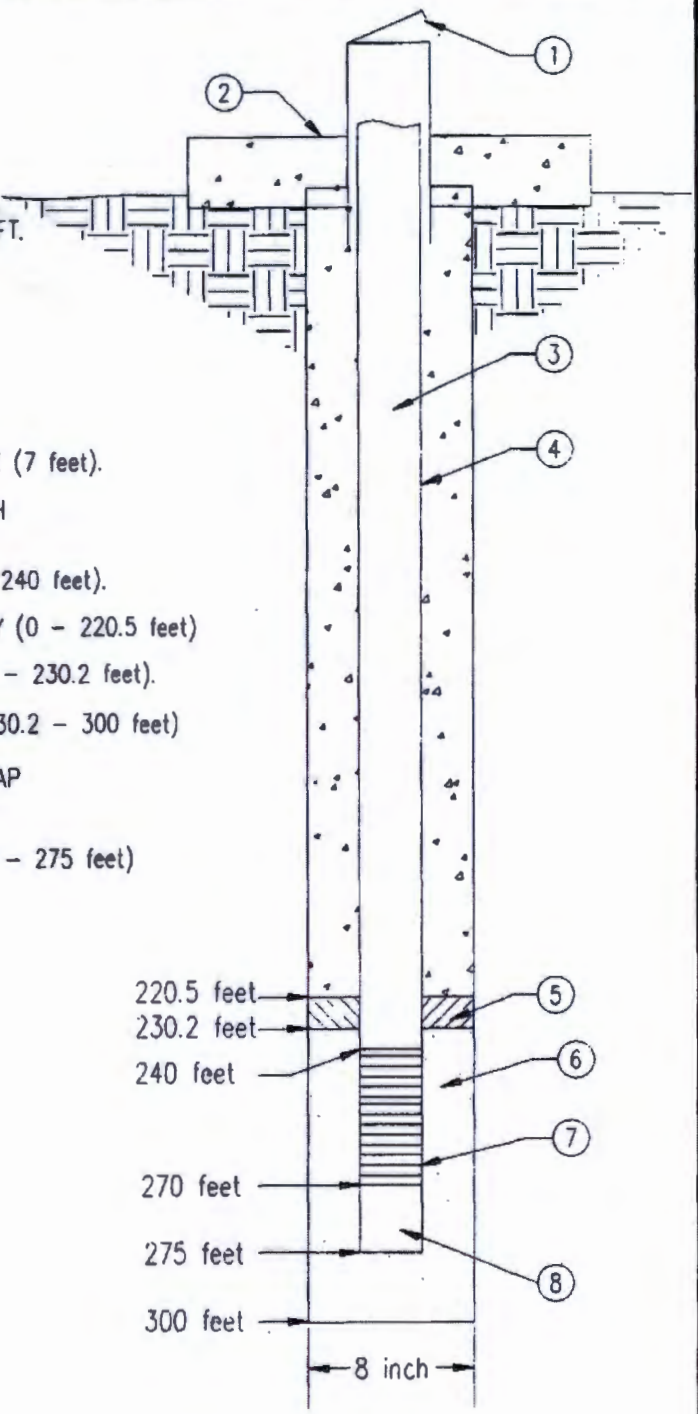
THANK YOU



WELL CONSTRUCTION DIAGRAM

WELL NUMBER: **MPL-10**
WELL NAME: MAIN POST LANDFILL MONITORING WELL
GEOLOGIST: DANA DOWNS, P.G.

ELEVATIONS: TOP OF PVC WELL CASING: 4,052.05 FT.
AT BRASS SURVEY MARKER: 4,050.06 FT.
HORIZONTAL UTM: 3,582,676.538 N
364,243.69 E



KEYED NOTES:

1. PROTECTIVE STEEL OUTER SURFACE CASING W/LOCK (7 feet).
2. CONCRETE PAD (36 inch X 36 inch X 12 inch) WITH EMBEDDED BRASS SURVEY MARKER
3. WELL CASING: 4-INCH DIAM. SCHED. 40 PVC (0 – 240 feet).
4. ANNULUS BACKFILL: CEMENT/5% BENTONITE SLURRY (0 – 220.5 feet)
5. UPPER SEAL: HYDRATED BENTONITE CHIPS (220.5 – 230.2 feet).
6. FILTER PACK: 20 – 40 MESH SIZE SILICA SAND (230.2 – 300 feet)
7. WELL SCREEN: 4-INCH DIAM. NO. 10 SIZE WIRE WRAP SCHED. 40 PVC (240 – 270 feet)
8. WELL SUMP: 4-INCH DIAM. SCHED. 40 PVC (270 – 275 feet)

GENERAL NOTES:

1. TOTAL TEST HOLE DEPTH: 300 feet.
2. BOREHOLE DIAMETER: 8 INCHES
3. ALL DEPTHS MEASURED FROM GROUND SURFACE.
4. ELEVATIONS ARE NAVD, 1988
5. UTM LOCATIONS ARE NAD, 1983
6. DRAWING NOT TO SCALE.

Field Lithologic Log
MPL-10

Project:	SWMU Groundwater Monitoring	Installation:	WSMR
Location:	Main Post Landfill		
Drilling Co.:	GeoProjects International	Drill Rig:	Gardner Denver 2400
Driller:	Lee Gebbert	Method:	Mud Rotary
Borehole:	Vertical	Borehole Diameter: 8 inches	
Geologist:	J. Kyle Williams	Dates of Drilling: February 26, 1997	

Depth	Date/Time	Description of Material	Remarks
5	1454	Very coarse-grained sand with fine gravel, minor fines	Gravel layer (7.5')
10	1458	Fine gravel, very coarse- to fine-grained sand	
15	1502	Sand, very coarse- to fine-grained, silt	
20	1506	Sand, very coarse- to medium-grained, coarse and fine gravel	Gravel 1510- changed out spud, add 20' drill collar and tri-cone
25	1515	Sand, very coarse- to medium-grained, fine gravel, silt	
30	1517	Sand, very coarse- to medium-grained, no gravel	
35	1519	Sand, very coarse- to coarse-grained, fine gravel, coated grains, minor cement	
40	1521	Gravel, fine-grained, very coarse-grained sand, minor cement	Gravel (1')

45	1527	Gravel, fine-grained, very coarse- to medium-grained sand, minor cement	
50	1530	Gravel, fine, very coarse- to medium-grained sand, minor cement	
55	1532	Sand, very coarse to medium-grained, fine gravel, silt, cement	
60	1536	Sand, very coarse- to medium-grained, silt, fine gravel, cement	
65	1540	Silty sand, very coarse- to medium-grained, cement	
70	1542	Silty sand, very coarse- to medium-grained, cement	
75	1545	Silty sand, coarse- to medium-grained, cement	
80	1548	Sandy silt, coarse- to medium-grained, minor clay, cement	
85	1553	Sandy silt, fine- to medium-grained, minor clay, cement	
90	1556	Sandy silt, coarse- to fine-grained	
95	1558	Sandy silt, coarse- to medium-grained	
100	1601	Sandy silt, coarse- to medium-grained, minor clay	Clay (1603) clay with gravel
105	1606	Sandy silt with clay, very coarse-grained sand, fine gravel	
110	1611	Silty sand, minor clay, very coarse- to fine-grained sand	
115	1614	Silty sand, minor clay, very coarse- to medium-grained sand	
120	1617	Silty sand, minor clay, very coarse-grained sand, minor fine gravel	Clay lens
125	1626	Sandy silt, clay, coarse- to medium-grained sand, fine gravel	Clay lens

130	1629	Sandy silt/clay, coarse- to fine-grained sand	
135	1632	Sandy silt, medium- to fine-grained sand	
140	1638	Sandy silt, fine-grained sand minor clay	
145	1651	Silt, fine-grained sand, minor clay	
150	1654	Silt, fine-grained sand, clay	Gravelly
155	1655	Silty sand, fine- to medium-grained, minor clay	Clay (158'-159.5'), slow drilling, fines
160	1700	Silt, with fine-grained sand, clay	
165	1712	Silt, with fine-grained sand, clay	
170	1721	Silt, fine-grained sand, clay	
175	1728	Silt, fine-grained sand, clay	Gravel sand 176'-177'
180	1732	Sandy silt, coarse- to fine-grained sand	
185	1744	Silty sand, medium- to fine-grained	
190	1749	Silty sand, medium- to fine-grained	
195	1755	Silty sand, fine- to medium-grained	
200	1804	Sandy silt, fine-grained	1805 to1820- trip pipe to clear borehole and stabilize
205		Silt, fine- to medium-grained sand	
210		Sand, coarse- to fine-grained, silt	
215		Sand, coarse- to fine-grained, gravel, silt	
220		Sand, coarse- to fine-grained sand, fine gravel, silt	
225		Sand, coarse- to fine-grained, fine gravel, silt	Gravel (227'-229.5')
230		Gravel, coarse- to medium-grained sand, silt	
235		Silt, fine- to coarse-grained sand	
240		Silt, with fine- to medium-grained sand	

245	Silt, with fine- to medium-grained sand	
250	Silt with fine- to medium-grained sand	
255	Sandy silt, fine- to medium-grained	Gravel (256'-262')
260	Silty sand, fine- to coarse-grained sand	Silt
265	Sandy silt, fine- to medium-grained	Gravel (266.5'-280.5')
270	Silty sand, coarse- to fine-grained sand, fine gravel	
275	Silty sand, medium- to fine-grained	
280	Silty sand, coarse- to fine-grained sand	Silt (280.5'-292')
285	Sandy silt, fine- to medium-grained	
290	Sandy silt, fine-grained sand	
295	Sandy silt, fine-grained sand	Silt
300	Sandy silt, medium- to fine-grained sand	

Detailed Litholgic Log for MPL - 10

Lithology	Thickness (feet)	Depth interval below ground surface (feet)
Sand, very fine-grained to fine pebbles; angular to sub-rounded, poorly to moderately sorted; composed of granite, feldspar, quartz, hornblende, biotite, muscovite, and chert; poorly cemented with calcite and moderate yellowish-brown (10YR 5/4) silt.	10	0-10
Sand, very fine-grained to fine pebbles; sub-angular to sub-rounded, poorly to moderately sorted; composed of quartz, granite, feldspar, hornblende, biotite, muscovite, and chert; grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche coating some grains.	5	10-15
Sand, very fine-grained to fine pebbles; angular to sub-rounded, poorly sorted; composed of quartz, granite, feldspar, hornblende, biotite, muscovite, chert, and a minor amount of dark gray (N3) (sedimentary) rock; poorly cemented with calcite; grayish-orange (10YR 7/4) silt, and a minor amount of very pale orange (10YR 8/2) caliche; from 20 to 25 feet, very pale orange (10YR 8/2) caliche decreases to a very minor amount.	10	15-25
Sand, very fine-grained to granule; sub-rounded, well sorted and composed of granite, feldspar, quartz, and minor amounts of hornblende, biotite, muscovite, chert, and dark gray (N3) (sedimentary) rock; and minor amounts of grayish-orange (10YR 7/4) silt and very pale orange (10YR 8/2) caliche.	10	25-35
Sand, very fine-grained to granule; sub-angular to rounded, moderately well sorted; composed of granite, feldspar, quartz, minor amounts of dark gray (N3) and light gray (N7) (sedimentary) rocks and very minor amounts of hornblende and biotite; a minor amount of grayish-orange (10YR 7/4) silt and a very minor amount of very pale orange (10YR 8/2) caliche, some partially coating grainsfrom 40 to 45 feet, sand coarsens to medium to coarse-grained and is moderately sorted.	10	35-45

Sand, very fine-grained to medium pebbles; angular to rounded, poorly sorted; composed of granite, quartz, feldspar, chert and a very minor amount of hornblende; poorly cemented with calcite; very minor amounts of grayish-orange (10YR 7/4) silt and very pale orange (10YR 8/2) caliche, some coating grains; from 50 to 55 feet, calcite cement increases.	10	45-55
Sand, very fine-grained to fine pebbles; sub-angular to rounded, moderately well sorted; composed of granite, quartz, feldspar, and minor amounts of chert, hornblende, medium light gray (N6) and pale reddish-brown (10R 5/4) (sedimentary) rocks, biotite, and muscovite; poorly cemented with calcite, grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche some coating grains.	5	55-60
Sand, very fine to medium-grained with a minor amount from coarse-grained to granule; sub-angular to rounded, poorly sorted, composed of granite, quartz, feldspar, chert, hornblende, and minor amounts of muscovite, biotite, medium light gray (N6) and pale reddish-brown (10R 5/4) (sedimentary) rocks; and grayish-orange (10YR 7/4) silt.	5	60-65
Sand, very fine-grained to fine pebbles; angular to rounded, moderately sorted; composed of granite, quartz, feldspar, chert, hornblende, and minor amounts of muscovite, biotite, and dark gray (N3) (sedimentary) rocks; and grayish-orange (10YR 7/4) silt; from 70 to 75 feet, sand coarsens to medium-grained to pebble and is well sorted, grayish-orange (10YR 7/4) silt decreases; very poorly cemented with calcite.	10	65-75
Silt, grayish-orange (10YR 7/4), very fine-grained to fine pebble sand; sub-angular to well rounded, well sorted; composed of granite, quartz, feldspar, chert, hornblende, muscovite, and biotite; and a minor amount of moderate yellowish-brown (10YR 5/4) clay.	5	75-80
Silt, grayish-orange (10YR 7/4), very fine-grained to medium pebble sand; sub-angular to well rounded, well sorted; composed of quartz, feldspar, granite, chert, hornblende, and minor amounts of muscovite, and biotite; and a minor amount of moderate yellowish-brown (10YR 5/4) clay.	5	80-85

Sand, very fine-grained to granule; angular to rounded, well sorted; composed of quartz, feldspar, granite, chert, hornblende, and muscovite; grayish-orange (10YR 7/4) silt, and moderate yellowish-brown (10YR 5/4) clayfrom 90 to 95 feet, coarse-grained fraction of the sand increases and moderate yellowish-brown (10YR 5/4) clay decreases.	10	85-95
Sand, very fine-grained to fine pebbles; angular to rounded, well sorted; composed of quartz, feldspar, hornblende, chert, muscovite and biotite; grayish-orange (10YR 7/4) silt, and a minor amount of light brown (5YR 5/6) clay.	5	95-100
Sand, very fine-grained to fine pebbles; angular to rounded, well sorted; composed of quartz, feldspar, hornblende, chert and granite; grayish-orange (10YR 7/4) silt, and a minor amount of light brown (5YR 5/6) clay.	5	100-105
Sand, very fine-grained to medium pebbles; angular to sub-rounded, poorly sorted; composed of granite, quartz, feldspar, and dark reddish-brown (10R 3/4) (sedimentary) rocks; grayish-orange (10YR 7/4) silt and a minor amount of pale brown (5YR 5/2) clay; from 110 to 125 feet, sand fines downward and is moderately to well sorted.	20	105-125
Sand, very fine-grained to medium pebbles; angular to sub-rounded, poorly sorted; composed of granite, quartz, feldspar, chert, muscovite and biotite, grayish-orange (10YR 7/4) silt and a very minor amount of pale brown (5YR 5/2) clay.	5	125-130
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, granite, hornblende, and minor amounts of biotite and muscovite; and light brown (5YR 5/6) clay; from 135 to 140 feet, grayish-orange (10YR 7/4) silt, muscovite and biotite increase, light brown (5YR 5/6) clay decreases.	10	130-140

Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, granite, hornblende, and minor amounts of biotite and muscovite; light brown (5YR 5/6) clay with a minor amount of calcite cement, and white (N9) caliche, some coating grains; from 145 to 150 feet, light brown (5YR 5/6) clay increases.	10	140-150
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; angular to sub-rounded, poorly to moderately sorted; composed of quartz, feldspar, chert, granite, hornblende, biotite, and muscovite; white (N9) caliche and light brown (5YR 5/6) clay; from 155 to 160 feet, white (N9) caliche increases and light brown (5YR 5/6) clay includes a minor amount of organic matter.	10	150-160
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; sub-angular to sub-rounded, moderately sorted; composed of quartz, feldspar, chert, granite, hornblende, biotite, and muscovite; light brown (5YR 5/6) clay, and white (N9) caliche; from 170 to 175 feet, white (N9) caliche and light brown (5YR 5/6) clay decrease.	15	160-175
Sand, very fine- to very-coarse grained; sub-angular to round, moderately to well sorted; composed of quartz, feldspar, chert, granite, a minor amount of hornblende, and very minor amounts of biotite and muscovite; grayish-orange (10YR 7/4) silt, and minor amounts of very pale orange (10YR 8/2) caliche, and light brown (5YR 6/4) clayfrom 180 to 185 feet, sand fines to very fine- to medium-grained, is angular to sub-rounded, well sorted; biotite, muscovite, and light brown (5YR 5/6) clay increase.	10	175-185
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, and a minor amount of mafic minerals; and minor amounts of moderate brown (5YR 4/4) clay with some calcite cement, and white (N9) caliche; from 190 to 195 feet, sand fines to very fine- to medium-grained, is angular, and well sorted.	10	185-195

Sand, very fine- to coarse-grained; angular- to sub-angular, well sorted; composed of quartz, feldspar, chert, hornblende and a very minor amount of biotite; poorly cemented with calcite; grayish-orange (10YR 7/4) silt, and white (N9) caliche, some partially coating grains, and a minor amount of moderate brown (5YR 4/4) clay.	5	195-200
Sand, very fine- to coarse-grained; angular- to sub-angular, well sorted; composed of quartz, feldspar, chert, hornblende and a very minor amount of biotite; poorly cemented with calcite; grayish-orange (10YR 7/4) silt, and white (N9) caliche, some partially coating grains, very pale orange (10YR 8/2) caliche coating some grains, and a minor amount of moderate brown (5YR 4/4) clay.	5	200-205
Sand, very fine- to medium-grained; sub-rounded to rounded, well sorted; composed of quartz, feldspar, chert, and hornblende; grayish-orange (10YR 7/4) silt, and a very minor amount of white (N9) caliche.	5	205-210
Sand, very fine- to medium-grained, grayish-orange (10YR 7/4) silt, and a very minor amount of white (N9) caliche; sub-rounded to rounded, well sorted; composed of quartz, feldspar, chert, hornblende, and granite.	5	210-215
Sand, very fine- to pebble; angular to rounded, poorly sorted; composed of quartz, feldspar, granite, chert, a minor amount of hornblende and very minor amounts of biotite and muscovite; grayish-orange (10YR 7/4) silt, and white (N9) caliche.	5	215-220
Sand, very fine-grained to fine pebbles; angular to sub-rounded, moderately sorted; composed of granite, quartz, feldspar, chert, hornblende, and minor amounts of biotite and muscovite; white (N9) caliche and very pale orange (10YR 8/2) caliche coating some grains, and a very minor amount of grayish-orange (10YR 7/4) silt; from 225 to 230 feet, white (N9) caliche increases.	10	220-230
Sand, very fine- to coarse-grained; angular, well sorted; composed of quartz, feldspar, granite, chert, hornblende, and very minor amounts of biotite and muscovite; grayish-orange (10YR 7/4) silt, white (N9) caliche and very pale orange (10YR 8/2) caliche coating some grains.	5	230-235

Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular, well sorted; composed of quartz, feldspar, granite, chert, hornblende, and very minor amounts of biotite and muscovite; very pale orange (10YR 8/2) caliche coating grains and a very minor amount of white (N9) caliche.	5	235-240
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular, well sorted; composed of quartz, feldspar, granite, chert, hornblende; very pale orange (10YR 8/2) caliche coating grains and a very minor amount of white (N9) caliche.	5	240-245
Sand, very fine- to coarse-grained; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, chert, granite, hornblende, and very minor amounts of biotite and muscovite; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche coating some grains, and white (N9) caliche; from 250 to 255 feet, white (N9) caliche and very pale orange (10YR 8/2) caliche increase.	10	245-255
Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, hornblende, and minor amounts of biotite and muscovite; grayish-orange (10YR 7/4) silt, very pale orange (10YR 8/2) caliche coating some grains and white (N9) caliche.	5	255-260
Silt, grayish-orange (10YR 7/4), very fine- to medium-grained sand; angular, well sorted; composed of quartz, chert and a very minor amount of mafic minerals; and white (N9) caliche containing very fine - to medium-grained sand and grayish-orange (10YR 7/4) silt.	5	260-265
Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, and hornblende; grayish-orange (10YR 7/4) silt, white (N9) caliche, very minor amounts of light brown (5YR 6/4) clay and very pale orange (10YR 8/2) caliche coating some grains.	5	265-270

Sand, very fine- to medium-grained; angular to sub-rounded, well sorted; composed of quartz, feldspar, chert, hornblende, granite and very minor amounts of biotite and muscovite; grayish-orange (10YR 7/4) silt, white (N9) caliche, very minor amounts of light brown (5YR 6/4) clay and very pale orange (10YR 8/2) caliche coating some grains.	5	270-275
Sand, very fine- to coarse-grained; sub-angular to sub-rounded, well sorted; composed of quartz, feldspar, hornblende, chert, granite, and a very minor amount of muscovite; grayish-orange (10YR 7/4) silt, and very pale orange (10YR 8/2) caliche coating some grains; from 280 to 285 feet, sand is moderately sorted.	10	275-285
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, chert, feldspar, hornblende, granite, and very minor amounts of muscovite and biotite; very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and grayish-orange (10YR 7/4) silt and a very minor amount of pale reddish-brown (10R 5/4) clay.	5	285-290
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, chert, hornblende, and granite; very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and grayish-orange (10YR 7/4) silt; and a very minor amount of pale reddish-brown (10R 5/4) clay.	5	290-295
Silt, grayish-orange (10YR 7/4), very fine- to coarse-grained sand; angular to sub-rounded, moderately sorted; composed of quartz, feldspar, chert, hornblende, granite, and minor amounts of biotite and muscovite; very pale orange (10YR 8/2) caliche containing very fine- to medium-grained sand and grayish-orange (10YR 7/4) silt and a very minor amount of pale reddish-brown (10R 5/4) clay.	5	295-300

Southwest Geophysical Services, Inc.

GEOPHYSICAL WELL LOG: CALIPER GAMMA RAY NEUTRON	PERM. DATUM: GROUND LEVEL LOG MEASURED FROM: GL ELEVATION:	OTHER SERVICES: NONE

COMPANY: MEVATEC
PROJECT/FIELD: MAIN POST LANDFILL, WSMR, NM
WELL: MPL-MW-09-A
LOCATION: SEC: T: R:
NORTH= EAST=
COUNTY: DONA ANA STATE: NEW MEXICO

ELEVATION KB:
DF:
GL:

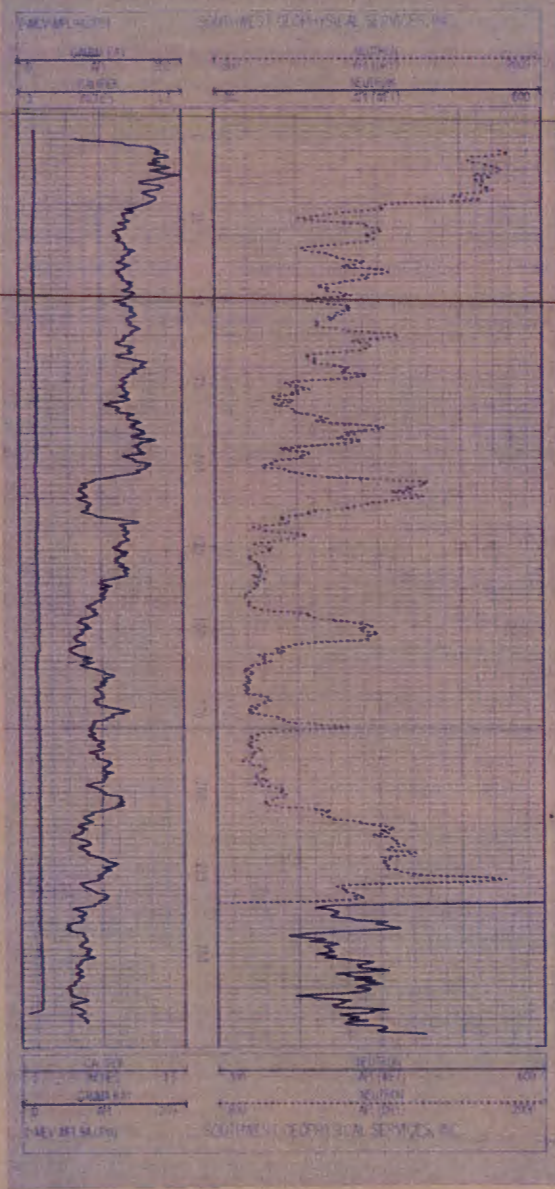
WELL: MPL-10

COMPANY: MEVATEC

	RUN NO. 1		RUN NO. 1
DATE	3/4/97	FLUID LEVEL	335 FT
DEPTH DRILLER	275 FT	FLUID NATURE	WATER
DEPTH LOGGER	275.5 FT	FLUID VISCOSITY	
BOTTOM LOGGED	275.5 FT	FL. RESISTIVITY	
TOP LOGGED INT.	SURFACE	FL. RES. @ BHT.	
CASING LEVEL	ALL	CIRCULATION TEMP.	
CASING SIZE	4.5 IN OD	BOT HOLE TEMP.	
CASING SIZE	PVC	TOOL #	DOWSO
BIT SIZE	7 & 7 7/8 IN	LOGGED BY:	SHERRY MARIN
BIT SIZE	ROTARY	WITNESSED BY.	KYLE WILLIAMS

REMARKS:
DRILLED BY GEOPRODUCTS, INC.
THIS HOLE WAS LOGGED AFTER THE PVC CASING WAS INSTALLED.

THIS HOLE WAS LOGGED HALF AS FAST AS LAST YEAR. (10 FT/MIN)
PLEASE NOTE SCALE CHANGES ON THE GAMMA RAY AND CALIPER CURVES.
THANK YOU



WSMR Environmental Document ES-EC-TO-052-08-266

Closure and Post-Closure Care Plan Municipal and Asbestos Areas Main Post Landfill

White Sands Missile Range

December 2008

White Sands Missile Range
Environment and Safety Directorate
White Sands Missile Range, New Mexico 88002
EPA ID# NM 2750211235

WHITE SANDS TECHNICAL SERVICES

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This Closure and Post-Closure Care Plan has been developed to meet the requirements of New Mexico Administrative Code 20.9.6. This plan includes construction quality assurance, groundwater monitoring, and post-closure care plans.

15. SUBJECT TERMS
Main Post Landfill, MPL, Closure, Post-Closure, Construction and Demolition waste, C&D, municipal solid waste

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CLOSURE AND POST-CLOSURE CARE PLAN
MUNICIPAL AND ASBESTOS AREAS
MAIN POST LANDFILL

Submitted to:

U.S. Army
White Sands Missile Range
Directorate of Public Works - Environment Division
White Sands Missile Range, New Mexico 88002-5048

December 2008

Submitted by:

White Sands Technical Services, LLC
Building 126
White Sands Missile Range, New Mexico 88002

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LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AL	Asbestos Landfill
C&D	Construction and Demolition [waste]
CQA / CQC	Construction Quality Assurance / Construction Quality Control
DoD	Department of Defense
HELP	Hydrologic Evaluation of Landfill Performance
Mg/L	milligrams per liter
MPL	Main Post Landfill
MSW	Municipal Solid Waste
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
STP	Sewage Treatment Plant
SWB	Solid Waste Bureau
SWMU	Solid Waste Management Unit
USCS	Unified Soil Classification System
WSMR	White Sands Missile Range

CLOSURE AND POST-CLOSURE CARE PLAN
MUNICIPAL AND ASBESTOS AREAS
MAIN POST LANDFILL

1.0 INTRODUCTION

White Sands Missile Range (WSMR) has developed this Closure and Post-Closure Care Plan to meet the New Mexico Environment Department Solid Waste Bureau (NMED SWB) requirements for closure of portions of the Main Post Landfill (MPL) and Asbestos Landfill (AL).

The MPL and AL is located within Dona Ana County, approximately three miles east by southeast of the WSMR Main Post and occupies portions of Sections 21, 22, 27, and 28 of Township 22 South, Range 5 East (Figure 1). The complete facility, including the AL, occupies approximately 37 hectares (92 acres) of land owned by the Department of Defense (DoD).

NMED SWB requires all solid waste facilities to provide Closure and Post-Closure Care Plans at the time of application for a permit. WSMR submitted such a plan in 2001, when reapplying for a renewal of the MPL operating permit. That permit application was administratively denied in December 2005 and NMED has since issued new solid waste regulations. Municipal solid waste disposal activities ceased in 1996. Thus, WSMR is now submitting an updated Closure and Post-Closure Care Plan for relevant portions of the MPL, to wit, the older construction and demolition (C&D) and municipal solid waste (MSW) disposal areas and the AL.

This plan has been prepared in accordance with the requirements of the New Mexico Solid Waste Management Regulations (20.9.6NMAC), effective date 2 August 2007; and NMED's *Guidance Document for Performance Demonstration for an Alternate Cover Design under Section 502.A.2 of the New Mexico Solid Waste management Regulations (20 NMAC 9.1) Using HELP Modeling*, April 1998.

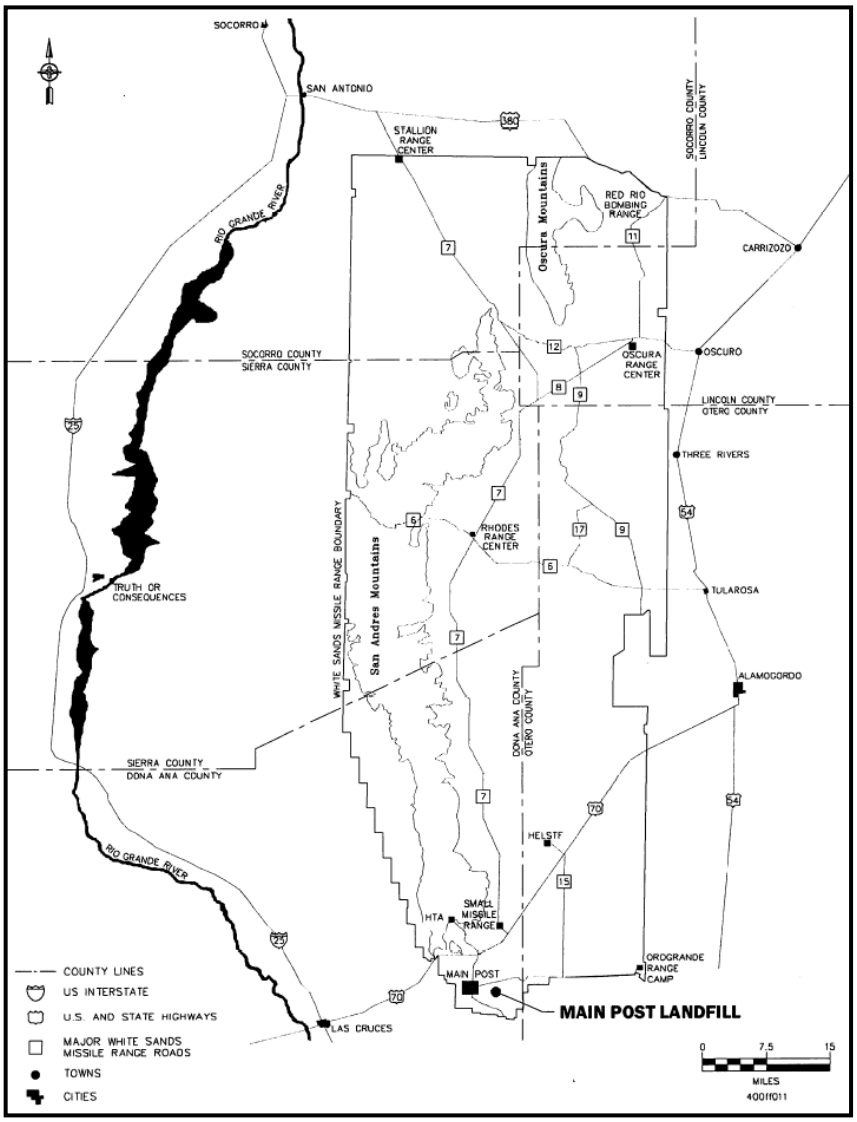

FIGURE 1: LOCATION OF MAIN POST LANDFILL

This plan describes closure actions for the older C&D, MSW, and AL areas. Included are a Construction Quality Assurance / Construction Quality Control (CQA/CQC) Plan and a Post-Closure Care Plan.

2.0 SITE DESCRIPTION

The WSMR Main Post Landfill was registered with NMED in April 1982 and at that time contained three disposal pits—residential refuse or municipal solid waste (MSW), dead animals, and construction and demolition (C&D) debris. The landfill has been in operation since 1983. MPL covers an area of approximately 82.9 acres, although only approximately 38.6 acres have actually been utilized to dispose of waste material. MPL ceased receiving MSW in 1996, and now only accepts C&D waste. Based on these dates MPL qualifies as a "category 3 landfill" as defined by 20.9.2.7.L(1) NMAC. A separate landfill, the AL, located immediately to the east of the MSW and C&D landfill area, is designated for disposal of asbestos containing material. The AL is approximately 4.7 acres and is near capacity. All waste cells at MPL are unlined and a leachate collection system was not installed.

The immediate area around MPL is undeveloped, with the exception of the Scrap Yard (metal recycling facility) to the south. The Main Post Sewage Treatment Plant (STP) is located 0.7 miles west by southwest and the Main Post Headquarters, including residential area, is located approximately three miles west by northwest of MPL. A map of the surrounding area is provided in Figure 2.

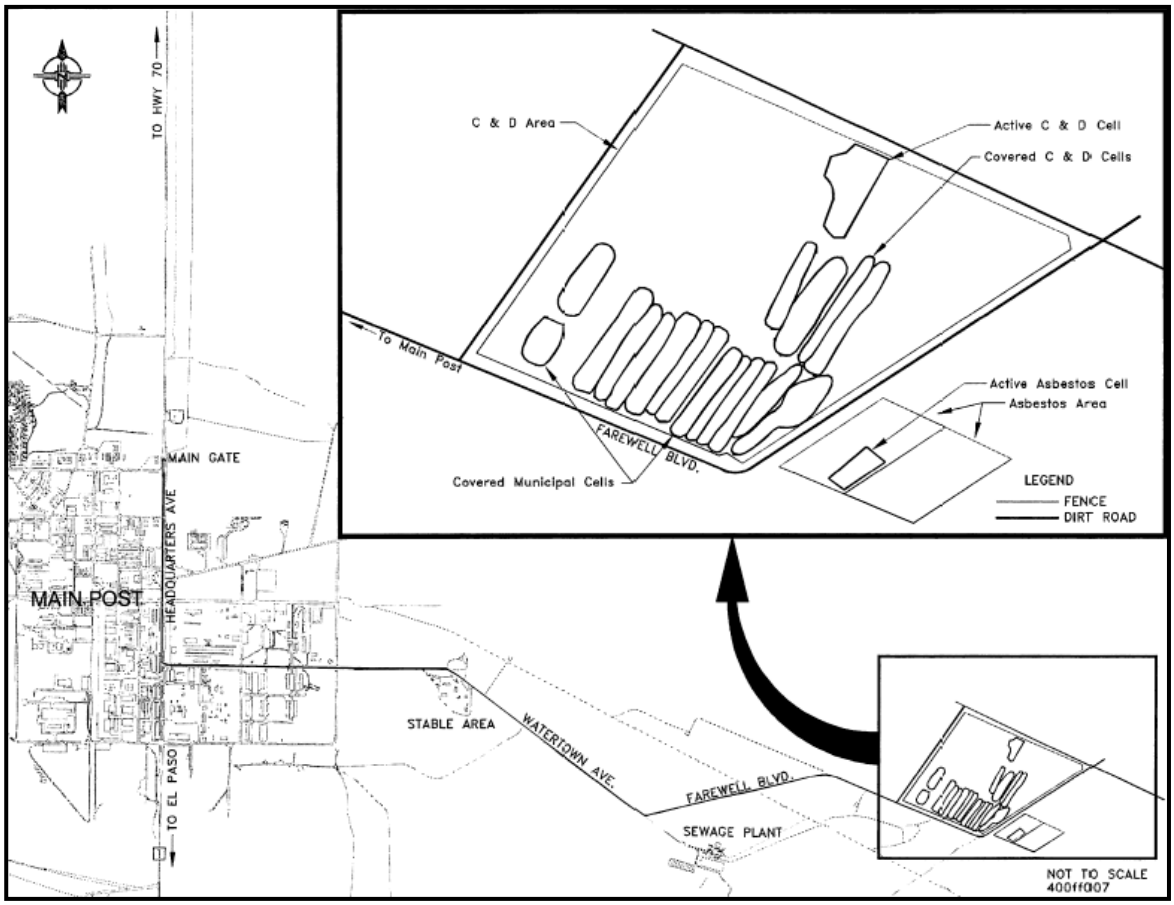

FIGURE 2: MAIN POST LANDFILL AND VICINITY (FIGURE REPRESENTS PAST OPERATIONS)

Groundwater monitoring activities began in 1996 with installation of four monitor wells and five quarters of sampling to establish background concentrations. Following development of background, groundwater monitoring has been conducted since 2000. Depth to groundwater in the area of MPL is approximately 180 to 200 feet below ground surface. Monitoring for methane, previously conducted on a quarterly basis with negative results, has been suspended.

2.1 Geology

Summaries of the area geology and hydrogeology were included in the *Main Post Landfill Background Groundwater Monitoring Plan* (Radian, 1995) and the *Summary Report of Geology and Hydrogeology at the Main Post Landfill* (Exhibit Y of the 2001 *Solid Waste Permit Application* developed by MEVATEC Corp., 2001). Also pertinent to the groundwater situation is legacy contamination from discharges to the WSMR STP. This contamination was not detected until 1996, when background groundwater monitoring was begun for MPL. This contamination and its effect on MPL are detailed in the *Site Characterization Report for the Former Sewage Treatment Plant (STP) Percolation Ditches* (MEVATEC, 1999). Portions of these reports are summarized in section 2.1 and 2.2 of this closure plan.

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 geologic setting of WSMR consists predominantly of the Tularosa Basin and surrounding mountain ranges. The majority of WSMR property, including most test facilities, is located within the Tularosa Basin (WSMR, 1998). The San Andres, 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 range. The average elevation of the Tularosa Basin is 4,000 ft above mean sea level. Specific soil information was collected from the *Soil Survey of White Sands Missile Range, New Mexico* (USDA, 1976)

2.1.1 General Geology

Basin deposits consisting of piedmont alluvium, fine-grained lake and playa sediments, coarse-grained river deposits, and aeolian material can exceed 5,000 feet in thickness. Gypsum dissolved from the surrounding mountains is concentrated in the intermittent dry lakebed of Lake Lucero and then transported by winds to form the gypsum dunes of White Sands National Monument in the center of the Tularosa Basin.

2.1.2 Site Specific Geology

MPL is located along the western edge of the Tularosa Basin approximately 3 miles from the Organ Mountains. The facility is located on the distal portion of the alluvial fan extending eastward from the Organ Mountains. Sediments consist of varying layers of sands and clays to below the zone of interest, becoming somewhat more fine-grained to the east (toward the center of the basin).

According to the soil survey for WSMR, MPL is located within the soil grouping, “Dune land-Dona Ana complex” (USDA, 1976). This complex consists of approximately 40 percent Dune land (mainly loamy fine sand or fine sand), 25 percent Dona Ana sandy loam (gently undulating to undulating soil between dunes), and 20 percent Bluepoint loamy fine sand (gently undulating soil near low dunes). Runoff from this complex is slow with a slight hazard for water erosion, while wind erosion potential is high. Vegetation is scattered mesquite, chamiza, soaptree yucca, sand dropseed, broom snakeweed, and annuals (USDA, 1976). In 1999, seven soil samples were collected from borings through the existing cover. Results from this analysis appear in Table 1. Cross-sections of the near-surface geology under the MPL, based on these borings, are provided in Figure 3 on the following page.

Site-specific geology can be further characterized based on the well logs developed when the monitor wells were installed in the immediate area. Typical of alluvial fans, the unconsolidated alluvial material underlying the site consists of layers of sand, silt, and clay in various proportions and intermixed with gravel. Monitor wells and test wells in the vicinity of the site have not reached bedrock (Dept. of the Army, 1976). A fence diagram has been developed based on logs from all of the monitor wells in the vicinity; it is included as Appendix A. These logs demonstrate that sand is the principal soil type of the top 30 to 75 feet. Clay layers exist at multiple locations in the subsurface and may be 4 to 75 feet thick depending on location.

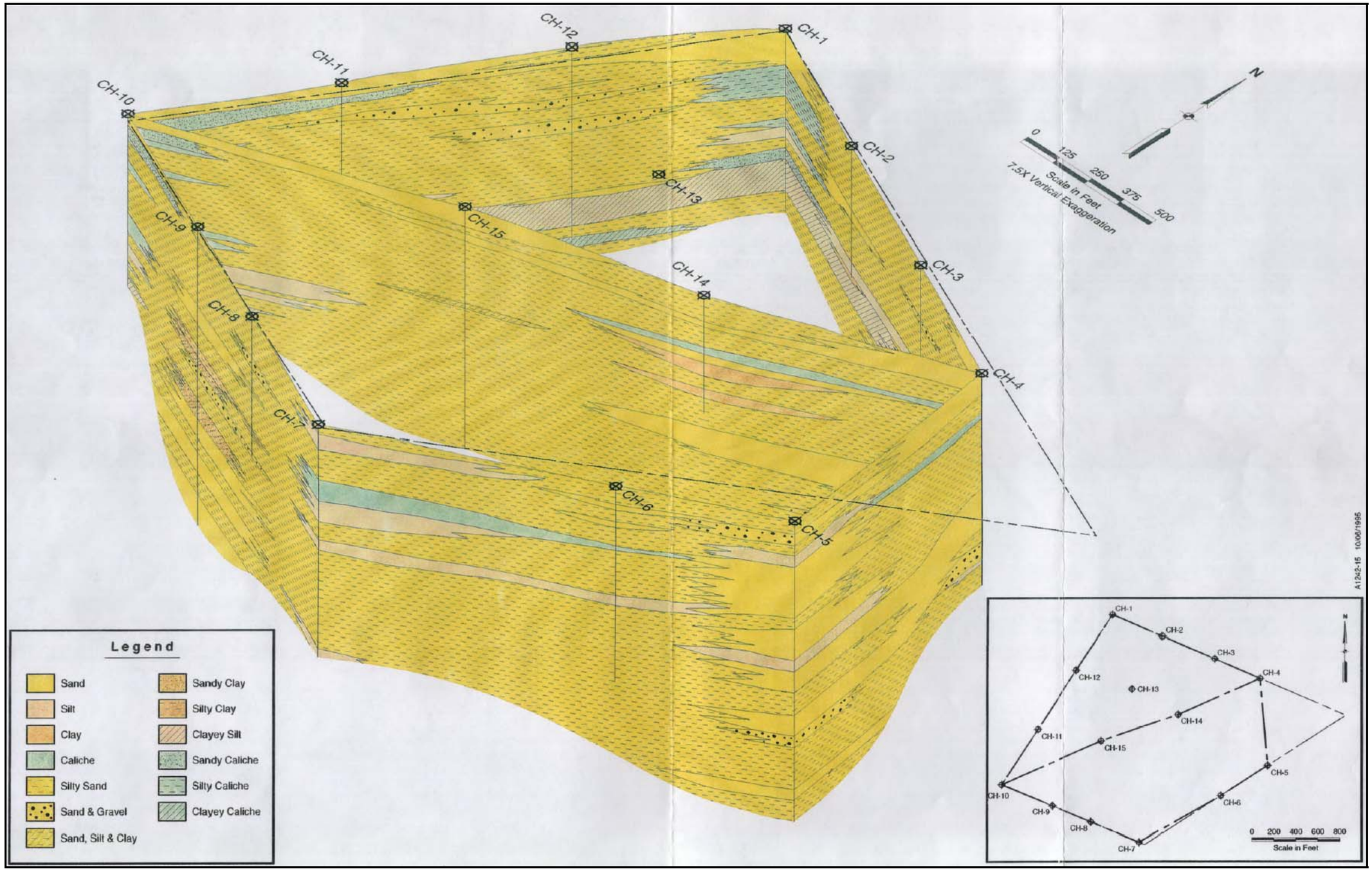

FIGURE 3: GEOLOGIC CROSS-SECTIONS

TABLE 1: PROPERTIES OF IN-SITU SOILS AT MAIN POST LANDFILL							
Sample	**Soil Type**	**USCS**	**AASHTO**	**Max Dry Density (pcf)**	**Percent moisture**	**Percent compaction**	**k_{20} (cm/sec)**
MPL 1	Silty sand	SM	A-2-4	125.3	10.3	92.0	2.8×10^{-5}
MPL 2	Silty sand	SM	A-2-4	121.4	12.2	92.0	2.4×10^{-5}
MPL 3	Silty sand	SM	A-4	127.3	8.7	91.8	2.6×10^{-6}
MPL 4	Silty sand	SM	A-2-4	125.0	9.9	92.3	4.2×10^{-5}
MPL 5	Silty sand	SM	A-2-4	112.9	11.8	92.0	4.0×10^{-4}
MPL 6	Silty sand	SM	A-2-4	120.6	12.5	91.9	5.8×10^{-6}
MPL 7	Silty sand	SM	A-2-4	124.9	9.8	92.0	1.1×10^{-4}

USCS – Unified Soil Classification System
AASHTO – American Association of State Highway and Transportation Officials
k_{20} – coefficient of permeability, measured in centimeters per second

2.2 Hydrogeology

Hydrogeology in the area has been carefully studied because of a nearby occurrence of cyanide contamination unrelated to MPL. This contamination is related to the former STP Percolation Ditches (Solid Waste Management Unit (SWMU) 82) as shown in Figure 4. Measured potentiometric surface elevations suggest a groundwater flow direction to the southeast. The configuration of the land surface and the water table (based on measurements taken in 1999) is shown in Figure 5 (unpublished MEVATEC Corporation graphic). As a conceptual model, little change appears to have occurred in the interim. Current configuration of the water table and inferred groundwater flow direction are shown on Figure 6.

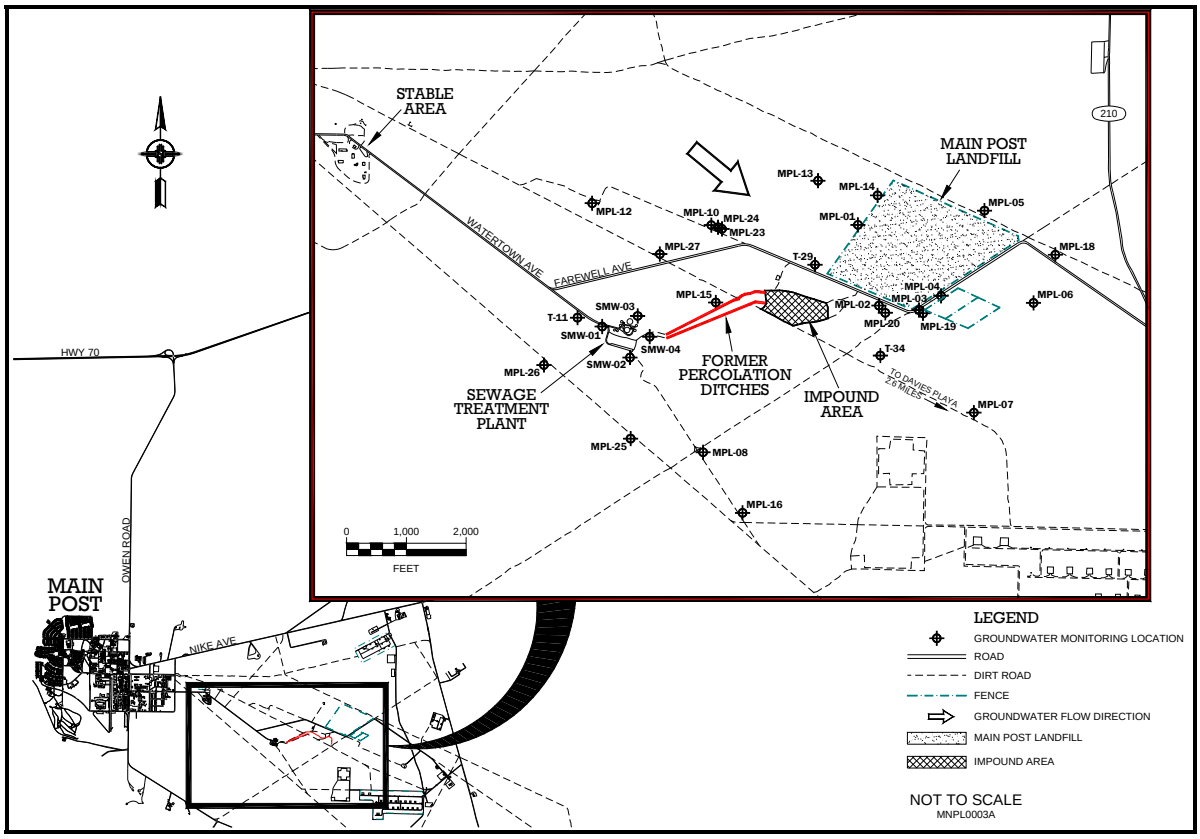

FIGURE 4: MPL & SWMU 82 SITE MAP

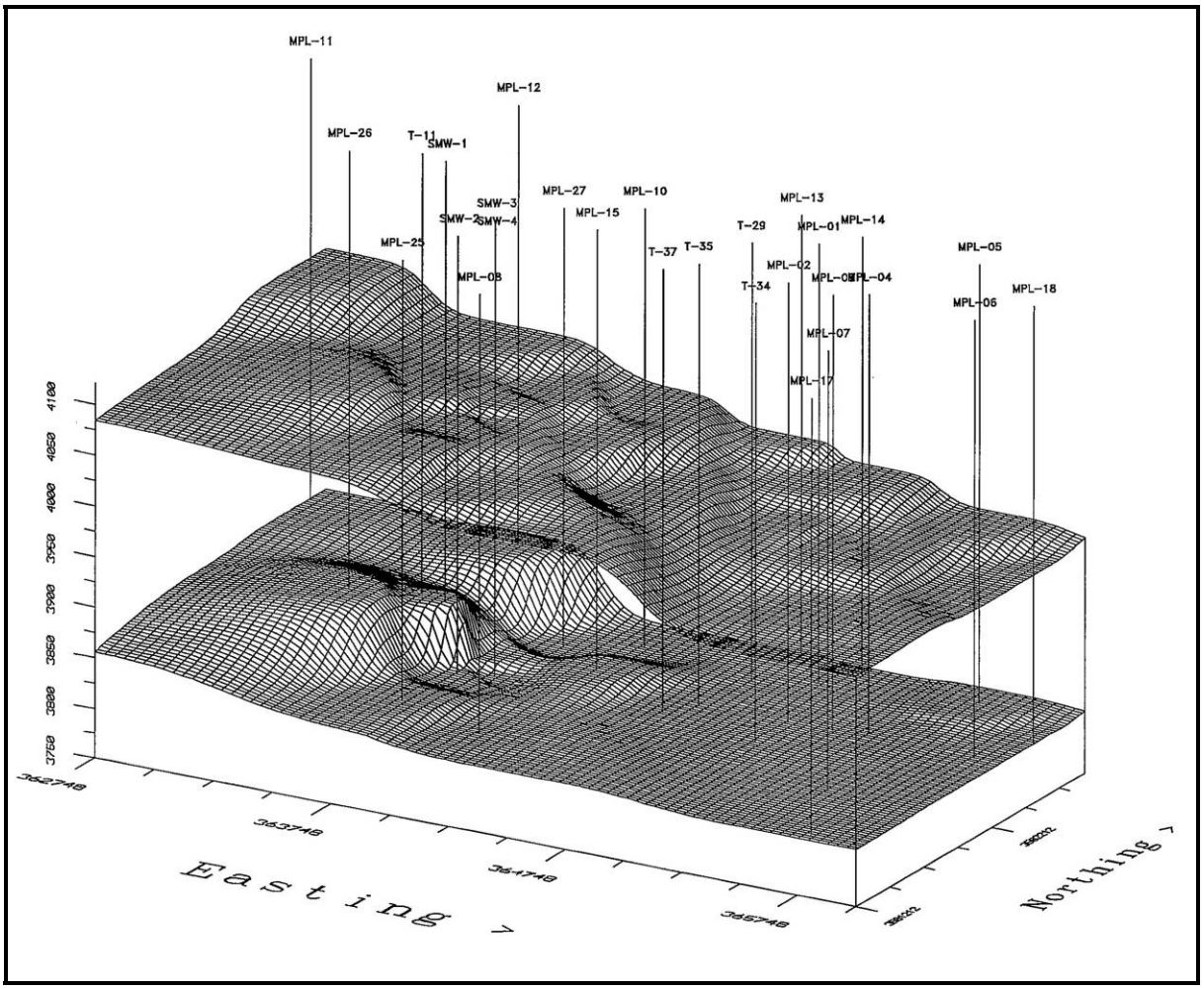

FIGURE 5: TOPOGRAPHY OF LAND SURFACE AND WATER TABLE IN THE VICINITY OF MPL

2.2.1 Groundwater

Based on recent groundwater measurements (June 2008) the water table has a gradual slope (0.0013 ft/ft) to the southeast. Figure 6 notes groundwater flow direction and gradient based on recent measurements to the water table.

TABLE 2: MONITOR WELL CONSTRUCTION DETAILS

Well	Date Installed	Total Depth (ft)	Elevation Brass Cap (ft)	Screen Length (ft, bgs)	Groundwater Elevation (ft)
MPL-01	05/17/1996	220.6	4012.56	195-215	3813.77
MPL-02	05/19/1996	220.5	4004.55	195-215	3811.59
MPL-03	05/22/1996	228.5	3997.75	203-223	3810.96
MPL-04	05/30/1996	225.0	3993.50	200-220	3810.98

Construction details given in "Groundwater Monitoring at the Main Post Landfill" (MEVATEC, 1997). Groundwater elevation based on water level measurements collected 3 February 1997.

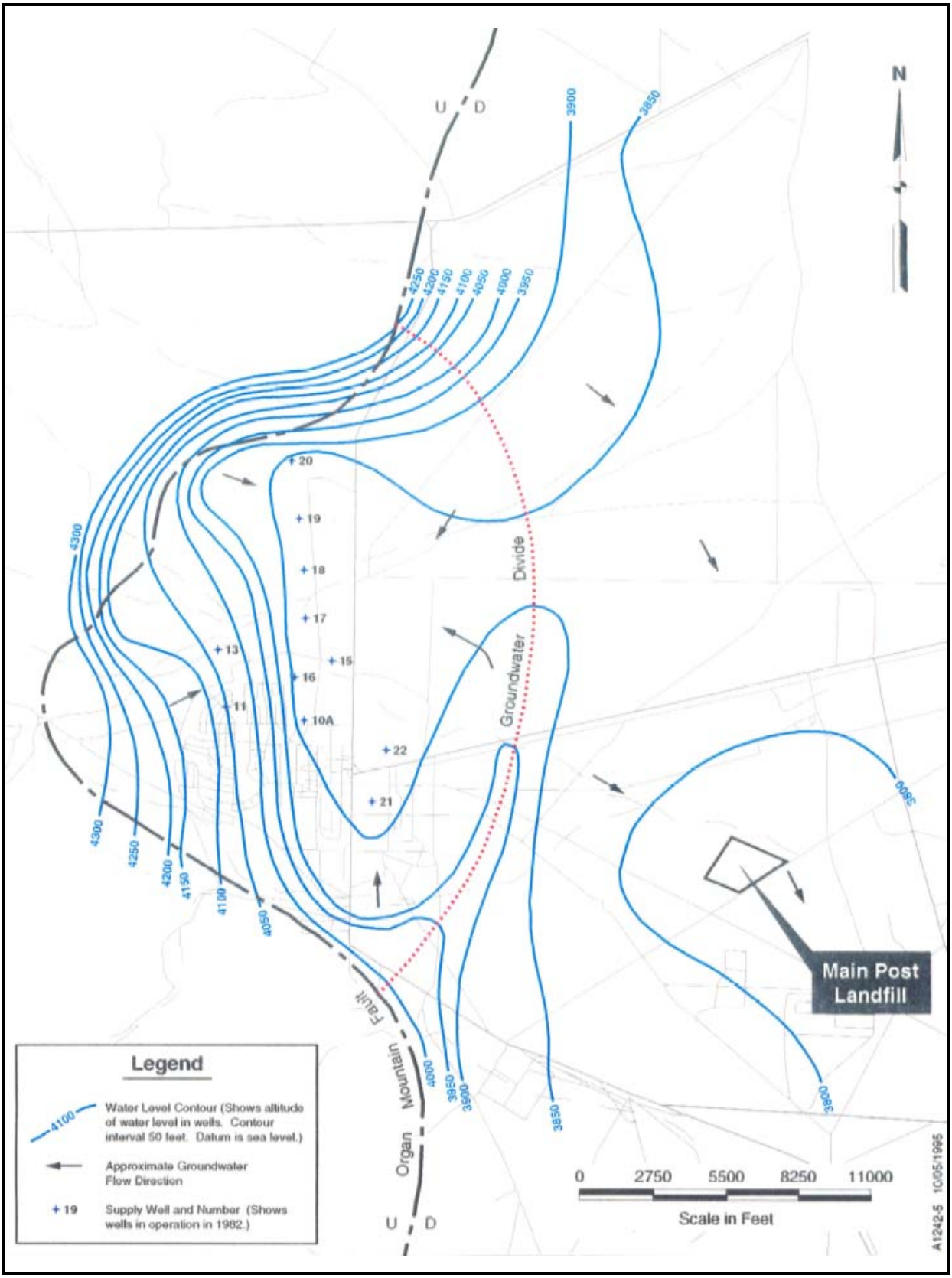

FIGURE 6: GROUNDWATER FLOW DIRECTION

Groundwater monitoring in association with the landfill has occurred since 1996. Based on recent groundwater measurements, the groundwater level has declined 3 to 4 feet over the last 11 years. This may be due to natural fluctuations based on recent drought conditions in the region as well as the continued gradual subsidence of the groundwater mound, identified by Risser (1988), which is a relict of the STP percolation ditches.

2.2.2 Groundwater Quality

Generally, groundwater quality deteriorates as it moves further east, away from the recharge area at the foot of the mountains and the alluvial fans. Approximately 5 miles east of the mountains dissolved solids content in the groundwater is greater than 1,000 milligrams per liter (mg/L) and thus, it is no longer considered potable. Groundwater at MPL has consistently demonstrated total dissolved solids readings ranging from 250 to 490 mg/L).

Initial groundwater monitoring was conducted at the MPL (wells MPL01, 02, 03, and 04, as shown in Figure 7) in 1996 and 1997. Figure 7 depicts the landfill configuration as it existed in 1996. This effort and the associated results are detailed in *Groundwater Monitoring at the Main Post Landfill White Sands Missile Range* (MEVATEC, 1997). The five independent samples were collected in June, August, October, November 1996, and February 1997. Sampling methods consisted of purging three well volumes and then collecting samples. Concentrations of aluminum, barium, boron, calcium, iron, magnesium, manganese, potassium, and sodium were detected. The presence of these metals was attributed to natural sources. Nitrate and the hazardous constituent, cyanide were also detected. These two contaminants were shown to be the result of historic discharges (1958 to 1986) of treated effluent from the STP.

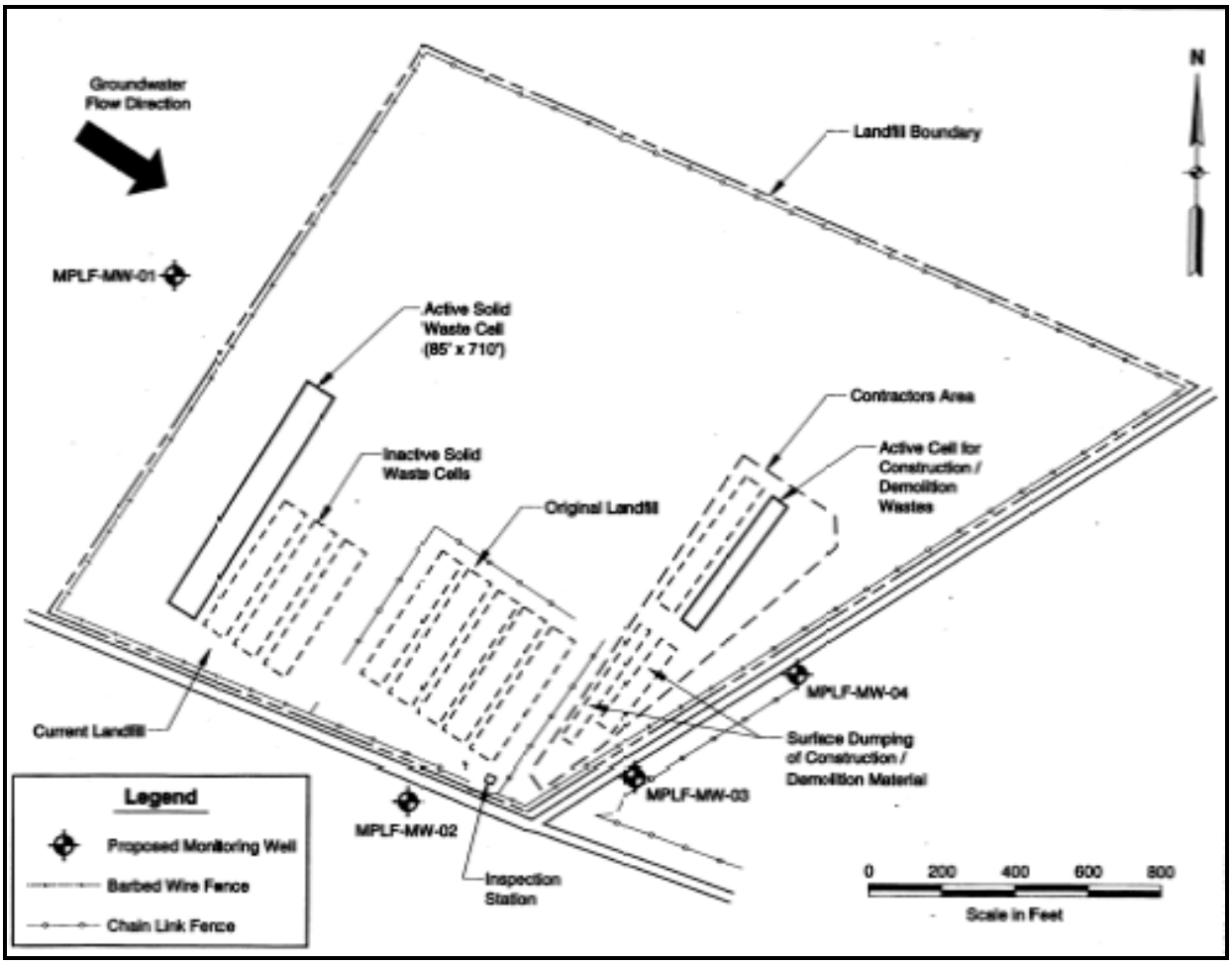

FIGURE 7: MONITORING WELL LOCATION

Groundwater monitoring activities continue in conjunction with ongoing surveillance of SWMU 82, which falls under the purview of the Hazardous Waste Bureau. Results pertaining to the MPL are reported in the Annual Solid Waste Questionnaire. Since 2005, MPL monitor wells have been sampled via low-flow methods following guidance from ASTM *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations (D 6771-02)* and NMED's *Use of Low-flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (1 October 2001). A copy of the most recent groundwater monitoring report is presented at Appendix B.

Detected analytes did not exceed their respective groundwater protection standards. Detections were in the range of prior sampling events. The total iron sample (0.660 mgL) from MPL01 did exceed 50 percent of the groundwater protection standard (1.0 mg/L) in the February 2007 sampling. High iron detections are typical. This constituent has previously been shown to be naturally occurring.

2.3 Landfill Description & Operational History

Based on prior documentation, the trench method of landfilling was utilized for most disposal within the MPL. Some of the early C&D disposal may have been dumped on the surface, but has since been buried (Radian, 1995). According to records, MPL consisted of three disposal pits when operations began in 1983 — residential refuse or MSW, dead animals, and C&D debris. MPL ceased receiving MSW in 1996.

Measurement of areas noted in this section relied on historical documents, the topographical survey performed by Robert Pounds in 1999, and the geophysical survey performed by Blackhawk Geometrics, Inc. in 1999. Depths of cells are reported to be 25 to 35 feet (Radian, 1995). Current cover thickness varies. Hand auger tests were conducted in 1999 to confirm cover thickness at five locations. A map showing the results of a current (2008) topographic survey is included in the pocket.

2.3.1 Construction and Demolition Area to be Closed

C&D debris has been disposed in multiple areas as noted in Figures 2 and 7. The total area is approximately 9.9 acres. These cells were to be covered with at least 2 feet of soil. Three hand auger tests reached depths of 1.5, 3, and 5 feet before encountering waste. Current topography does not provide adequate slope to promote positive drainage. Landfill final grades will be sloped to prevent the ponding of water and erosion of the cover material. Additional details are noted in the Cover Plan (section 3.0) and construction drawings (Appendix C).

2.3.2 Municipal Waste Area to be Closed

The municipal waste area consists of approximately 13.9 acres of covered cells. This area received waste from 1983 to 1996. These cells were to be covered with at least 2 feet of soil. Two hand auger tests reached depths of 5 and 9 feet before encountering waste. Current topography does not provide adequate slope on portions of the area to promote positive drainage. Landfill final grades will be sloped to prevent the ponding of water and erosion of the cover material. Additional details are noted in the Cover Plan (Section 3.0) and construction drawings (Appendix C).

2.3.3 Asbestos Landfill (AL)

The AL, directly east of MPL, is near capacity on the 4.7 acres originally permitted. When WSMR applied for a new permit in 2001, an additional 5-acre expansion area was proposed. Because the application was administratively denied in 2005 this area was never utilized to dispose of asbestos material. However, there are multiple sources which incorrectly reference the AL as consisting of 10 acres. Additional details are noted in the Cover Plan (section 3.0) and construction drawings (Appendix C).

2.3.4 Types of Waste Accepted

Municipal solid waste from WSMR activities (office and base housing) was deposited in MPL from 1982 through 1996. Material accepted included household waste from approximately 850 residences, office waste, and green waste. According to the prior closure plan, MSW was placed in 12 cells along the southern portion of MPL. C&D debris has been placed in trenches north and west of the MSW area. Material accepted is typical of C&D waste—concrete, brick, wood, stone, and soil.

Debris deposited in the AL included material from remodeling/renovation projects, facilities maintenance and repair actions, building demolition projects, and missile parts (gaskets, seals, and coatings).

2.3.5 Estimated Volume of Waste On-site

The acreage and volumes of waste currently on site are shown in Table 3. Since the current C&D cell is open and receiving wastes, the volume at closure is an estimated quantity. Future C&D waste disposal is not addressed in this plan.

TABLE 3: ESTIMATED VOLUME OF WASTE

Disposed Material	Area (acres)	Estimated Volume (cubic yards)
Municipal Solid Waste	13.9	378,400
Asbestos	4.7	128,000
C&D (ready for closure)	9.9	269,500
C&D (current open trench)	1.5	30,000
C&D (future use)	44	NA
Volume calculations assume cover thickness of 2.5 feet and 25 percent volume occupied by daily cover.		

3.0 COVER PLAN

WSMR proposes to continue use of the landfill site to dispose of C&D debris generated within WSMR. Approximately 44 acres remain within the landfill fence that have not been utilized for waste disposal. New cells will be opened to receive future C&D waste; all existing cells will be closed in accordance with this closure plan.

The final cover design employs lined drainage channels which limit precipitation infiltration and minimize fill needed to reach the required slope. The shallow drainage channel will be lined with high-density polyethylene and filled with gravel to protect the liner while allowing adequate storm-water flow. The design sheets give additional construction details and are included as Appendix C. This alternative cover has been evaluated using the Army Corps of Engineers modeling software, Hydrologic Evaluation of Landfill Performance (HELP). Modeling with HELP has shown the native soil available at the site, when compacted to a thickness of 30 inches, provides protection of public health, welfare, and the environment equivalent to the cover details noted in 20.9.6.9.A NMAC. This modeling is further discussed in section 3.2.

3.1 Thickness of Existing Cover Material

Based on operating records, each of the cells was capped with a native soil cover when capacity was reached. Hand auger tests of cover thickness conducted in 1999 noted measurements of 1.5 to 9 feet. Prior to closure a systematic survey will be performed using a hand auger to measure thickness of existing cover, where data is missing. These measurements will be utilized to verify that cover requirements are met based on the alternative cover design detailed within this closure plan. Previous sample points are shown in Figure 8. Depths of existing cover are noted in Table 4.

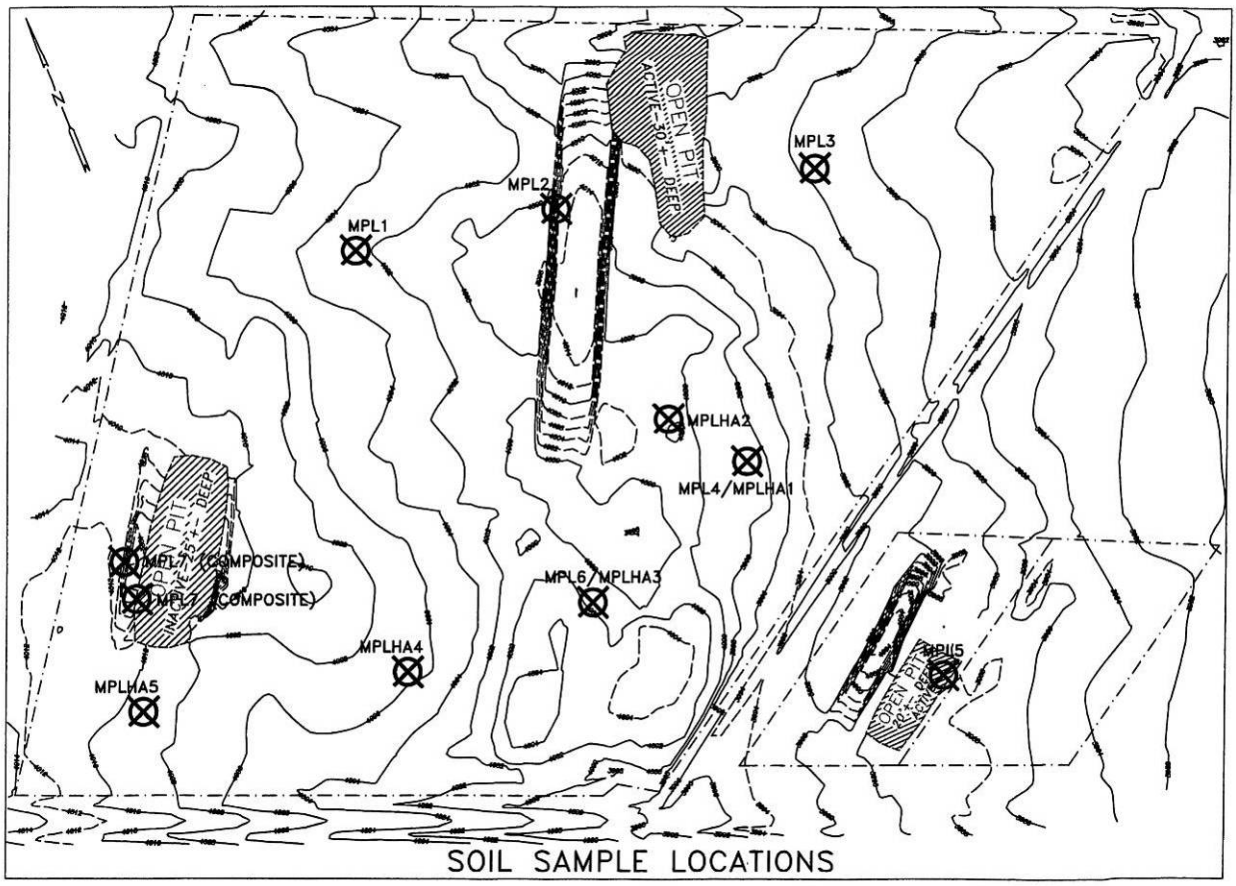

FIGURE 8: APPROXIMATE LOCATIONS OF AUGER POINTS ON EXISTING CELLS

TABLE 4: HAND AUGER RESULTS		
Sample	**Cover thickness at sample location (ft)**	**Type of waste encountered**
MPLHA 1	5	nylon mesh, wood
MPLHA 2	1.5	clay pipe, wood
MPLHA 3	5	plastic, Styrofoam, insulation
MPLHA 4	9	Styrofoam
MPLHA 5	3	aluminum, plastic, Styrofoam

3.2 HELP Model

According to 20.9.6.9.A NMAC, the cover requirement for municipal and special waste landfills is 18 inches of earthen material having a saturated hydraulic conductivity no greater than $1x10^{-5}$ centimeters per second. This is applicable to landfills like MPL which are unlined and did not receive more than 20 tons of waste per day annual average. An erosion layer consisting of 6 inches of earthen material capable of sustaining native plant growth is required over the cover. This cover is considered prescriptive cover design. WSMR proposes to use an alternative cover consisting of native soils which provides equivalent protection as the prescriptive cover.

Samples from the existing intermediate cover were collected in 1999. These samples demonstrated a range of hydraulic conductivities as noted in Table 5. Locations of these samples are noted in Figure 8.

TABLE 5: EXISTING COVER SOIL PROPERTIES

Sample	Soil Type	Cover sample location	Hydraulic conductivity (cm/sec)
MPL 1	Silty sand	surface	$2.8x10^{-5}$
MPL 2	Silty sand	stockpile	$2.4x10^{-5}$
MPL 3	Silty sand	surface	$2.6x10^{-6}$
MPL 4	Silty sand	co-located with MPLHA 1	$4.2x10^{-6}$
MPL 5	Silty sand	open pit (asbestos landfill)	$4.0x10^{-4}$
MPL 6	Silty sand	co-located with MPLHA 3	$5.8x10^{-6}$
MPL 7	Silty sand	stockpile	$1.1x10^{-4}$

3.3 MSW Area to be Closed

The existing municipal waste disposal area occupies approximately 13.9 acres. The current soil surface has a gradual slope (1 percent) to the east. According to the regulations governing closure of landfills (including MSW, asbestos, and C&D) slopes of finished grades shall not exceed 25 percent and not be less than 5 percent for landfills permitted after the effective date of the current regulations (20.9.6 NMAC). Landfills permitted prior to the effective date (2 August 2007) can be approved with minimum slope of 2 percent. However, WSMR has designed to the 5 percent standard. WSMR will verify slope and correct any areas of ponding once the final cover is complete.

Based on these requirements, WSMR proposes a native soil cover of 30 inches thickness. An additional 6 inches of soil material which is resistant to wind and water erosion will be placed over the native soil cover. The cover material will be excavated from future C&D landfill cells or from designated borrow pits on WSMR. The erosion layer will be transported from borrow pits located along the eastern slopes of the San Andres Mountains, approximately 9 miles from the site.

3.4 C&D Area to be Closed

Regulations for closure of cells containing C&D (20.9.6.10 NMAC) require a cover consisting of a minimum 18 inches of compacted soil with an additional 6 inches of soil material capable of supporting native plant life. Required slope must be less than 25 percent and more than 5 percent for landfills permitted after the effective date (2 August 2007). Landfills permitted prior to the effective date may have slopes as flat as 2 percent. As mentioned previously, WSMR is using the 5 percent standard. WSMR will verify slope and correct any areas of ponding once the final cover is complete. WSMR proposes to utilize native soil from the immediate area for construction of the cover. Additional details of proposed cover material are discussed in section 3.6.

The final cover will consist of a compacted layer of not less than 30 inches of clean soil and a minimum of 6 inches of erosion layer capable of supporting native vegetation.

3.5 Asbestos Landfill

Regulations for closure of cells containing only regulated asbestos [20.9.6.9.A.(1).(h) NMAC] require a cover with 30 inches of compacted native soil and an additional 6 inches of topsoil. The cover material can finish at original grade with measures taken to control erosion and rodent intrusion. Final elevation of the cover will be based on depth to landfilled material. If deemed necessary test borings may be used to verify the depth of cover. Any test borings made at the AL will require appropriate precautions to protect personnel performing the work. Only individuals who have been trained on the hazards

associated with asbestos containing materials will be allowed to perform direct measurements using hand auger equipment. If measured depths are not sufficient to meet the requirements noted above, adjustments to final cover grade will be made so cover thickness is met and the potential for ponding or erosion is minimized.

3.6 Cover material

Cover material will be principally derived from the existing material on site or from designated, nearby borrow pits. The cover is designed in such a way to make use of the existing soil properties and still meet the closure requirements (20.9.6.9 NMAC). The existing soil does not have a significant "topsoil" component. The lack of available topsoil should not materially effect growth of a protective vegetative layer. Native vegetation is well adapted at surviving in the alkaline sandy surface soil. The 6-inch thick erosion layer will be composed of material with a larger percentage of gravel sized particles making it more resistant to wind erosion typical of this region. This material is not available in the immediate area and will need to be transported from other locations on WSMR.

One such source of borrow material is located 9 miles north of MPL along the east slope of the San Andres Mountains. This borrow pit contains abundant coarse material. A recent sample was classified as "slightly silty sand with gravels (SM-SP)." Assuming a 6 inch thick erosion layer, approximately 20,100 cubic yards of material will be required to complete the cap for all existing MSW and C&D areas at MPL. If available, WSMR will locate a closer source for the erosion layer.

3.7 Construction Quality Assurance / Construction Quality Control (CQA/CQC)

Construction work practice will follow the guidance noted or referenced in this section. The requirements for CQA/CQC plans are taken from 20.9.4.14 NMAC.

3.7.1 Equipment, method of compaction, proctor density

Compaction will be to no less than 75 percent and no more than 85 percent of the standard proctor density [20.9.6.9.A.(1).(g) NMAC].

According to 20.9.4.14 NMAC, quality control plans will:

- Define procedures for obtaining samples and testing and reporting the test results for the installation of the final cover;
- Describe and illustrate all necessary procedures for maintaining the integrity of the final cover;
- Prescribe the minimum frequency of testing for the soil component of all final covers as follows:
    - Borrow soil will have grain size tested once every 1,000 cubic yards;
    - Atterberg limits tested once every 5,000 cubic yards;
    - Proctor compaction moisture density curve conformance tested one every 5,000 cubic yards;
    - Laboratory permeability will be tested once every 5,000 cubic yards;
    - During construction of the cover the soil will be tested as follows:
        - Density and moisture content tested by nuclear densiometer four times per acre per lift;
        - Laboratory or in-situ permeability will be tested once per 2 acres; laboratory samples will be undisturbed or recompacted to the site-specific field conditions;
        - Total thickness, by survey, will be tested once per acre (on grid)

WSMR will adhere to these requirements during construction.

3.7.2 Thickness of cover material

Thickness of the current cover will be verified using auger equipment to bore until encountering waste. Proposed locations for boreholes are noted in Figure 8.

3.7.3 Geomembrane

According to 20.9.4.14 NMAC, quality control plans will address the following:

- The geomembrane component of all liners and final covers as defined in section A of 20.9.4.13 NMAC and subsection A of 20.9.6.9 NMAC, testing both shop and field will be as recommended by the manufacturer. Minimum frequency for destructive seam sample testing will be one per 500 feet of seam length. A portion of each test sample tested in the field and another in the laboratory. Seam samples will be tested for peel adhesion and bonded seam strength. Non-destructive testing will be performed for all seams, seam repairs, and liner repairs.

The sole use of geomembranes in the planned cover is to line drainage swales. Such elements of the NMED requirements as are applicable will be followed.

3.7.4 Topographical map showing final contours and grade

WSMR will produce a topographical map noting final contours, grade, remaining structures, and drainage controls. The holding ponds, berms, and lined swale will be constructed to promote positive drainage over the entire facility. NMED recommends minimum of 5 percent on top and side slopes less than 25 percent. The top portion of the cover will have no less than a two percent slope and side slopes will not exceed 25 percent.

4.0 FINAL USE

MPL is completely located on land owned by DoD. DoD does not propose any other use of the closed MPL. There is no anticipation of base closure or other land transfer actions in the foreseeable future. Documentation will be filed with the appropriate land use agencies noting the location, contents, and closure of MPL.

4.1 Vegetation Plan

Once the protective vegetation layer has been installed and graded to design specifications, the landfill cover will be seeded with native vegetation. The seed mix and application rate is given in Table 6. Application of the seeds will be timed with the summer monsoon season to increase the probability of successful germination and establishment. Seeds will be covered with straw and rolled. An alternative form of application, such as hydroseeding, may be utilized, depending on then-current weather and climate.

TABLE 6: PROPOSED SEED MIXTURE

Name	Pounds per acre (pure live seed)
Alkali sacaton	1.0 – 1.25
Green sprangletop	2.5
Scarlet globemallow	0.75
Sand dropseed	1.0
Plains bristlegrass (Setaria)	3.0

4.2 Final Usage Plan for Site

Once closure is complete, WSMR will continue to monitor the site through the post-closure care period. WSMR is a federal testing facility that will continue to see usage and occupation by the DoD for the foreseeable future. No plans are currently proposed for usage of the site for any other purpose. The site is registered with WSMR Master Planning as a closed waste disposal site. Any future usage will take into

account the existence of the landfill and potential hazards to public health, welfare, and the environment. WSMR asserts that the area is not a threat to human health due to its limited access; access is controlled coming onto the missile range, the landfill is away from the most populated area (the Main Post), and the landfill is surrounded by a fence with a locked gate.

4.3 Methane Monitoring Plan

Prior methane monitoring consisted of quarterly sampling at 27 discrete points around the perimeter of the current landfill fence at approximately 300-foot intervals and sampling near the two on-site structures. MPL does not have methane monitor wells and relied on a soil probe to obtain samples from below the ground surface. Sampling is carried out at approximate depth of 3 feet using a soil probe and a portable gas detection meter. Reports were included in the annual Solid Waste Questionnaire delivered to NMED. No methane was detected for any events in calendar years 2004 – 2007.

The decomposition of organic material typically found in MSW landfills produces methane gas which can collect in nearby structures and pose an explosion hazard. However, the lack of significant structures near the landfill, its age and its nature, limit the potential for methane formation and impact. Further, no methane has been detected for a number of years. Therefore, WSMR proposes to conduct no additional methane sampling at the MPL.

4.4 Post Closure Submittals

Upon closure, WSMR will provide NMED with a detailed description of the site, including a plat. This will also be filed with the WSMR planning office and WSMR Real Property Division. Submittals are further discussed in section 5.4 of this plan.

5.0 POST-CLOSURE CARE PLAN

The following sections describe the actions that WSMR will take to insure the continued safety and integrity of the landfill site. WSMR asserts that the area is not a threat to human health due to its limited access; access is controlled coming onto the missile range, the landfill is away from the most populated area (the Main Post), and the landfill is secured by a fence with a locked gate. Therefore, no additional security measures are contemplated.

5.1 Monitoring and Repair Plan

This closure plan notes methods and structures, which will be put in place and serve to protect human health and the environment from potential contaminants located within the solid waste cells of MPL.

- Semi-annual inspections will occur during the groundwater sampling events (see Section 5.3) to examine the site for integrity of the cover relating to settlement, ponding, water and wind erosion, drainage, and vegetation maintenance over the 30-year post-closure care period. These inspections will also verify the fence, drainage structures, and monitor wells are free from damage and operating as intended.
- The cover is designed in such a way to limit the potential for wind and water erosion. The construction assurance plan notes methods to limit settlement which leads to ponding. Despite these efforts, issues with erosion, settlement, or other problems may occur.
- As inspections reveal these problems, WSMR will take steps to repair and remedy any noted issues. Remedies may include filling and regrading areas of settlement or erosion; replacing cover cap material (milled asphalt or gravel); repair of fences, gates, or well covers; and repair of lined drainage structures.
- Any minor problems noted will be addressed and corrected within 60 days of inspection. If major deficiencies are found, WSMR will contact NMED in writing to discuss correction procedure and schedule.

5.2 Methane Monitoring Plan

As discussed in Section 4.3, WSMR plans no additional monitoring for methane.

5.3 Groundwater Monitoring System Plan

Based on the dates of operation, WSMR was required to submit and obtain approval of a groundwater monitoring system plan (20.9.9.8 NMAC). The initial groundwater monitoring plan for MPL was approved in correspondence from NMED dated 8 November 1995. Groundwater monitoring, conducted in conjunction with surveillance of SWMU 62, has taken place since 2000. This program has been more extensive than that designated by the Monitoring Plan. Beginning in 2005, groundwater monitoring has been carried out via approved low-flow methods. Specific monitor well details and historic detections are discussed in section 2.2 of this report.

In a continuing effort to consolidate and conserve effort, monitoring of the landfill site will continue in conjunction with surveillance of SWMU 82. The current monitoring program for SWMU 82 is provided as Appendix E. For purposes of this closure plan, the applicability of the monitoring plan is limited to monitor wells MPL01 through 04.

5.3.1 Frequency

Groundwater monitoring will continue on a semi-annual basis as currently carried out, unless analytical results demonstrate more frequent sampling is necessary. Sampling events generally occur in January and June of a given year. If continued sampling demonstrates limited variation in constituent concentrations, WSMR will propose reducing sampling frequency to an annual basis. Unless approved by NMED, WSMR will continue to perform groundwater monitoring activities and reporting throughout the 30 year post-closure care period. Inspections of the landfill will occur during groundwater monitoring events.

5.3.2 Sampling Method

Monitor wells were sampled via low-flow methods following guidance from ASTM *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations (D 6771-02)* and NMED's *Use of Low-flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (30 October 2001). Samples will be collected when temperature and conductivity, as measured during pumping, have stabilized.

5.4 Security and Signage

5.4.1 Security Plan

WSMR asserts that the area is not a threat to human health due to its limited access; access is controlled coming onto the missile range, the landfill is away from the most populated area (the Main Post), and the landfill is secured by a fence with a locked gate. The Main Post Landfill is gated and continually staffed to control access to the site. Therefore, no additional security measures are contemplated. The asbestos landfill is fenced with two locked gates and access will be required thru the environmental office.

5.4.2 Signage and Physical Barriers

The portions of the landfill to be closed are inside a larger compound that also contains future C&D landfill operations. Signage will be emplaced to warn current and future operators of the presence of buried waste. Signs will be posted around the perimeter of the closed cells, in English and Spanish, as follows:

WARNING
ENTRY IS PROHIBITED
CLOSED LANDFILL
No Dumping or Digging Allowed

and

AVISO
ENTRAR ES PROHIBIDO
RELLENO SANITARIO CLAUSURADO.
Prohibido descargar basura o escombro.
Prohibido excavar.

In addition, boulders or concrete barriers will be spaced around the edges of the closed cells to delineate the boundaries.

5.5 Schedule for Completion of Closure Activities

The closure of the facility will be based on the following schedule as noted in NMAC regulations. The following schedule may be modified or amended by NMED. Changes will be noted in official correspondence, which will be made part of the operating record. References to the secretary indicate the secretary of NMED or official designee.

1. Once NMED deems the plan is complete, notice of the closure plan will be posted in local newspapers in Doña Ana and Otero counties. If sufficient public response is received, NMED may hold a non-adjudicatory hearing (20.9.6.8G NMAC).
2. WSMR will not begin closure activities until approval of the Closure and Post-Closure Care Plan (20.9.6.8.F NMAC). Closure activities will begin within 30 days of receiving plan approval or 30 days after the landfill receives the final receipt of waste, whichever is later (20.9.6.9 NMAC).
3. WSMR will notify the secretary in writing of intent to close at least 90 days before closure occurs. Notice in writing will also be given within 14 days of becoming a locked facility (20.9.6.8.D NMAC). These notices will be placed in the operating record.
4. White Sands Missile Range will complete closure activities in accordance with the approved closure plan within 180 days of beginning such activities (20.9.6.9. NMAC).
5. Following closure, WSMR will file a plat with WSMR Real Property noting the property was used as a landfill facility and further use is restricted as described in the Post-Closure Care Plan (20.9.6.9.A.6 NMAC).
6. WSMR will submit a closure report to NMED within 60 days of closure completion. This report will contain a summary of closure activities and be certified by a New Mexico registered professional engineer (20.9.6.8.L NMAC). This certification will state that closure of the solid waste facility has been completed and all conditions of the approved closure plan have been satisfied.
7. Once the post-closure care period expires, WSMR will submit a post-closure report which includes a summary of post-closure activities and is certified by a New Mexico registered professional engineer that post-closure requirements and any applicable corrective actions have been completed and all conditions of the Post-Closure Care Plan have been satisfied (20.9.6.8.N NMAC). Post-closure care is not terminated until the secretary provides written verification that the requirements of the approved post-closure care plan have been satisfied (20.9.6.8.O NMAC).

6.0 FINANCIAL ASSURANCE

WSMR is a Federal facility and is therefore exempt from financial assurance requirements as noted in 20.9.10.8.A NMAC.

REFERENCES

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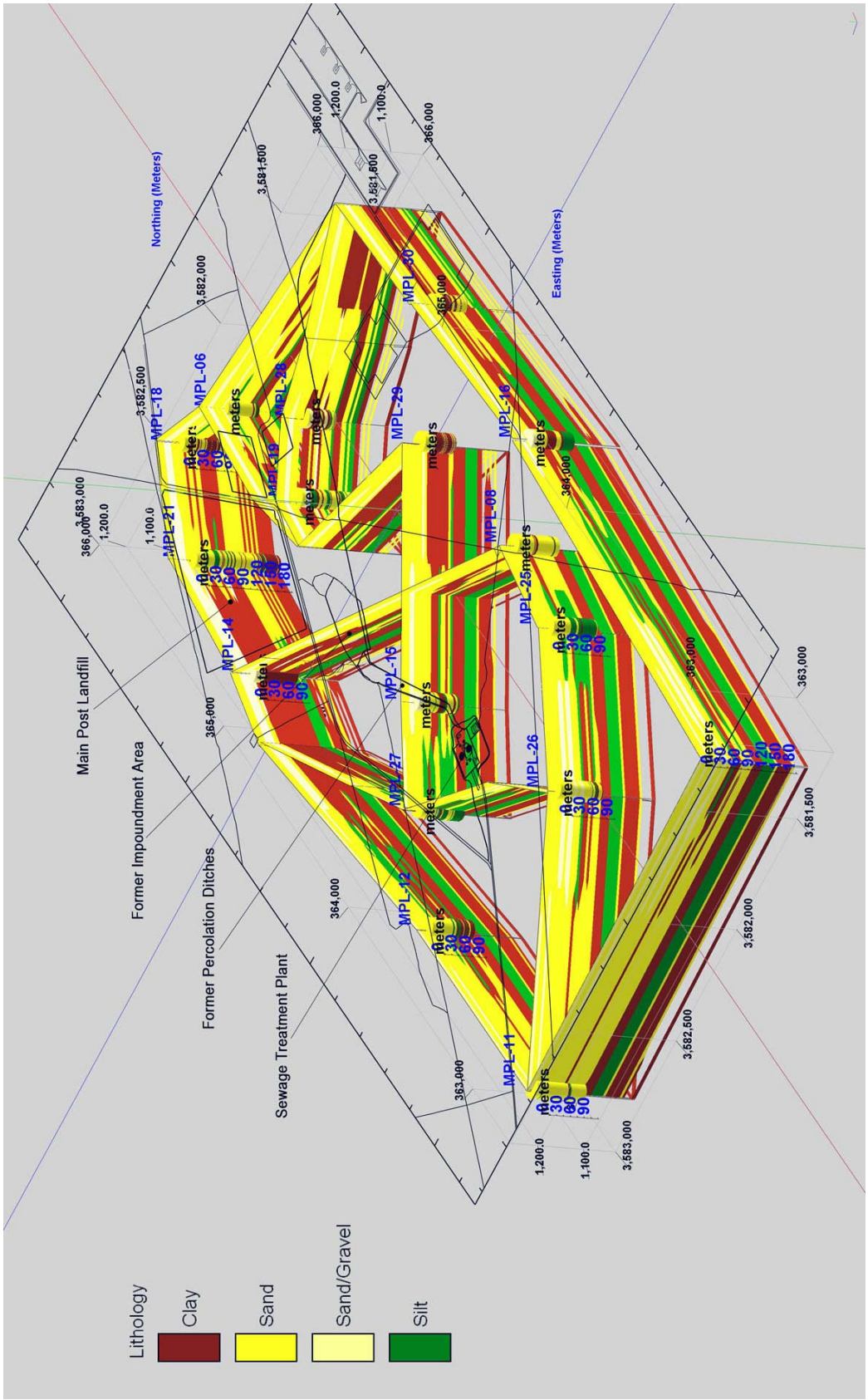
APPENDIX A

Fence Diagram



FENCE DIAGRAM FOR MAIN POST LANDFILL VICINIT

APPENDIX B

Analytical Results of 2007 Groundwater Sampling for the Main Post Landfill

I. 2007 General Information Form

Facility Information January 1-December 31, 2007

Permit/Registration #

County: Dona Ana Check One: ☑ Open Facility ☐ Closed Facility

Facility Name WSMR Main Post Landfill Phone 575-678-1007

Contact Person Javier Mendoza E-Mail Address javier.mendoza@us.army.mil

Facility Mailing Address 100 Headquarters Ave. ATTN: IMSW-WSM-PW

City: White Sands Missile Range (WSMR) State: NM Zip Code: 88002

Physical Location of Facility (City/County Road) WSMR, Dona Ana County, three miles east of Main Post on Farewell Blvd.

Facility Operator US Army WSMR Phone 575-678-8966

Contact Person Thomas A. Ladd E-mail Address ta.ladd@us.army.mil

Street Address 100 Headquarters Ave. ATTN: IMSW-WSM-PW

City WSMR State: NM Zip Code: 88002

Facility Owner Same Phone

Contact Person E-mail Address

Street Address

City State: Zip Code:

Land Owner US Army WSMR Phone 575-678-2220

Contact Person Gary D. Giebel E-mail Address gary.giebel@us.army.mil

Street Address 100 Headquarters Ave. ATTN: IMSW-WSM-ZA

City WSMR State: NM Zip Code: 88002

Financial Assurance

☑ Check One Box

☐ Updated Financial Assurance Attached

☐ Financial Assurance required but not Attached (Explain on Comment Sheet)

☑ Financial Assurance not required (Explain on Comment Sheet)

Questions?
Call 505-827-0197,
or 505-476-3561

Landfills Only

Check One: ☑ Open Landfill ☐ Closed Landfill

Capacity Information for Open Landfills ***(If not provided explain on Comment Sheet)***

Provide Landfill Capacity **Used** during 2006 5003.7 (Cubic Yards)

Provide **Remaining** Landfill Capacity 530673 (Cubic Yards) (See *V. Capacity Worksheet*.)

Provide **Remaining** Landfill Life 106.1 (Years) (See *V. Capacity Worksheet*.)

Number of acres at current site, not permitted, that could be used for diposal in the future

Were there any changes in operations that reduced the active life of the landfill by 25% or more?

☑ No ☐ Yes (Attach Notification)

Monitoring Results for Open Landfills (and Closed Landfill in Post-Closure Care)

☐ **No** ☑ **Yes** Summary of Landfill Gas Monitoring Results Enclosed (if not explain on Comment Sheet)

☐ **No** ☑ **Yes** Summary of Landfill Ground Water Monitoring Results Enclosed (if not explain on Comment Sheet)

☑ **No** ☐ **Yes** Summary of Leachate Generated & Treated or Disposed Enclosed (if not explain on Comment Sheet)

Closure and Post-Closure Activity Date of Closure

Total Acreage Used for Disposal (as of 12/31/06) (Acres)

Intermediate Cover (Acres) Area Seeded (Acres)

Total Acreage with Final Cover Installed (per Closure Plan) (Acres)

II. 2007 Material and Solid Waste Management Form

Facility Name: WSMR Main Post Landfill	**PRINT** Name, Title and Telephone # of the Person Completing Form: James Thompson, Task Coordinator, 575-678-1941
County: Dona Ana — Permit or Registration #	Facility Type: ☑ Landfill ☐ Recycling ☐ Composting ☐ Transfer/Convenience Center

	Material Type (See Instructions)	Method ☒ Mark One: Weighed	Method: Estimated	Waste Origin: Amount of In-State Material Received in **Tons** (a)	Waste Origin: Amount Out-of State Materials Received in **Tons** (b)	Managed On-Site: Landfilled or Treated (c)	Managed On-Site: Composted or Mulched (d)	Managed On-Site: Beneficially Used (e)	Sent Off-Site to be: Treated, Disposed, Incinerated (f)	Sent Off-Site to be: Recycled, Mulched, Composted (g)	Sent Off-Site to be: Beneficially Used (h)	Sent to: Provide Facility Name, City and State (i)
1	MSW	X							1247.01			Otero-Lincoln County Regional Landfill, Alamogordo, NM
2	C & D		X			1667.90						WSMR C&D Landfill, WSMR, NM
3	Clean Fill											
Special Wastes:												
4	Industrial Waste											
5	Regulated Asbestos		X			92.20						WSMR Asbestos Landfill, WSMR, NM
6	Infectious Waste											
7	Ash											
8	PCS											
9	Offal											
10	Bio-Solids (Treated Sewage Sludge)											
11	Other Sludges											
12	Other Special Waste											
Other Materials:												
13	Brush/Green Waste											
14	Scrap Tires	X								47.93		DRMO, Holloman AFB, Alamogordo, NM
15	Motor Oil		x							77.40		Thermofluids, Inc., El Paso, TX
16	Antifreeze		x							3.72		Thermofluids, Inc., El Paso, TX
17	Lead Acid Batteries	x								57.94		DRMO, Holloman AFB, Alamogordo, NM
18	HHW											
19	Other Wastes											
20	**TOTAL**					1760.10			1247.01	186.99		

Please refer to the enclosed tables *Volume to Weight Conversion Factors* to convert cubic yards and gallons to TONS.

Questions?
Call 505-827-0197
or 505-476-3561

III. 2007 Recyclable Materials Form

Facility Name: WSMR Main Post Landfill	**PRINT** Name, Title & Telephone # of Person Completing Form: James Thompson, Task Coordinator, 575-678-1941
County: Dona Ana; Permit or Registration #	Facility Type: ☑ Landfill ☐ Recycling ☐ Composting ☐ Transfer/Convenience Center

	Type of Recyclable	Method ☒ Mark One: Weighed	Method: Estimated	Material Origin: Amount of In-State Materials Received in **Tons** (a)	Material Origin: Amount of Out-of-State Materials Received in **Tons** (b)	Managed On-Site: (c) Beneficially Used or Re-used	Sent Off-Site to be: (d) Recycled or Processed	Sent Off-Site to be: (e) Beneficially Used	Facility sent to: (f) Provide Facility Name and City/State
Paper:									
1	Mixed Paper								
2	Cardboard (OCC)		X				24.00		Durango-McKinley Paper, Albuquerque, NM
3	Newspaper (ONP)								
4	Office Paper								
5	Phone Books								
6	Chip Board								
Containers:									
7	Plastics								
8	Aluminum								
9	Steel Cans								
10	Glass								
11	Mixed Containers								
Other Materials:									
12	Scrap Metals/ White Goods	X					835.16		MPI, B&B Recycling, El Paso, TX
13	Carpet Padding								
14	Pallets								
15	Electronic Scrap								
16	Plastic Films								
17	Other Plastics								
18	Household Items								
19	Textiles/Clothing								
20	Other								
21	**TOTAL**						859.16		

Please refer to the enclosed tables *Volume to Weight Conversion Factors* to convert cubic yards and gallons to TONS.

Questions?
Call 505-827-0197
or 505-476-3561

IV. 2007 Comment Sheet

Name of Facility:	WSMR Main Post Landfill
Name of Person completing form:	James Thompson, White Sands Technical Services, LLC

Financial Assurance not enclosed because:

Not necessary since WSMR is a Federal government facility and is exempt from this requirement.

Gas Monitoring Results not enclosed because:

One quarter of gas monitoring results are enclosed. The other three quarters were not available at the time of submittal due to communication difficulties within WSMR. These remaining three quarters will be provided to NMED-SWB as soon as this problem can be resolved. WSMR appreciates NMED-SWB's patience in this matter.

Ground Water Monitoring Results not enclosed because:

Leachate Generation Report not enclosed because:

No leachate collection system exists due to age of landfill.

C&D landfills do not require a leachate generation report.

Capacity Information not provided because:

Questons?
Call 505-827-0197or 505-476-3561

Revised 12/13/07

V. Capacity Worksheet

Landfill Capacity Calculation Worksheet for__ WSMR Main Post Landfill

All owners operators are required to provide information regarding landfill capacity. To calculate your landfill's remaining capacity you may use this Excel worksheet, a terrain computer model program such as "TerraModel ToolPak", or hire an engineering firm to complete the calculations. If you use the worksheet it will calculate the values K, L and M for you, all you need to do is input the information as requested for Items A through J. A completed SAMPLE is also provided for your reference and to understand the process. Once completed include this form as part of your Annual Report.

There are threesheets in this data base. Click on the labeled tabs below to acess sheets

Enter your data here

Landfill information

(A)	Total landfill area	26.0	Acres
(B)	Total permitted volume (gross capacity)	871,200	Cubic yards
(C)	Thickness of liner protective soil layer	0.0	Feet
(D)	Thickness of final cover	2.5	Feet
(E)	Estimated percentage of gross capacity taken by daily and intermediate covers (if unknown, use default value of 25%)	25.0	%

Waste Information

Note: The worksheet allows you to enter the amount of received waste based on combination of two different types of records: tonnage and gate-yards. Combined, these records should represent the total received waste. Mark appropriate boxes if values are actual or estimated .

				Actual	Estimated
(F)	Waste received through 2006 based on tonnage (if no tonnage receipts, enter 0)	4,285.4	Tons	☐	X
(G)	Waste received through 2006 based on gate-yards (if no gate-yard receipts, enter 0)		Cubic yards	☐	☐
(H)	Waste received in 2007 based on tonnage (if no tonnage receipts, enter 0)	1,667.9	Tons	☐	X
(I)	Waste received in 2007 based on gate-yards (if no gate-yard receipts, enter 0)		Cubic yards	☐	☐
(J)	Compaction rate of emplaced waste (for example, enter 3 for 3 to 1 compaction). If wastes are being compacted but compaction rate is unknown, enter default value of 2 for a conservative result. If no compaction, enter 1.	2.0			

Calculations

Note: If the calculations are not performed automatically by the worksheet, complete them manually using the provided formulas.

Do not add values for K, L, and M

(K)	**Net waste capacity** K=B - A*(C+D)*4840/3 - B*E/100	548,533	Cubic yards
(L)	**Remaining permitted waste capacity** L=K - (F+H)*6/J - (G+I)/J	530,673	Cubic yards
(M)	**Estimated remaining site life** M=L/(H*6/J + I/J)	106.1	Years

Notes:

K: 4,840 = square yards in acre

L: 6 = number of uncompacted cubic yards in 1 ton

Form Completed by:___James Thompson_____

Telephone number:_____575-678-1941_____

LETTER REPORT

The following letter report was prepared under Contract W9124Q-04-D-0012, TO No. 052.

1. TITLE

Analytical results of 2007 Groundwater Sampling for the Main Post Landfill

2. DATE

February 2008

3. INTRODUCTION

White Sands Missile Range (WSMR) has the requirement to monitor groundwater at the Main Post Landfill (MPL) on a semi-annual basis. This monitoring is performed in conjunction with the groundwater sampling for the former Sewage Treatment Plant (STP) Percolation Ditches. This letter report conveys the results of the groundwater monitoring for calendar year 2007.

4. BACKGROUND

The WSMR Main Post Landfill was registered with NMED in April 1982 and has been in operation since 1983. MPL covers an area of approximately 92.7 acres. Initially utilized as a municipal and construction and demolition (C&D) waste landfill, the MPL now only accepts C&D waste. The landfill received municipal waste until 1996. A section of the landfill is designated for asbestos containing wastes. The asbestos area is approximately 10 acres. All waste cells at MPL are unlined and a leachate collection system was not installed. Groundwater monitoring activities began in 1996 with installation of the monitoring wells and five quarters of sampling to establish background concentrations. Groundwater monitoring, as designated by the Monitoring Plan, has been taking place since 2000. Groundwater in the area of MPL exists at approximately 180 to 200 feet below ground surface. Methane monitoring takes place at MPL on a quarterly basis. Results of this monitoring are reported to NMED separately.

5. DISCUSSION

Monitor wells were sampled via low-flow methods following guidance from ASTM Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations (D 6771-02) and NMED's Use of Low-flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring (1 October 2001). The average production rate for the four wells sampled was 120 milliliters per minute. Samples were collected when temperature and conductivity stabilized. Sampling was conducted on 8, 9, and 12 February as well as 6, 7, and 11 June 2007. The analytical schedule is shown on Table 1.

6. ANALYSIS

The observations made at the time of sampling are shown in Table 2 and 3. Detected analytes are noted in Table 3 and 4. The associated laboratory reports are attached as an appendix. Prior reports compared observed values to concentrations presented in the New Mexico Solid Waste Regulations (20.9.1.1100 A. Table 1 NMAC). The NMED Solid Waste Bureau has updated 20.9.9 NMAC as of 2 August 2007, which included a repeal of 20.9.1. This updated code contains reference to constituents and parameters (20.9.9.20 NMAC) which are to be evaluated, but at the time of this report's preparation no new standards or practical quantitation limits (PQLs) were available. Thus, WSMR refers to the most recent standards, PQLs, and assessment monitoring levels (AMLs) agreed to by WSMR and NMED HWB. Concentrations above those standards are **bolded.** The data shown are consistent with previous events.

TABLE 1: MAIN POST LANDFILL ANALYTICAL SCHEDULE

Parameter		Reference Method	Method Type
Field Parameters			
pH		SM 4500-H^+ B	Field / Probe
Conductivity		SM 2510 B	
Turbidity		SM 2130 B	
Dissolved Oxygen		SM 4500-O G	
Temperature		SM 2550 B	
Oxidation/Reduction Potential		SM 2580 B	
Total Metals			
Aluminum Arsenic Barium Boron Cadmium Chromium Cobalt Copper Iron Lead	Magnesium Manganese Molybdenum Nickel Potassium Selenium Silver Sodium Uranium Zinc	SW846 6010A	Inductively Coupled Plasma Emission Spectroscopy

TABLE 2: PARAMETERS AT THE TIME OF SAMPLING – FEBRUARY 2007

Field Sample ID	Date Collected	Well Name	Depth to Water (ft bgs)	Well Elevation (ft MSL)	Water Table Elevation (ft MSL)	Temperature °C	Conductivity (µmho/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Turbidity (NTU)
MNPL-MPL-MPL-001-0207	02/08/07	MPL01	202.53	4012.56	3810.03	25.42	0.396	4.94	7.68	170.8	9.79
MNPL-MPL-MPL-002-0207	02/09/07	MPL02	195.96	4004.55	3808.59	20.56	0.539	5.29	7.33	235.2	2.24
MNPL-MPL-MPL-003-0207	02/12/07	MPL03	189.90	3997.75	3807.85	21.29	0.677	4.95	7.34	237.7	5.72
MNPL-MPL-MPL-004-0207	02/12/07	MPL04	185.69	3993.50	3807.81	20.56	0.777	5.32	7.21	248.7	4.00

TABLE 3: PARAMETERS AT THE TIME OF SAMPLING – JUNE 2007

Field Sample ID	Date Collected	Well Name	Depth to Water (ft bgs)	Well Elevation (ft MSL)	Water Table Elevation (ft MSL)	Temperature °C	Conductivity (µmho/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Turbidity (NTU)
MNPL-MPL-MPL-001-0607	06/06/07	MPL01	202.37	4012.56	3810.19	25.25	0.375	5.34	7.56	117.9	1.61
MNPL-MPL-MPL-002-0607	06/07/07	MPL02	187.81	4004.55	***3816.74***	23.20	0.512	5.05	7.13	206.1	3.07
MNPL-MPL-MPL-003-0607	06/07/07	MPL03	189.75	3997.75	3808.00	23.27	0.640	4.95	7.18	217.0	2.11
MNPL-MPL-MPL-004-0607	06/11/07	MPL04	185.51	3993.50	3807.99	23.74	0.738	5.16	6.99	221.6	3.39

The water table measurement from June 2007 at MPL-02 is outside of the normal range. This is apparently a measurement error. This error does not materially affect the sampling conducted in June. All other parameters are within the expected ranges. Care will be taken during the next sampling event to determine the accurate measurement of MPL-02.

TABLE 4: ANALYTES DETECTED (FEBRUARY 2007)

Field Sample ID	Well Name	Date Collected	Analyte Name	Detection Limit	Reporting Limit	Result	Standard*
MNPL-MPL-MPL-001-0207	MPL01	2/08/2007	Total Aluminum	0.00228	0.00500	0.693	5.0 List C PQL = 3.0
MNPL-MPL-MPL-002-0207	MPL02	2/09/2007		0.00228	0.00500	0.063	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.00228	0.00500	0.080	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.00228	0.00500	0.103	
MNPL-MPL-MPL-001-0207	MPL01	2/08/2007	Total Barium	0.0017	0.0100	0.1180	1.0 PQL = 0.02
MNPL-MPL-MPL-002-0207	MPL02	2/09/2007		0.0017	0.0100	0.0770	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.0017	0.0100	0.0550	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.0017	0.0100	0.0700	
MNPL-MPL-MPL-001-0207	MPL01	2/08/2007	Total Boron	0.0044	0.00500	0.0250	0.75 List C PQL = 0.5
MNPL-MPL-MPL-002-0207	MPL02	2/09/2007		0.0044	0.00500	0.0290	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.0044	0.00500	0.0305	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.0044	0.00500	0.0420	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Calcium	0.517	1.00	49.4	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.517	1.00	70.5	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.517	1.00	89.4	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.517	1.00	109.0	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Chromium	0.0009	0.00500	0.0160	0.05 PQL = 0.01
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.0009	0.00500	0.0120	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.0009	0.00500	0.0085	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.0009	0.00500	0.0050	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Iron	0.0069	0.0100	***0.660***	1.0 List B PQL = 0.1
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.0069	0.0100	0.239	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.0069	0.0100	0.2535	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.0069	0.0100	0.281	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Magnesium	0.203	1.00	8.34	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.203	1.00	12.1	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.203	1.00	15.55	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.203	1.00	19.2	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Potassium	0.866	1.00	3.14	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.866	1.00	3.59	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.866	1.00	4.15	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.866	1.00	4.58	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Sodium	0.668	1.00	26.3	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.668	1.00	32.1	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.668	1.00	36.05	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.668	1.00	36.5	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Vanadium	0.0015	0.00500	0.00600	None given PQL = 0.08
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.0015	0.00500	<0.00500	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.0015	0.00500	<0.00500	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.0015	0.00500	<0.00500	
MNPL-MPL-MPL-001-0207	MPL01	2/8/2007	Total Zinc	0.0071	0.00500	0.0110	10.0 List B PQL = 0.05
MNPL-MPL-MPL-002-0207	MPL02	2/9/2007		0.0071	0.00500	0.0200	
MNPL-MPL-MPL-003-0207*	MPL03	2/12/2007		0.0071	0.00500	0.0050	
MNPL-MPL-MPL-004-0207	MPL04	2/12/2007		0.0071	0.00500	0.0120	

Notes: Analytical values and standards given in milligrams per liter (mg/L).
* Analytical results from MPL03 are a mean of duplicate analyses.
** Standards are as noted in NMAC 20.6.2.3103. Unless otherwise noted, standards are from List A "Human Health Standards." List B includes "Other Standards for Domestic Water Supply" and List C includes "Standards for Irrigation Use." Practical quantitation limits (PQL) noted are from NMAC 20.9.1.1100 Table A.

The Standards noted in Tables 5 and 6 have been updated based on the most recent (August 2007) publication of NMAC 20.9. Previous reports had relied on the Standards in NMAC 20.9.1.1100 Table A. This table is no longer included in NMAC 20.9. The solid waste regulations (NMAC 20.9) now reference NMAC 20.6.2.3103 and other sources for groundwater protection standards. Since WSMR is a RCRA regulated facility and NMED-HWB relies on the standards noted in NMAC 20.6.2.3103, those standards are now relied on for comparison to analytical detections from 2007 sampling events at MPL.

TABLE 5: ANALYTES DETECTED (JUNE 2007)

Field Sample ID	Well Name	Date Collected	Analyte Name	Detection Limit	Reporting Limit	Result	Standard*
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Aluminum	0.00228	0.00500	0.120	5.0 List C PQL = 3.0
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.00228	0.00500	0.0710	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.00228	0.00500	0.0965	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.00228	0.00500	0.137	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Barium	0.0017	0.0100	0.1180	1.0 PQL = 0.02
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.0017	0.0100	0.0780	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.0017	0.0100	0.0570	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.0017	0.0100	0.0760	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Boron	0.0044	0.00500	0.0310	0.75 List C PQL = 0.5
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.0044	0.00500	0.0240	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.0044	0.00500	0.0425	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.0044	0.00500	0.0440	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Calcium	0.517	1.00	50	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.517	1.00	69.6	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.517	1.00	87.05	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.517	1.00	98.2	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Chromium	0.0009	0.00500	0.0170	0.05 PQL = 0.01
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.0009	0.00500	0.0150	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.0009	0.00500	0.0135	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.0009	0.00500	0.0140	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Iron	0.0069	0.0100	0.204	1.0 List B PQL = 0.1
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.0069	0.0100	0.248	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.0069	0.0100	0.266	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.0069	0.0100	0.321	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Magnesium	0.203	1.00	8.24	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.203	1.00	12.0	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.203	1.00	15.05	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.203	1.00	18.2	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Potassium	0.866	1.00	3.03	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.866	1.00	3.37	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.866	1.00	3.855	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.866	1.00	4.00	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Sodium	0.668	1.00	26.5	None given PQL = 1
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.668	1.00	31.6	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.668	1.00	35.25	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.668	1.00	34.9	
MNPL-MPL-MPL-001-0207	MPL01	6/6/2007	Total Vanadium	0.0015	0.00500	0.00600	None given PQL = 0.08
MNPL-MPL-MPL-002-0207	MPL02	6/7/2007		0.0015	0.00500	<0.00500	
MNPL-MPL-MPL-003-0207*	MPL03	6/7/2007		0.0015	0.00500	<0.00500	
MNPL-MPL-MPL-004-0207	MPL04	6/11/2007		0.0015	0.00500	<0.00500	

Notes: Analytical values and standards given in milligrams per liter (mg/L).
* Analytical results from MPL03 are a mean of duplicate analyses.
** Standards are as noted in NMAC 20.6.2.3103. Unless otherwise noted, standards are from List A "Human Health Standards." List B includes "Other Standards for Domestic Water Supply" and List C includes "Standards for Irrigation Use." Practical quantitation limits (PQL) noted are from NMAC 20.9.1.1100 Table A.

7. CONCLUSIONS

None of the detected analytes exceeded their respective groundwater protection standards. Detections were in the range of prior sampling events. The total iron sample (0.660 milligrams per liter) from MPL-01 did exceed 50 percent of the groundwater protection standard (1.0 milligrams per liter) in the February 2007 sampling. High iron detections are typical. This constituent has previously been shown to be naturally occurring.

8. RECOMMENDATIONS

Semi-annual groundwater monitoring is recommended to continue as planned. Additional care will be taken during water level measurements to maintain accuracy. This report will be incorporated in the NMED 2007 Annual Solid Waste Questionnaire scheduled for submittal in early 2008.

9. WTS TASK MANAGER AND TASK COORDINATOR / PHONE NO.:

Task Manager: Fred Bourger, Phone (575) 678-3426
Task Coordinator: James J. Thompson, P.E., Phone (575) 678-1941

APPENDIX
Analytical Data

Analytical and Quality Control Report

William Little
WTS
P.O. Box 363
Building 126 3RD Floor
WSMR, NM, 88002

Report Date: June 29, 2007

Work Order: 7061301

Project Name: Main Post Landfill Well MPL-01-TO MPL-04
Project Number: 15

Enclosed are the Analytical Report and Quality Control Report for the following sample(s) submitted to TraceAnalysis, Inc.

Sample	Description	Matrix	Date Taken	Time Taken	Date Received
127179	MNPL-MPL-MPL-103-0207	water	2007-02-12	10:07	2007-06-11
127184	MNPL-MPL-MPL-003-0207	water	2007-02-12	10:07	2007-06-11
127185	MNPL-MPL-MPL-002-0207	water	2007-02-09	10:45	2007-06-11
127186	MNPL-MPL-MPL-001-0207	water	2007-02-08	14:55	2007-06-11
127187	MNPL-MPL-MPL-001-0607	water	2007-06-06	13:50	2007-06-04
127188	MNPL-MPL-MPL-002-0607	water	2007-06-07	10:15	2007-06-04
127189	MNPL-MPL-MPL-003-0607	water	2007-06-07	13:31	2007-06-04
127190	MNPL-MPL-MPL-103-0607	water	2007-06-07	13:31	2007-06-04
127191	MNPL-MPL-MPL-004-0607	water	2007-06-11	10:21	2007-06-04
127196	MNPL-MPL-MPL-004-0207	water	2007-02-12	14:15	2007-06-11

These results represent only the samples received in the laboratory. The Quality Control Report is generated on a batch basis. All information contained in this report is for the analytical batch(es) in which your sample(s) were analyzed.

This report consists of a total of 26 pages and shall not be reproduced except in its entirety, without written approval of TraceAnalysis, Inc.

Dr. Blair Leftwich, Director

Standard Flags

B - The sample contains less than ten times the concentration found in the method blank.

Case Narrative

Samples for project Main Post Landfill Well MPL-01-TO MPL-04, Main Post Landfill Well MPL-01-TO MPL-04, Main Post Landfill Well MPL-01-TO MPL-04, Main Post Landfill Well MPL-01-TO MPL-04, MPL Total Metals and Main Post Landfill Well MPL-01-TO MPL-04 were received by TraceAnalysis, Inc. on 2007-06-11, 2007-06-11, 2007-06-11, 2007-06-11, 2007-06-04 and 2007-06-11 and assigned to work orders 7061301, 7061303, 7061304, 7061305, 7061306 and 7061309 respecively. Samples for work order 7061301 were received intact at a temperature of 4.0 deg.C.Samples for work order 7061303 were received intact at a temperature of 4.0 deg.C.Samples for work order 7061304 were received intact at a temperature of 4.0 deg.C.Samples for work order 7061305 were received intact at a temperature of 4.0 deg.C.Samples for work order 7061306 were received intact at a temperature of 4.0 deg.C.Samples for work order 7061309 were received intact at a temperature of 4.0 deg.C.

Samples were analyzed for the following tests using their respective methods.

Results for these samples are reported on a wet weight basis unless data package indicates otherwise.

A matrix spike (MS) and matrix spike duplicate (MSD) sample is chosen at random from each preparation batch. The MS and MSD will indicate if a site specific matrix problem is occurring, however, it may not pertain to the samples for work orders 7061301, 7061303, 7061304, 7061305, 7061306 and 7061309 since the sample was chosen at random. Therefore, the validity of the analytical data reported has been determined by the laboratory control sample (LCS) and the method blank (MB). These quality control measures are performed with each preparation batch to ensure data integrity.

All other exceptions associated with this report have been footnoted on the appropriate analytical page to assist in general data comprehension. Please contact the laboratory directly if there are any questions regarding this project.

Analytical Report

Sample: 127179 - MNPL-MPL-MPL-103-0207

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**90.6**	mg/L	1	1.00
Total Magnesium		**16.1**	mg/L	1	1.00
Total Potassium		**4.09**	mg/L	1	1.00
Total Sodium		**37.1**	mg/L	1	1.00

Sample: 127179 - MNPL-MPL-MPL-103-0207

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.0720**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0450**	mg/L	1	0.00500
Total Barium		**0.0550**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0120**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.246**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Uranium		<0.0200	mg/L	1	0.0200
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		<0.00500	mg/L	1	0.00500

Sample: 127184 - MNPL-MPL-MPL-003-0207

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38634	Date Analyzed:	2007-06-28	Analyzed By:	TP
Prep Batch:	33401	Sample Preparation:	2007-06-28	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**88.2**	mg/L	1	1.00
Total Magnesium		**15.0**	mg/L	1	1.00
Total Potassium		**4.20**	mg/L	1	1.00
Total Sodium		**35.0**	mg/L	1	1.00

Sample: 127184 - MNPL-MPL-MPL-003-0207

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38621	Date Analyzed:	2007-06-28	Analyzed By:	RR
Prep Batch:	33401	Sample Preparation:	2007-06-28	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.0880**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0160**	mg/L	1	0.00500
Total Barium		**0.0550**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		<0.00500	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.261**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		<0.00500	mg/L	1	0.00500

Sample: 127184 - MNPL-MPL-MPL-003-0207

Analysis:	U, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38621	Date Analyzed:	2007-06-28	Analyzed By:	RR
Prep Batch:	33401	Sample Preparation:	2007-06-28	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Uranium		<0.0200	mg/L	1	0.0200

Sample: 127185 - MNPL-MPL-MPL-002-0207

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**70.5**	mg/L	1	1.00
Total Magnesium		**12.1**	mg/L	1	1.00
Total Potassium		**3.59**	mg/L	1	1.00
Total Sodium		**32.1**	mg/L	1	1.00

Sample: 127185 - MNPL-MPL-MPL-002-0207

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.0630**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0290**	mg/L	1	0.00500
Total Barium		**0.0770**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0120**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.239**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		**0.0200**	mg/L	1	0.00500

Sample: 127185 - MNPL-MPL-MPL-002-0207

Analysis:	U, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Uranium		<0.0200	mg/L	1	0.0200

Sample: 127186 - MNPL-MPL-MPL-001-0207

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**49.4**	mg/L	1	1.00
Total Magnesium		**8.34**	mg/L	1	1.00
Total Potassium		**3.14**	mg/L	1	1.00
Total Sodium		**26.3**	mg/L	1	1.00

Sample: 127186 - MNPL-MPL-MPL-001-0207

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.693**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0250**	mg/L	1	0.00500
Total Barium		**0.118**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0160**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.660**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Uranium		<0.0200	mg/L	1	0.0200
Total Vanadium		**0.00600**	mg/L	1	0.00500
Total Zinc		**0.0110**	mg/L	1	0.00500

Sample: 127187 - MNPL-MPL-MPL-001-0607

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

continued . . .

sample 127187 continued . . .

Parameter	Flag	RL Result	Units	Dilution	RL

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**50.0**	mg/L	1	1.00
Total Magnesium		**8.24**	mg/L	1	1.00
Total Potassium		**3.03**	mg/L	1	1.00
Total Sodium		**26.5**	mg/L	1	1.00

Sample: 127187 - MNPL-MPL-MPL-001-0607

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.120**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0310**	mg/L	1	0.00500
Total Barium		**0.118**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0170**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.204**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Uranium		<0.0200	mg/L	1	0.0200
Total Vanadium		**0.00600**	mg/L	1	0.00500
Total Zinc		<0.00500	mg/L	1	0.00500

Sample: 127188 - MNPL-MPL-MPL-002-0607

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**69.6**	mg/L	1	1.00

continued . . .

sample 127188 continued . . .

Parameter	Flag	RL Result	Units	Dilution	RL
Total Magnesium		**12.0**	mg/L	1	1.00
Total Potassium		**3.37**	mg/L	1	1.00
Total Sodium		**31.6**	mg/L	1	1.00

Sample: 127188 - MNPL-MPL-MPL-002-0607

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.0710**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0240**	mg/L	1	0.00500
Total Barium		**0.0780**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0150**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.248**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Uranium		<0.0200	mg/L	1	0.0200
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		<0.00500	mg/L	1	0.00500

Sample: 127189 - MNPL-MPL-MPL-003-0607

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**87.2**	mg/L	1	1.00
Total Magnesium		**14.9**	mg/L	1	1.00
Total Potassium		**3.88**	mg/L	1	1.00
Total Sodium		**35.5**	mg/L	1	1.00

Sample: 127189 - MNPL-MPL-MPL-003-0607

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.0300**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0420**	mg/L	1	0.00500
Total Barium		**0.0560**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0140**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.206**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Uranium		<0.0200	mg/L	1	0.0200
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		<0.00500	mg/L	1	0.00500

Sample: 127190 - MNPL-MPL-MPL-103-0607

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**86.9**	mg/L	1	1.00
Total Magnesium		**15.2**	mg/L	1	1.00
Total Potassium		**3.83**	mg/L	1	1.00
Total Sodium		**35.0**	mg/L	1	1.00

Sample: 127190 - MNPL-MPL-MPL-103-0607

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

continued . . .

sample 127190 continued . . .

Parameter	Flag	RL Result	Units	Dilution	RL

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.163**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0430**	mg/L	1	0.00500
Total Barium		**0.0580**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0130**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.326**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Uranium		<0.0200	mg/L	1	0.0200
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		<0.00500	mg/L	1	0.00500

Sample: 127191 - MNPL-MPL-MPL-004-0607

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**98.2**	mg/L	2	1.00
Total Magnesium		**18.2**	mg/L	1	1.00
Total Potassium		**4.00**	mg/L	1	1.00
Total Sodium		**34.9**	mg/L	1	1.00

Sample: 127191 - MNPL-MPL-MPL-004-0607

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200

continued . . .

sample 127191 continued . . .

Parameter	Flag	RL Result	Units	Dilution	RL
Total Aluminum		**0.137**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0440**	mg/L	1	0.00500
Total Barium		**0.0760**	mg/L	1	0.0100
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		**0.0140**	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.321**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Uranium		<0.0200	mg/L	1	0.0200
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		<0.00500	mg/L	1	0.00500

Sample: 127196 - MNPL-MPL-MPL-004-0207

Analysis:	Salts, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Calcium		**109**	mg/L	10	1.00
Total Magnesium		**19.2**	mg/L	1	1.00
Total Potassium		**4.58**	mg/L	1	1.00
Total Sodium		**36.5**	mg/L	1	1.00

Sample: 127196 - MNPL-MPL-MPL-004-0207

Analysis:	Total Metals	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Silver		<0.00200	mg/L	1	0.00200
Total Aluminum		**0.103**	mg/L	1	0.00500
Total Arsenic		<0.0100	mg/L	1	0.0100
Total Boron		**0.0420**	mg/L	1	0.00500
Total Barium		**0.0700**	mg/L	1	0.0100

continued . . .

sample 127196 continued . . .

Parameter	Flag	RL Result	Units	Dilution	RL
Total Beryllium		<0.00250	mg/L	1	0.00250
Total Cadmium		<0.00100	mg/L	1	0.00100
Total Cobalt		<0.00500	mg/L	1	0.00500
Total Chromium		<0.00500	mg/L	1	0.00500
Total Copper		<0.00500	mg/L	1	0.00500
Total Iron		**0.281**	mg/L	1	0.0100
Total Manganese		<0.0250	mg/L	1	0.0250
Total Molybdenum		<0.0500	mg/L	1	0.0500
Total Nickel		<0.00500	mg/L	1	0.00500
Total Lead		<0.00500	mg/L	1	0.00500
Total Antimony		<0.0500	mg/L	1	0.0500
Total Selenium		<0.0100	mg/L	1	0.0100
Total Thallium		<0.0500	mg/L	1	0.0500
Total Vanadium		<0.00500	mg/L	1	0.00500
Total Zinc		**0.0120**	mg/L	1	0.00500

Sample: 127196 - MNPL-MPL-MPL-004-0207

Analysis:	U, Total	Analytical Method:	S 6010B	Prep Method:	S 3010A
QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	Sample Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	RL Result	Units	Dilution	RL
Total Uranium		<0.0200	mg/L	1	0.0200

Method Blank (1) QC Batch: 38315

QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	QC Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	MDL Result	Units	RL
Total Uranium		<0.0545	mg/L	0.02

Method Blank (1) QC Batch: 38315

QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	QC Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	MDL Result	Units	RL
Total Silver		<0.00210	mg/L	0.002

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method blank continued . . .

Parameter	Flag	MDL Result	Units	RL
Total Aluminum		<0.00228	mg/L	0.005
Total Arsenic		<0.00430	mg/L	0.01
Total Boron		<0.00440	mg/L	0.005
Total Barium		<0.00170	mg/L	0.01
Total Beryllium		<0.00220	mg/L	0.0025
Total Cadmium		<0.00140	mg/L	0.001
Total Cobalt		<0.00220	mg/L	0.005
Total Chromium		<0.000900	mg/L	0.005
Total Copper		<0.00140	mg/L	0.005
Total Iron		<0.00690	mg/L	0.01
Total Manganese		<0.000600	mg/L	0.025
Total Molybdenum		<0.00790	mg/L	0.05
Total Nickel		<0.00190	mg/L	0.005
Total Lead		<0.00740	mg/L	0.005
Total Antimony		<0.0166	mg/L	0.05
Total Selenium		<0.0131	mg/L	0.01
Total Thallium		<0.0189	mg/L	0.05
Total Uranium		<0.0545	mg/L	0.02
Total Vanadium		<0.00150	mg/L	0.005
Total Zinc		<0.00710	mg/L	0.005

Method Blank (1) QC Batch: 38431

QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	QC Preparation:	2007-06-19	Prepared By:	TS

Parameter	Flag	MDL Result	Units	RL
Total Calcium		<0.517	mg/L	1
Total Magnesium		<0.203	mg/L	1
Total Potassium		<0.866	mg/L	1
Total Sodium		<0.668	mg/L	1

Method Blank (1) QC Batch: 38621

QC Batch:	38621	Date Analyzed:	2007-06-28	Analyzed By:	RR
Prep Batch:	33401	QC Preparation:	2007-06-28	Prepared By:	TS

Parameter	Flag	MDL Result	Units	RL
Total Uranium		<0.0545	mg/L	0.02

Method Blank (1) QC Batch: 38621

QC Batch:	38621	Date Analyzed:	2007-06-28	Analyzed By:	RR
Prep Batch:	33401	QC Preparation:	2007-06-28	Prepared By:	TS

Parameter	Flag	MDL Result	Units	RL
Total Silver		<0.00210	mg/L	0.002
Total Aluminum		<0.00228	mg/L	0.005
Total Arsenic		<0.00430	mg/L	0.01
Total Boron		<0.00440	mg/L	0.005
Total Barium		<0.00170	mg/L	0.01
Total Beryllium		<0.00220	mg/L	0.0025
Total Cadmium		<0.00140	mg/L	0.001
Total Cobalt		<0.00220	mg/L	0.005
Total Chromium		<0.000900	mg/L	0.005
Total Copper		<0.00140	mg/L	0.005
Total Iron		<0.00690	mg/L	0.01
Total Manganese		<0.000600	mg/L	0.025
Total Molybdenum		<0.00790	mg/L	0.05
Total Nickel		<0.00190	mg/L	0.005
Total Lead		<0.00740	mg/L	0.005
Total Antimony		<0.0166	mg/L	0.05
Total Selenium		<0.0131	mg/L	0.01
Total Thallium		<0.0189	mg/L	0.05
Total Vanadium		<0.00150	mg/L	0.005
Total Zinc		<0.00710	mg/L	0.005

Method Blank (1) QC Batch: 38634

QC Batch:	38634	Date Analyzed:	2007-06-28	Analyzed By:	TP
Prep Batch:	33401	QC Preparation:	2007-06-28	Prepared By:	TS

Parameter	Flag	MDL Result	Units	RL
Total Calcium		<0.517	mg/L	1
Total Magnesium		<0.203	mg/L	1
Total Potassium		1.28	mg/L	1
Total Sodium		<0.668	mg/L	1

Laboratory Control Spike (LCS-1)

QC Batch:	38315	Date Analyzed:	2007-06-19	Analyzed By:	RR
Prep Batch:	33164	QC Preparation:	2007-06-19	Prepared By:	TS

Param	LCS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Uranium	0.487	mg/L	1	0.500	<0.0545	97	85 - 115

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	LCSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Uranium	0.486	mg/L	1	0.500	<0.0545	97	85 - 115	0	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Laboratory Control Spike (LCS-1)

QC Batch: 38315 Date Analyzed: 2007-06-19 Analyzed By: RR
Prep Batch: 33164 QC Preparation: 2007-06-19 Prepared By: TS

Param	LCS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Silver	0.127	mg/L	1	0.125	<0.00210	102	87.2 - 108
Total Aluminum	0.965	mg/L	1	1.00	<0.00228	96	76.4 - 107
Total Arsenic	0.509	mg/L	1	0.500	<0.00430	102	81.9 - 110
Total Boron	0.0545	mg/L	1	0.0500	<0.00440	109	75.7 - 124
Total Barium	1.02	mg/L	1	1.00	<0.00170	102	88.7 - 111
Total Beryllium	0.0232	mg/L	1	0.0250	<0.00220	93	78.1 - 117
Total Cadmium	0.256	mg/L	1	0.250	<0.00140	102	83.4 - 111
Total Cobalt	0.243	mg/L	1	0.250	<0.00220	97	91 - 108
Total Chromium	0.104	mg/L	1	0.100	<0.000900	104	86.5 - 115
Total Copper	0.131	mg/L	1	0.125	<0.00140	105	91.2 - 109
Total Iron	0.522	mg/L	1	0.500	<0.00690	104	89.4 - 113
Total Manganese	0.250	mg/L	1	0.250	<0.000600	100	85 - 113
Total Molybdenum	0.546	mg/L	1	0.500	<0.00790	109	80 - 114
Total Nickel	0.254	mg/L	1	0.250	<0.00190	102	86.1 - 111
Total Lead	0.518	mg/L	1	0.500	<0.00740	104	88 - 108
Total Antimony	0.227	mg/L	1	0.250	<0.0166	91	79.4 - 114
Total Selenium	0.425	mg/L	1	0.500	<0.0131	85	70.2 - 111
Total Thallium	0.468	mg/L	1	0.500	<0.0189	94	81.8 - 115
Total Uranium	0.487	mg/L	1	0.500	<0.0545	97	85 - 115
Total Vanadium	0.265	mg/L	1	0.250	<0.00150	106	85.9 - 110
Total Zinc	0.244	mg/L	1	0.250	<0.00710	98	82.9 - 109

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	LCSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Silver	0.126	mg/L	1	0.125	<0.00210	101	87.2 - 108	1	20
Total Aluminum	0.977	mg/L	1	1.00	<0.00228	98	76.4 - 107	1	20
Total Arsenic	0.493	mg/L	1	0.500	<0.00430	99	81.9 - 110	3	20
Total Boron	0.0524	mg/L	1	0.0500	<0.00440	105	75.7 - 124	4	20
Total Barium	1.02	mg/L	1	1.00	<0.00170	102	88.7 - 111	0	20
Total Beryllium	0.0237	mg/L	1	0.0250	<0.00220	95	78.1 - 117	2	20
Total Cadmium	0.257	mg/L	1	0.250	<0.00140	103	83.4 - 111	0	20
Total Cobalt	0.242	mg/L	1	0.250	<0.00220	97	91 - 108	0	20
Total Chromium	0.105	mg/L	1	0.100	<0.000900	105	86.5 - 115	1	20
Total Copper	0.131	mg/L	1	0.125	<0.00140	105	91.2 - 109	0	20
Total Iron	0.528	mg/L	1	0.500	<0.00690	106	89.4 - 113	1	20
Total Manganese	0.253	mg/L	1	0.250	<0.000600	101	85 - 113	1	20
Total Molybdenum	0.544	mg/L	1	0.500	<0.00790	109	80 - 114	0	20
Total Nickel	0.254	mg/L	1	0.250	<0.00190	102	86.1 - 111	0	20

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control spikes continued . . .

Param	LCSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Lead	0.523	mg/L	1	0.500	<0.00740	105	88 - 108	1	20
Total Antimony	0.237	mg/L	1	0.250	<0.0166	95	79.4 - 114	4	20
Total Selenium	0.424	mg/L	1	0.500	<0.0131	85	70.2 - 111	0	20
Total Thallium	0.468	mg/L	1	0.500	<0.0189	94	81.8 - 115	0	20
Total Uranium	0.486	mg/L	1	0.500	<0.0545	97	85 - 115	0	20
Total Vanadium	0.267	mg/L	1	0.250	<0.00150	107	85.9 - 110	1	20
Total Zinc	0.248	mg/L	1	0.250	<0.00710	99	82.9 - 109	2	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Laboratory Control Spike (LCS-1)

QC Batch: 38431 Date Analyzed: 2007-06-22 Analyzed By: TP
Prep Batch: 33164 QC Preparation: 2007-06-19 Prepared By: TS

Param	LCS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Calcium	51.2	mg/L	1	50.0	<0.517	102	85 - 115
Total Magnesium	50.1	mg/L	1	50.0	<0.203	100	85 - 115
Total Potassium	50.6	mg/L	1	50.0	<0.866	101	85 - 115
Total Sodium	51.6	mg/L	1	50.0	<0.668	103	87.3 - 124

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	LCSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Calcium	51.4	mg/L	1	50.0	<0.517	103	85 - 115	0	20
Total Magnesium	50.3	mg/L	1	50.0	<0.203	101	85 - 115	0	20
Total Potassium	50.8	mg/L	1	50.0	<0.866	102	85 - 115	0	20
Total Sodium	51.3	mg/L	1	50.0	<0.668	103	87.3 - 124	1	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Laboratory Control Spike (LCS-1)

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR
Prep Batch: 33401 QC Preparation: 2007-06-28 Prepared By: TS

Param	LCS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Uranium	0.553	mg/L	1	0.500	<0.0545	111	85 - 115

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	LCSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Uranium	0.558	mg/L	1	0.500	<0.0545	112	85 - 115	1	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Laboratory Control Spike (LCS-1)

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR
Prep Batch: 33401 QC Preparation: 2007-06-28 Prepared By: TS

Param	LCS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Silver	0.126	mg/L	1	0.125	<0.00210	101	87.2 - 108
Total Aluminum	0.966	mg/L	1	1.00	<0.00228	97	76.4 - 107
Total Arsenic	0.509	mg/L	1	0.500	<0.00430	102	81.9 - 110
Total Boron	0.0470	mg/L	1	0.0500	<0.00440	94	75.7 - 124
Total Barium	1.02	mg/L	1	1.00	<0.00170	102	88.7 - 111
Total Beryllium	0.0260	mg/L	1	0.0250	<0.00220	104	78.1 - 117
Total Cadmium	0.248	mg/L	1	0.250	<0.00140	99	83.4 - 111
Total Cobalt	0.252	mg/L	1	0.250	<0.00220	101	91 - 108
Total Chromium	0.107	mg/L	1	0.100	<0.000900	107	86.5 - 115
Total Copper	0.131	mg/L	1	0.125	<0.00140	105	91.2 - 109
Total Iron	0.513	mg/L	1	0.500	<0.00690	103	89.4 - 113
Total Manganese	0.258	mg/L	1	0.250	<0.000600	103	85 - 113
Total Molybdenum	0.507	mg/L	1	0.500	<0.00790	101	80 - 114
Total Nickel	0.261	mg/L	1	0.250	<0.00190	104	86.1 - 111
Total Lead	0.503	mg/L	1	0.500	<0.00740	101	88 - 108
Total Antimony	0.225	mg/L	1	0.250	<0.0166	90	79.4 - 114
Total Selenium	0.484	mg/L	1	0.500	<0.0131	97	70.2 - 111
Total Thallium	0.467	mg/L	1	0.500	<0.0189	93	81.8 - 115
Total Vanadium	0.260	mg/L	1	0.250	<0.00150	104	85.9 - 110
Total Zinc	0.253	mg/L	1	0.250	<0.00710	101	82.9 - 109

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	LCSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Silver	0.126	mg/L	1	0.125	<0.00210	101	87.2 - 108	0	20
Total Aluminum	0.953	mg/L	1	1.00	<0.00228	95	76.4 - 107	1	20
Total Arsenic	0.475	mg/L	1	0.500	<0.00430	95	81.9 - 110	7	20
Total Boron	0.0480	mg/L	1	0.0500	<0.00440	96	75.7 - 124	2	20
Total Barium	1.03	mg/L	1	1.00	<0.00170	103	88.7 - 111	1	20
Total Beryllium	0.0260	mg/L	1	0.0250	<0.00220	104	78.1 - 117	0	20
Total Cadmium	0.246	mg/L	1	0.250	<0.00140	98	83.4 - 111	1	20
Total Cobalt	0.251	mg/L	1	0.250	<0.00220	100	91 - 108	0	20
Total Chromium	0.106	mg/L	1	0.100	<0.000900	106	86.5 - 115	1	20
Total Copper	0.132	mg/L	1	0.125	<0.00140	106	91.2 - 109	1	20
Total Iron	0.512	mg/L	1	0.500	<0.00690	102	89.4 - 113	0	20
Total Manganese	0.256	mg/L	1	0.250	<0.000600	102	85 - 113	1	20
Total Molybdenum	0.512	mg/L	1	0.500	<0.00790	102	80 - 114	1	20
Total Nickel	0.258	mg/L	1	0.250	<0.00190	103	86.1 - 111	1	20
Total Lead	0.511	mg/L	1	0.500	<0.00740	102	88 - 108	2	20
Total Antimony	0.226	mg/L	1	0.250	<0.0166	90	79.4 - 114	0	20
Total Selenium	0.466	mg/L	1	0.500	<0.0131	93	70.2 - 111	4	20
Total Thallium	0.523	mg/L	1	0.500	<0.0189	105	81.8 - 115	11	20
Total Vanadium	0.261	mg/L	1	0.250	<0.00150	104	85.9 - 110	0	20
Total Zinc	0.260	mg/L	1	0.250	<0.00710	104	82.9 - 109	3	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Laboratory Control Spike (LCS-1)

QC Batch: 38634 Date Analyzed: 2007-06-28 Analyzed By: TP
Prep Batch: 33401 QC Preparation: 2007-06-28 Prepared By: TS

Param	LCS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Calcium	50.3	mg/L	1	50.0	<0.517	101	85 - 115
Total Magnesium	49.2	mg/L	1	50.0	<0.203	98	85 - 115
Total Potassium	48.5	mg/L	1	50.0	<0.866	97	85 - 115
Total Sodium	50.1	mg/L	1	50.0	<0.668	100	87.3 - 124

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	LCSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Calcium	47.8	mg/L	1	50.0	<0.517	96	85 - 115	5	20
Total Magnesium	46.6	mg/L	1	50.0	<0.203	93	85 - 115	5	20
Total Potassium	45.9	mg/L	1	50.0	<0.866	92	85 - 115	6	20
Total Sodium	47.7	mg/L	1	50.0	<0.668	95	87.3 - 124	5	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Matrix Spike (MS-1) Spiked Sample: 127196

QC Batch: 38315 Date Analyzed: 2007-06-19 Analyzed By: RR
Prep Batch: 33164 QC Preparation: 2007-06-19 Prepared By: TS

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Uranium	0.463	mg/L	1	0.500	<0.0545	93	75 - 125

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	MSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Uranium	0.453	mg/L	1	0.500	<0.0545	91	75 - 125	2	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Matrix Spike (MS-1) Spiked Sample: 127196

QC Batch: 38315 Date Analyzed: 2007-06-19 Analyzed By: RR
Prep Batch: 33164 QC Preparation: 2007-06-19 Prepared By: TS

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Silver	0.124	mg/L	1	0.125	<0.00210	99	80.5 - 104
Total Aluminum	1.01	mg/L	1	1.00	0.103	91	62.2 - 133
Total Arsenic	0.558	mg/L	1	0.500	<0.00440	112	67.6 - 116
Total Boron	0.0950	mg/L	1	0.0500	0.042	106	10 - 168
Total Barium	1.06	mg/L	1	1.00	0.07	99	61.9 - 120
Total Beryllium	0.0260	mg/L	1	0.0250	<0.00220	104	76.5 - 118

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matrix spikes continued . . .

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Cadmium	0.249	mg/L	1	0.250	<0.00140	100	72.9 - 109
Total Cobalt	0.232	mg/L	1	0.250	<0.00220	93	71 - 112
Total Chromium	0.108	mg/L	1	0.100	<0.000900	108	66.2 - 121
Total Copper	0.128	mg/L	1	0.125	<0.00140	102	84.1 - 108
Total Iron	0.787	mg/L	1	0.500	0.281	101	61 - 122
Total Manganese	0.240	mg/L	1	0.250	<0.000600	96	61.2 - 120
Total Molybdenum	0.550	mg/L	1	0.500	<0.00790	110	60.1 - 125
Total Nickel	0.245	mg/L	1	0.250	<0.00190	98	56.1 - 119
Total Lead	0.512	mg/L	1	0.500	<0.00740	102	74.1 - 111
Total Antimony	0.242	mg/L	1	0.250	<0.0166	97	71.3 - 118
Total Selenium	0.458	mg/L	1	0.500	<0.0131	92	64.3 - 111
Total Thallium	0.459	mg/L	1	0.500	<0.0189	92	66 - 121
Total Uranium	0.463	mg/L	1	0.500	<0.0545	93	75 - 125
Total Vanadium	0.261	mg/L	1	0.250	<0.00150	104	74.1 - 110
Total Zinc	0.258	mg/L	1	0.250	0.012	98	75.5 - 113

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	MSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Silver	0.125	mg/L	1	0.125	<0.00210	100	80.5 - 104	1	20
Total Aluminum	1.03	mg/L	1	1.00	0.103	93	62.2 - 133	2	20
Total Arsenic	0.545	mg/L	1	0.500	<0.00440	109	67.6 - 116	2	20
Total Boron	0.100	mg/L	1	0.0500	0.042	116	10 - 168	5	20
Total Barium	1.08	mg/L	1	1.00	0.07	101	61.9 - 120	2	20
Total Beryllium	0.0250	mg/L	1	0.0250	<0.00220	100	76.5 - 118	4	20
Total Cadmium	0.254	mg/L	1	0.250	<0.00140	102	72.9 - 109	2	20
Total Cobalt	0.236	mg/L	1	0.250	<0.00220	94	71 - 112	2	20
Total Chromium	0.104	mg/L	1	0.100	<0.000900	104	66.2 - 121	4	20
Total Copper	0.130	mg/L	1	0.125	<0.00140	104	84.1 - 108	2	20
Total Iron	0.813	mg/L	1	0.500	0.281	106	61 - 122	3	20
Total Manganese	0.245	mg/L	1	0.250	<0.000600	98	61.2 - 120	2	20
Total Molybdenum	0.564	mg/L	1	0.500	<0.00790	113	60.1 - 125	2	20
Total Nickel	0.245	mg/L	1	0.250	<0.00190	98	56.1 - 119	0	20
Total Lead	0.520	mg/L	1	0.500	<0.00740	104	74.1 - 111	2	20
Total Antimony	0.234	mg/L	1	0.250	<0.0166	94	71.3 - 118	3	20
Total Selenium	0.445	mg/L	1	0.500	<0.0131	89	64.3 - 111	3	20
Total Thallium	0.442	mg/L	1	0.500	<0.0189	88	66 - 121	4	20
Total Uranium	0.453	mg/L	1	0.500	<0.0545	91	75 - 125	2	20
Total Vanadium	0.271	mg/L	1	0.250	<0.00150	108	74.1 - 110	4	20
Total Zinc	0.262	mg/L	1	0.250	0.012	100	75.5 - 113	2	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Matrix Spike (MS-1) Spiked Sample: 127196

QC Batch:	38431	Date Analyzed:	2007-06-22	Analyzed By:	TP
Prep Batch:	33164	QC Preparation:	2007-06-19	Prepared By:	TS

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Calcium	162	mg/L	1	50.0	109	106	75 - 125
Total Magnesium	68.3	mg/L	1	50.0	19.2	98	75 - 125
Total Potassium	53.8	mg/L	1	50.0	4.58	98	75 - 125
Total Sodium	87.7	mg/L	1	50.0	36.5	102	75 - 125

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	MSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Calcium	168	mg/L	1	50.0	109	118	75 - 125	4	20
Total Magnesium	70.1	mg/L	1	50.0	19.2	102	75 - 125	3	20
Total Potassium	55.8	mg/L	1	50.0	4.58	102	75 - 125	4	20
Total Sodium	89.9	mg/L	1	50.0	36.5	107	75 - 125	2	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Matrix Spike (MS-1) Spiked Sample: 127184

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR
Prep Batch: 33401 QC Preparation: 2007-06-28 Prepared By: TS

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Uranium	0.521	mg/L	1	0.500	<0.0545	104	75 - 125

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	MSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Uranium	0.499	mg/L	1	0.500	<0.0545	100	75 - 125	4	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Matrix Spike (MS-1) Spiked Sample: 127184

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR
Prep Batch: 33401 QC Preparation: 2007-06-28 Prepared By: TS

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Silver	0.126	mg/L	1	0.125	<0.00210	101	80.5 - 104
Total Aluminum	1.14	mg/L	1	1.00	0.088	105	62.2 - 133
Total Arsenic	0.482	mg/L	1	0.500	<0.00440	96	67.6 - 116
Total Boron	0.0720	mg/L	1	0.0500	0.016	112	10 - 168
Total Barium	1.14	mg/L	1	1.00	0.055	108	61.9 - 120
Total Beryllium	0.0270	mg/L	1	0.0250	<0.00220	108	76.5 - 118
Total Cadmium	0.267	mg/L	1	0.250	<0.00140	107	72.9 - 109
Total Cobalt	0.269	mg/L	1	0.250	<0.00220	108	71 - 112
Total Chromium	0.111	mg/L	1	0.100	<0.000900	111	66.2 - 121
Total Copper	0.132	mg/L	1	0.125	<0.00140	106	84.1 - 108
Total Iron	0.790	mg/L	1	0.500	0.261	106	61 - 122
Total Manganese	0.259	mg/L	1	0.250	<0.000600	104	61.2 - 120

continued . . .

matrix spikes continued . . .

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Molybdenum	0.550	mg/L	1	0.500	<0.00790	110	60.1 - 125
Total Nickel	0.261	mg/L	1	0.250	<0.00190	104	56.1 - 119
Total Lead	0.544	mg/L	1	0.500	<0.00740	109	74.1 - 111
Total Antimony	0.255	mg/L	1	0.250	<0.0166	102	71.3 - 118
Total Selenium	0.450	mg/L	1	0.500	<0.0131	90	64.3 - 111
Total Thallium	0.524	mg/L	1	0.500	<0.0189	105	66 - 121
Total Vanadium	0.247	mg/L	1	0.250	<0.00150	99	74.1 - 110
Total Zinc	0.248	mg/L	1	0.250	<0.00710	99	75.5 - 113

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	MSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Silver	0.125	mg/L	1	0.125	<0.00210	100	80.5 - 104	1	20
Total Aluminum	1.12	mg/L	1	1.00	0.088	103	62.2 - 133	2	20
Total Arsenic	0.501	mg/L	1	0.500	<0.00440	100	67.6 - 116	4	20
Total Boron	0.0610	mg/L	1	0.0500	0.016	90	10 - 168	16	20
Total Barium	1.14	mg/L	1	1.00	0.055	108	61.9 - 120	0	20
Total Beryllium	0.0260	mg/L	1	0.0250	<0.00220	104	76.5 - 118	4	20
Total Cadmium	0.265	mg/L	1	0.250	<0.00140	106	72.9 - 109	1	20
Total Cobalt	0.263	mg/L	1	0.250	<0.00220	105	71 - 112	2	20
Total Chromium	0.108	mg/L	1	0.100	<0.000900	108	66.2 - 121	3	20
Total Copper	0.132	mg/L	1	0.125	<0.00140	106	84.1 - 108	0	20
Total Iron	0.812	mg/L	1	0.500	0.261	110	61 - 122	3	20
Total Manganese	0.257	mg/L	1	0.250	<0.000600	103	61.2 - 120	1	20
Total Molybdenum	0.559	mg/L	1	0.500	<0.00790	112	60.1 - 125	2	20
Total Nickel	0.269	mg/L	1	0.250	<0.00190	108	56.1 - 119	3	20
Total Lead	0.541	mg/L	1	0.500	<0.00740	108	74.1 - 111	1	20
Total Antimony	0.245	mg/L	1	0.250	<0.0166	98	71.3 - 118	4	20
Total Selenium	0.489	mg/L	1	0.500	<0.0131	98	64.3 - 111	8	20
Total Thallium	0.523	mg/L	1	0.500	<0.0189	105	66 - 121	0	20
Total Vanadium	0.246	mg/L	1	0.250	<0.00150	98	74.1 - 110	0	20
Total Zinc	0.249	mg/L	1	0.250	<0.00710	100	75.5 - 113	0	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Matrix Spike (MS-1) Spiked Sample: 127184

QC Batch:	38634	Date Analyzed:	2007-06-28	Analyzed By:	TP
Prep Batch:	33401	QC Preparation:	2007-06-28	Prepared By:	TS

Param	MS Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit
Total Calcium	136	mg/L	1	50.0	88.2	96	75 - 125
Total Magnesium	62.1	mg/L	1	50.0	15	94	75 - 125
Total Potassium	52.5	mg/L	1	50.0	4.2	97	75 - 125
Total Sodium	83.1	mg/L	1	50.0	35	96	75 - 125

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Param	MSD Result	Units	Dil.	Spike Amount	Matrix Result	Rec.	Rec. Limit	RPD	RPD Limit
Total Calcium	140	mg/L	1	50.0	88.2	104	75 - 125	3	20
Total Magnesium	63.0	mg/L	1	50.0	15	96	75 - 125	1	20
Total Potassium	52.9	mg/L	1	50.0	4.2	97	75 - 125	1	20
Total Sodium	83.7	mg/L	1	50.0	35	97	75 - 125	1	20

Percent recovery is based on the spike result. RPD is based on the spike and spike duplicate result.

Standard (ICV-1)

QC Batch: 38315 Date Analyzed: 2007-06-19 Analyzed By: RR

Param	Flag	Units	ICVs True Conc.	ICVs Found Conc.	ICVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Uranium		mg/L	1.00	0.988	99	90 - 110	2007-06-19

Standard (ICV-1)

QC Batch: 38315 Date Analyzed: 2007-06-19 Analyzed By: RR

Param	Flag	Units	ICVs True Conc.	ICVs Found Conc.	ICVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Silver		mg/L	0.125	0.126	101	90 - 110	2007-06-19
Total Aluminum		mg/L	1.00	0.998	100	90 - 110	2007-06-19
Total Arsenic		mg/L	1.00	0.975	98	90 - 110	2007-06-19
Total Boron		mg/L	1.00	1.01	101	90 - 110	2007-06-19
Total Barium		mg/L	1.00	1.01	101	90 - 110	2007-06-19
Total Beryllium		mg/L	1.00	1.01	101	90 - 110	2007-06-19
Total Cadmium		mg/L	1.00	1.06	106	90 - 110	2007-06-19
Total Cobalt		mg/L	1.00	1.01	101	90 - 110	2007-06-19
Total Chromium		mg/L	1.00	1.04	104	90 - 110	2007-06-19
Total Copper		mg/L	1.00	1.00	100	90 - 110	2007-06-19
Total Iron		mg/L	1.00	1.05	105	90 - 110	2007-06-19
Total Manganese		mg/L	1.00	1.00	100	90 - 110	2007-06-19
Total Molybdenum		mg/L	1.00	1.08	108	90 - 110	2007-06-19
Total Nickel		mg/L	1.00	1.01	101	90 - 110	2007-06-19
Total Lead		mg/L	1.00	1.02	102	90 - 110	2007-06-19
Total Antimony		mg/L	1.00	1.02	102	90 - 110	2007-06-19
Total Selenium		mg/L	1.00	1.04	104	90 - 110	2007-06-19
Total Thallium		mg/L	1.00	0.944	94	90 - 110	2007-06-19
Total Uranium		mg/L	1.00	0.988	99	90 - 110	2007-06-19
Total Vanadium		mg/L	1.00	0.983	98	90 - 110	2007-06-19
Total Zinc		mg/L	1.00	0.998	100	90 - 110	2007-06-19

Standard (CCV-1)

QC Batch: 38315 Date Analyzed: 2007-06-19 Analyzed By: RR

Param	Flag	Units	CCVs True Conc.	CCVs Found Conc.	CCVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Uranium		mg/L	1.00	1.07	107	90 - 110	2007-06-19

Standard (CCV-1)

QC Batch: 38315 Date Analyzed: 2007-06-19 Analyzed By: RR

Param	Flag	Units	CCVs True Conc.	CCVs Found Conc.	CCVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Silver		mg/L	0.125	0.136	109	90 - 110	2007-06-19
Total Aluminum		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Arsenic		mg/L	1.00	1.08	108	90 - 110	2007-06-19
Total Boron		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Barium		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Beryllium		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Cadmium		mg/L	1.00	1.04	104	90 - 110	2007-06-19
Total Cobalt		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Chromium		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Copper		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Iron		mg/L	1.00	1.04	104	90 - 110	2007-06-19
Total Manganese		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Molybdenum		mg/L	1.00	1.04	104	90 - 110	2007-06-19
Total Nickel		mg/L	1.00	1.08	108	90 - 110	2007-06-19
Total Lead		mg/L	1.00	1.08	108	90 - 110	2007-06-19
Total Antimony		mg/L	1.00	1.08	108	90 - 110	2007-06-19
Total Selenium		mg/L	1.00	1.06	106	90 - 110	2007-06-19
Total Thallium		mg/L	1.00	0.990	99	90 - 110	2007-06-19
Total Uranium		mg/L	1.00	1.07	107	90 - 110	2007-06-19
Total Vanadium		mg/L	1.00	1.06	106	90 - 110	2007-06-19
Total Zinc		mg/L	1.00	1.08	108	90 - 110	2007-06-19

Standard (ICV-1)

QC Batch: 38431 Date Analyzed: 2007-06-22 Analyzed By: TP

Param	Flag	Units	ICVs True Conc.	ICVs Found Conc.	ICVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Calcium		mg/L	50.0	50.5	101	90 - 110	2007-06-22
Total Magnesium		mg/L	50.0	50.5	101	90 - 110	2007-06-22
Total Potassium		mg/L	50.0	50.1	100	90 - 110	2007-06-22
Total Sodium		mg/L	50.0	50.3	101	90 - 110	2007-06-22

Standard (CCV-1)

QC Batch: 38431 Date Analyzed: 2007-06-22 Analyzed By: TP

Param	Flag	Units	CCVs True Conc.	CCVs Found Conc.	CCVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Calcium		mg/L	50.0	48.8	98	90 - 110	2007-06-22
Total Magnesium		mg/L	50.0	48.3	97	90 - 110	2007-06-22
Total Potassium		mg/L	50.0	48.1	96	90 - 110	2007-06-22
Total Sodium		mg/L	50.0	48.3	97	90 - 110	2007-06-22

Standard (ICV-1)

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR

Param	Flag	Units	ICVs True Conc.	ICVs Found Conc.	ICVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Uranium		mg/L	1.00	1.00	100	90 - 110	2007-06-28

Standard (ICV-1)

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR

Param	Flag	Units	ICVs True Conc.	ICVs Found Conc.	ICVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Silver		mg/L	0.125	0.128	102	90 - 110	2007-06-28
Total Aluminum		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Arsenic		mg/L	1.00	1.08	108	90 - 110	2007-06-28
Total Boron		mg/L	1.00	1.02	102	90 - 110	2007-06-28
Total Barium		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Beryllium		mg/L	1.00	1.00	100	90 - 110	2007-06-28
Total Cadmium		mg/L	1.00	1.04	104	90 - 110	2007-06-28
Total Cobalt		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Chromium		mg/L	1.00	1.04	104	90 - 110	2007-06-28
Total Copper		mg/L	1.00	1.02	102	90 - 110	2007-06-28
Total Iron		mg/L	1.00	1.03	103	90 - 110	2007-06-28
Total Manganese		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Molybdenum		mg/L	1.00	1.02	102	90 - 110	2007-06-28
Total Nickel		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Lead		mg/L	1.00	1.04	104	90 - 110	2007-06-28
Total Antimony		mg/L	1.00	0.974	97	90 - 110	2007-06-28
Total Selenium		mg/L	1.00	0.979	98	90 - 110	2007-06-28
Total Thallium		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Vanadium		mg/L	1.00	1.03	103	90 - 110	2007-06-28
Total Zinc		mg/L	1.00	0.993	99	90 - 110	2007-06-28

Standard (CCV-1)

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR

Param	Flag	Units	CCVs True Conc.	CCVs Found Conc.	CCVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Uranium		mg/L	1.00	1.04	104	90 - 110	2007-06-28

Standard (CCV-1)

QC Batch: 38621 Date Analyzed: 2007-06-28 Analyzed By: RR

Param	Flag	Units	CCVs True Conc.	CCVs Found Conc.	CCVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Silver		mg/L	0.125	0.127	102	90 - 110	2007-06-28
Total Aluminum		mg/L	1.00	1.00	100	90 - 110	2007-06-28
Total Arsenic		mg/L	1.00	0.963	96	90 - 110	2007-06-28
Total Boron		mg/L	1.00	0.929	93	90 - 110	2007-06-28
Total Barium		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Beryllium		mg/L	1.00	0.995	100	90 - 110	2007-06-28
Total Cadmium		mg/L	1.00	1.04	104	90 - 110	2007-06-28
Total Cobalt		mg/L	1.00	0.994	99	90 - 110	2007-06-28
Total Chromium		mg/L	1.00	1.03	103	90 - 110	2007-06-28
Total Copper		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Iron		mg/L	1.00	1.02	102	90 - 110	2007-06-28
Total Manganese		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Molybdenum		mg/L	1.00	1.03	103	90 - 110	2007-06-28
Total Nickel		mg/L	1.00	0.998	100	90 - 110	2007-06-28
Total Lead		mg/L	1.00	1.03	103	90 - 110	2007-06-28
Total Antimony		mg/L	1.00	1.05	105	90 - 110	2007-06-28
Total Selenium		mg/L	1.00	0.959	96	90 - 110	2007-06-28
Total Thallium		mg/L	1.00	0.968	97	90 - 110	2007-06-28
Total Vanadium		mg/L	1.00	1.01	101	90 - 110	2007-06-28
Total Zinc		mg/L	1.00	0.987	99	90 - 110	2007-06-28

Standard (ICV-1)

QC Batch: 38634 Date Analyzed: 2007-06-28 Analyzed By: TP

Param	Flag	Units	ICVs True Conc.	ICVs Found Conc.	ICVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Calcium		mg/L	50.0	51.5	103	90 - 110	2007-06-28
Total Magnesium		mg/L	50.0	51.6	103	90 - 110	2007-06-28
Total Potassium		mg/L	50.0	51.4	103	90 - 110	2007-06-28
Total Sodium		mg/L	50.0	50.7	101	90 - 110	2007-06-28

Standard (CCV-1)

QC Batch: 38634 Date Analyzed: 2007-06-28 Analyzed By: TP

Param	Flag	Units	CCVs True Conc.	CCVs Found Conc.	CCVs Percent Recovery	Percent Recovery Limits	Date Analyzed
Total Calcium		mg/L	50.0	51.7	103	90 - 110	2007-06-28
Total Magnesium		mg/L	50.0	51.6	103	90 - 110	2007-06-28
Total Potassium		mg/L	50.0	50.6	101	90 - 110	2007-06-28
Total Sodium		mg/L	50.0	49.8	100	90 - 110	2007-06-28

QUARTERLY
LANDFILL METHANE MONITORING
FIRST QUARTER 2007
WHITE SANDS MISSILE RANGE

Submitted to:

Joe Talamantes

U.S. Army
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QUARTERLY LANDFILL GAS MONITORING
FIRST QUARTER 2007
THE MAIN POST CONSTRUCTION AND DEMOLITION LANDFILL
WHITE SANDS MISSILE RANGE

Executive Summary

The following report pertains to the ongoing quarterly landfill gas monitoring for the landfill located at the Main Post Construction and Demolition Landfill, White Sands Missile Range, New Mexico. At the request of White Sands Missile Range, SafeNet Services, LLC (SafeNet) conducted the gas monitoring on March 21, 2007, for the 1st quarter of 2007.

Findings:

> **Methane Gas-** Results indicate that no methane gas was detected at any of the sampling points.

This facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence. The reported site lithology is a sandy soil with some silt to thirty feet. This quarterly monitoring was conducted in accordance with, and to comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities.

The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

1.) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
2.) The lower explosive limit for gases at the property boundary.

On March 21, 2007, SafeNet personnel conducted monitoring operations for the possible migration of methane (CH_4) as directed by the Regulatory Compliance Office, White Sands Missile Range (WSMR) and in compliance with New Mexico Environmental Department, Solid Waste Bureau. Landfill gas monitoring points were selected within the landfill area at the property boundary at approximately 300-foot intervals. Each sampling point was taken at a total depth of three (3) feet below ground surface (bgs.) utilizing soil gas sampling technology. Monitoring points are presented in the Methane Sampling Location Map located in the Appendix. This monitoring event also encompassed all buildings within the permitted facility. All gas-monitoring points were conducted by constructing monitoring probes using the soil gas vapor impact probe system, and a Landtec GEM2000 portable gas detection meter. The GEM2000 meter was properly calibrated as to the manufactures specifications and utilized within the instrument's manufactures criteria for monitoring landfill gas. Identical methodology was utilized throughout the gas-monitoring event.

A total of twenty-seven (27) gas-monitoring points were conducted, within the landfill permitted area. Results from our on-site field analyses are presented as Landfill Gas Monitoring Results, downloaded from the Landtec GEM2000.

Introduction and Scope

The Main Post Construction and Demolition Landfill (landfill facility) is located at White Sands Missile Range, New Mexico. The facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence with two buildings. One building is currently utilized as a guardhouse and the other is a vacant guardhouse within the property boundary and is represented in this report as "Methane Sampling Location Map" located in the Appendix. The stratigraphy beneath the site is a sandy soil with some silt to thirty feet, as reported by WSMR. Examination of the retained soil retrieved from around the soil vapor probes during the sampling process verified this to a depth of three feet.

To comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities, quarterly landfill gas monitoring must be conducted for explosive gases. The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

1.) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
2.) The lower explosive limit for gases at the property boundary.

The sampling probe used in this monitoring event is a patented, re-usable; AMS Retract-A-Tip designed as a survey tool for collection of discrete soil gas samples. It is constructed of hardened stainless steel and is designed to open when the drive extensions are retracted by 2 inches. The sampling probe was driven into the soil using a heavy duty Bosch 11245 rotary hammer drill with a 5/8-inch diameter x 3-foot long extension drive rod. Once installed, the drive extension was retracted 2 inches. In this open position, a gas sample was collected utilizing a Landtec GEM2000 meter. Teflon tubing was used in conjunction with the GEM2000 for soil gas transference media.

To comply with the Main Post Landfill Operating Plan application permit, the quarterly landfill methane gas monitoring will be conducted in the following manner.

1.) Request and receive utility clearance from White Sands Missile Range.

2.) Non-discrete monitoring points will be installed along the facility perimeter at 300-foot intervals (27 collection points were identified).

3.) Monitoring points will include the inside of all facility structures; a Photo Ionization Detector (intrinsically safe) will be utilized before entering closed structures.

4.) Bar-hole or soil gas vapor probes will be installed for monitoring points to a depth of three feet.

5.) A Landtec GEM2000 Gas Analyzer or other combustible gas indicator (GEM2000) that utilizes the catalytic oxidation method or thermal conductivity will be used to detect and record combustible gas levels. Notify Regulatory Compliance Office, WSMR immediately if methane concentrations are detected at or near the limiting concentrations.

6.) Report all procedures used and the results in a quality that can be submitted to the State of New Mexico, Environment Department.

Sampling Plan

On March 21, 2007 SafeNet conducted monitoring operations for the possible migration of methane (CH_4) as directed by the WSMR Regulatory Compliance Office, in compliance with New Mexico Environmental Department, Solid Waste Bureau. A permit was obtained from WSMR as to the location of any buried utility lines (gas, water, electrical) at, near, or crossing the property boundary. The only utility identified was a phone line located in front of the guardhouse area. This area was avoided during the sampling event. Landfill gas monitoring points were then selected within the landfill area at the property boundary at approximately 300-foot intervals utilizing a Trumeter measuring wheel. A soil gas vapor probe was installed at each monitoring point utilizing the following procedures:

(1) Typical Soil Gas Vapor Probe Installation (27 each at 300' intervals):

- A pilot hole was first installed utilizing a heavy-duty hammer drill and soil probe, a 5/8-inch diameter rod with a stainless steel tip, which was driven approximately 2 ½ feet into the soil. Soils showed to be sandy with little silt.

- The soil probe was withdrawn to allow for the placement of the sampling tip (AMS Retract-A-Tip).

- Place the sampling tip onto the 5/8-inch hollow rod and a probe adapter that allowed for a ¼" ID Teflon sample tube to be attached. The heavy-duty hammer drill was used to drive the sample to a total depth of 3 feet below ground surface.

- The Landtec- GEM2000 was then attached to the Teflon tubing and a sample was collected. (See: GEM2000 *Infrared Gas Analyzer*).

- The probe was withdrawn from the hole and the screen checked for plugging or damage, when necessary probe screens were replaced as to insure appropriate consecutive readings and functionality of the probe.

- Each location was identified by a round marker attached with tin-plated wire onto the chain-linked or barbwire fence that surrounded the property, thus allowing for future sampling reference points.

Note: Operators measured and recorded the depth of each probe to insure standardization with each probe placement.

(2) On-site structures

There are two on-site structures, one is a small concrete building used as a landfill office and the other is a vacant guardhouse. The monitoring measurement was taken 6 feet from the north wall of the vacant structure. Landscaping gravel has been placed around the landfill office; therefore the sample by the office was moved to approximately 30 feet north of the building. All results were data logged and downloaded to computer (See: *Results and Findings*).

(3) GEM2000 **Infrared Gas Analyzer**

The Landtec GEM2000 is a compact field instrument that can and was configured to analyze the methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) levels in landfill gas (LFG). It is an approved instrument in monitoring migration gases, active and passive gas extraction systems and measuring LFG at flares or other approved control systems. This instrument uses computer technology that displays on-screen menus to provide a simplified user interface for accurate data analysis and recording. All information collected was dated and time stamped and readings were stored in memory. The data was later downloaded via a serial connection to a computer, then inserted into our table template and submitted into our report as Landfill Gas Monitoring Results.

This unit works with a vacuum sample pump that draws a quantity of gas through the sample hose, in-line water trap and the user replaceable particulate filter, into a sample chamber. An infrared beam is projected, via sapphire windows, through the gas sample. On the other side of the chamber, methane and carbon dioxide detectors sense the beam. A microprocessor calculates the amount of infrared light absorbed at different wavelengths and determines the various gas concentrations.

When a sufficient amount of gas has entered the sample chamber, gas concentration levels were shown on the display as it stabilizes (approximately 60 seconds). The SafeNet technician, with a few keystrokes, stores the measurement data in memory utilizing a unique I.D. code, as well as the date and time.

(4) Combustible Gas Instrument Field Calibration

The Landtec GEM2000 Gas Analyzer utilizes an internal pump to pull air into the calibration map that is accessed by its microprocessor for baseline reference data. This reference data, as stated by the manufacture, was programmed into the GEM2000 during the factory calibration using various gas mixtures in an environmental chamber. The GEM2000 can be cleared of user calibration settings and restored to “factory settings” as needed. The factory calibration has been designed to give the best possible results over a wide range of conditions. However, SafeNet technicians performed “field calibrations” to improve the instrument’s accuracy for this monitoring event. Each field calibration on-site was performed at stabilized working temperature. Whenever temperature changes occurred during the operation, the GEM2000 was re-calibrated (example: the cool of the morning to the hottest part of the day). Field calibration was performed using the manufacturer’s recommended gas mixture for low concentrations which are 15/15 (15% methane, 15% carbon dioxide), 4 % oxygen and balance nitrogen, 15/15% and 4.0% oxygen/nitrogen. (See Landtec GEM2000 Operation Manual for procedures)

(5) Probe Purging:

The probe condition was checked for structural integrity and suitability for monitoring before each use. After the probe had been driven to the desired sampling depth (3 feet), it was purged (evacuated) to remove ambient air. Typically purging can be accomplished using either a hand pump, peristaltic pump, or pump attached to the top of the probe via PVC or polyethylene tubing. The GEM2000 used in this event (see GEM2000 *Infrared Gas Analyzer*) was designed with an internal pump that did actively draw the vapor sample into the instrument for continual analysis.

The GEM2000 was used alone, due to the shallow depth of each probe in this monitoring event, for the purging of each probe point via the internal pump. Purge time was based on the volume of the probe sampling system, and purging done long enough to remove 1 to 5 casing volumes of air from the system. Purge volumes and times were recorded within the GEM2000, which are presented as Landfill Gas Monitoring Results, and also on field forms. A particulate-moisture trap was placed between the probe and the GEM2000 to prevent damage to the instrument. This trap was checked before each use or sampling point due to the soil make up (sand and silt) with the possible vacuum pickup of particulate from the probe. The GEM2000 was directly connected to the vapor probe with ¼" Teflon tubing.

Results and Findings

SAMPLE NUMBER SES-	CH_4%	CO_2 %	O_2%	ATMOSPHERIC PRESSURE "HG"	Temp. DegF	DEPTH FEET
1	0	0	20.5	25.92	73	3ft
2	0	0	20.7	25.92	73	3ft
3	0	0	20.7	25.92	73	3ft
4	0	0	20.9	25.91	73	3ft
5	0	0	20.8	25.91	73	3ft
6	0	0	20.8	25.91	73	3ft
7	0	0	20.9	25.92	73	3ft
8	0	0	21.0	25.92	73	3ft
9	0	0	21.2	25.91	73	3ft
10	0	0	20.8	25.93	73	3ft
11	0	0	20.7	25.92	73	3ft
12	0	0	20.7	25.92	73	3ft
13	0	0	21.3	25.92	73	3ft
14	0	0	21.0	25.93	73	3ft
15	0.1	0	21.1	25.93	73	3ft
16	0.1	0	21.1	25.94	73	3ft
17	0	0	21.1	25.94	73	3ft
18	0.1	0	21.0	25.94	73	3ft
19	0.1	0	20.9	25.95	73	3ft
20	0.1	0	21.1	25.95	73	3ft
21	0	0	21.2	25.95	73	3ft
22	0	0	21.0	25.96	73	3ft
23	0	0	21.0	25.96	73	3ft
24	0	0	21.0	25.96	73	3ft
25	0	0	21.1	25.97	73	3ft
26	0	0	21.2	25.97	73	3ft
27	0	0	20.8	25.97	73	3ft

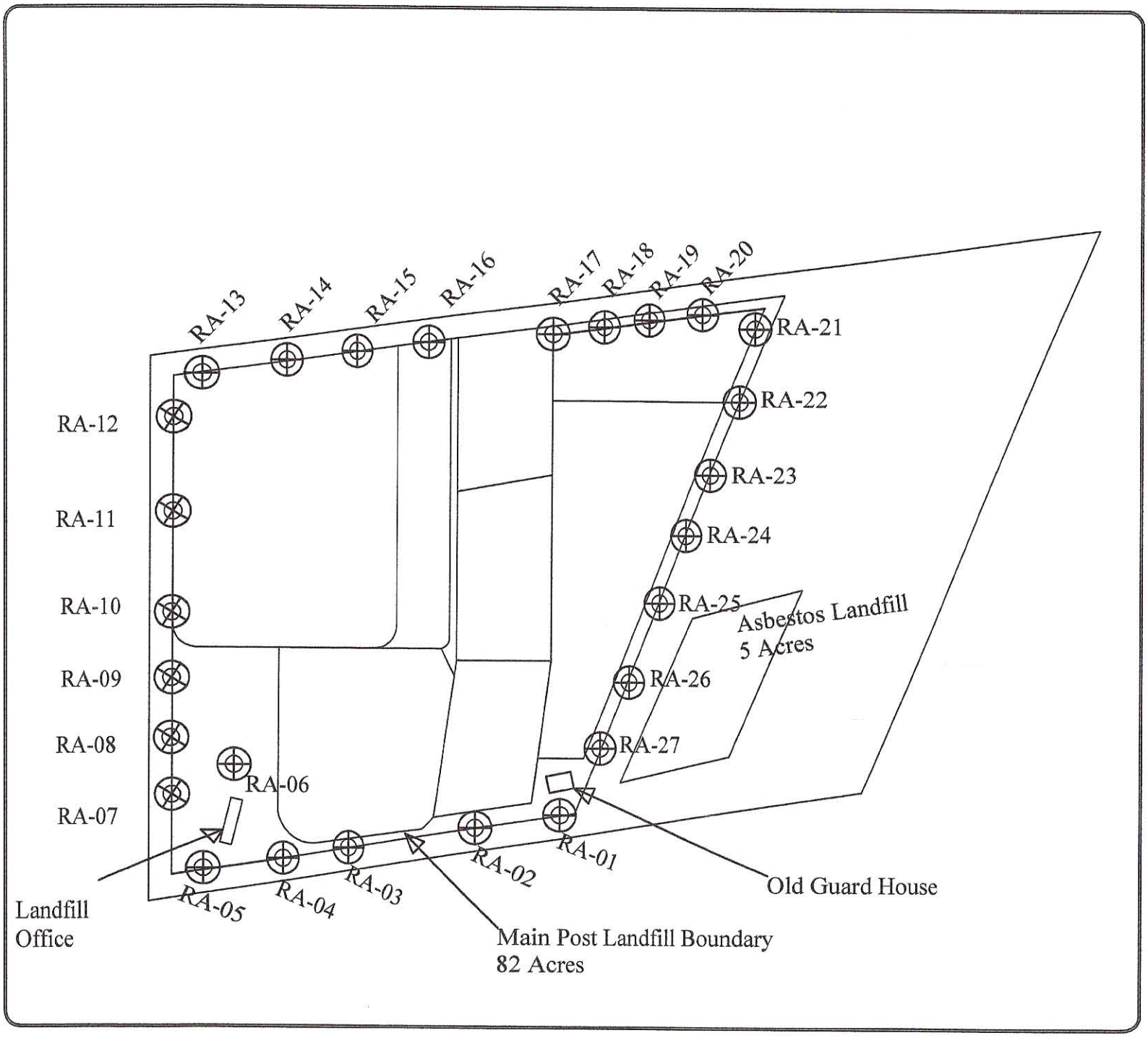
Discussion

This quarterly monitoring was conducted in accordance with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities. This field investigation as shown in the results, verified non-detectable levels of methane at the facility's property boundary and within all facility's structures.

Sincerely,

Oscar E. Ayala
SafeNet Services, LLC
cc: file

Appendix A



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FAX (915) 779-6689

WHITE SANDS MISSILE RANGE

METHANE MONITORING

LOCATION
White Sands Missile Range Landfill

LEGEND
Samples Location

REVISIONS

INSPECTED BY: O.E. AYALA
DRAWN BY: J.E. AYALA
DATE: 03/21/07
PROJECT#:
SHEET #:

QUARTERLY
LANDFILL METHANE MONITORING
SECOND QUARTER 2007
WHITE SANDS MISSILE RANGE

Submitted to:

Joe Talamantes

U.S. Army
White Sands Missile Range
National Range Support Directorate
Engineering Division
White Sands Missile Range, New Mexico 88002

Submitted by:

SafeNet Environmental Services, LLC
6500 Boeing Suite T-1
El Paso, Texas 79925

CH_4 Gas survey completed and prepared by:

Concurrence:

06/18/07
Oscar E. Ayala

06/18/07
Juan E. Ayala

QUARTERLY LANDFILL GAS MONITORING
SECOND QUARTER 2007
THE MAIN POST CONSTRUCTION AND DEMOLITION LANDFILL
WHITE SANDS MISSILE RANGE

Executive Summary

The following report pertains to the ongoing quarterly landfill gas monitoring for the landfill located at the Main Post Construction and Demolition Landfill, White Sands Missile Range, New Mexico. At the request of White Sands Missile Range, SafeNet Services, LLC (SafeNet) conducted the gas monitoring on June 18, 2007, for the second quarter of 2007.

Findings:

> **Methane Gas-** Results indicate that no methane gas was detected at any of the sampling points.

This facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence. The reported site lithology is a sandy soil with some silt to thirty feet. This quarterly monitoring was conducted in accordance with, and to comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities.

The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

1.) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
2.) The lower explosive limit for gases at the property boundary.

On June 18, 2007, SafeNet personnel conducted monitoring operations for the possible migration of methane (CH_4) as directed by the Regulatory Compliance Office, White Sands Missile Range (WSMR) and in compliance with New Mexico Environmental Department, Solid Waste Bureau. Landfill gas monitoring points were selected within the landfill area at the property boundary at approximately 300-foot intervals. Each sampling point was taken at a total depth of three (3) feet below ground surface (bgs.) utilizing soil gas sampling technology. Monitoring points are presented in the Methane Sampling Location Map located in the Appendix. This monitoring event also encompassed all buildings within the permitted facility. All gas-monitoring points were conducted by constructing monitoring probes using the soil gas vapor impact probe system, and a Landtec GEM2000 portable gas detection meter. The GEM2000 meter was properly calibrated as to the manufactures specifications and utilized within the instrument's manufactures criteria for monitoring landfill gas. Identical methodology was utilized throughout the gas-monitoring event.

A total of twenty-seven (27) gas-monitoring points were conducted, within the landfill permitted area. Results from our on-site field analyses are presented as Landfill Gas Monitoring Results, downloaded from the Landtec GEM2000.

Introduction and Scope

The Main Post Construction and Demolition Landfill (landfill facility) is located at White Sands Missile Range, New Mexico. The facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence with two buildings. One building is currently utilized as a guardhouse and the other is a vacant guardhouse within the property boundary and is represented in this report as "Methane Sampling Location Map" located in the Appendix. The stratigraphy beneath the site is a sandy soil with some silt to thirty feet, as reported by WSMR. Examination of the retained soil retrieved from around the soil vapor probes during the sampling process verified this to a depth of three feet.

To comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities, quarterly landfill gas monitoring must be conducted for explosive gases. The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

1.) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
2.) The lower explosive limit for gases at the property boundary.

The sampling probe used in this monitoring event is a patented, re-usable; AMS Retract-A-Tip designed as a survey tool for collection of discrete soil gas samples. It is constructed of hardened stainless steel and is designed to open when the drive extensions are retracted by 2 inches. The sampling probe was driven into the soil using a heavy duty Bosch 11245 rotary hammer drill with a 5/8-inch diameter x 3-foot long extension drive rod. Once installed, the drive extension was retracted 2 inches. In this open position, a gas sample was collected utilizing a Landtec GEM2000 meter. Teflon tubing was used in conjunction with the GEM2000 for soil gas transference media.

To comply with the Main Post Landfill Operating Plan application permit, the quarterly landfill methane gas monitoring will be conducted in the following manner.

1.) Request and receive utility clearance from White Sands Missile Range.

2.) Non-discrete monitoring points will be installed along the facility perimeter at 300-foot intervals (27 collection points were identified).

3.) Monitoring points will include the inside of all facility structures; a Photo Ionization Detector (intrinsically safe) will be utilized before entering closed structures.

4.) Bar-hole or soil gas vapor probes will be installed for monitoring points to a depth of three feet.

5.) A Landtec GEM2000 Gas Analyzer or other combustible gas indicator (GEM2000) that utilizes the catalytic oxidation method or thermal conductivity will be used to detect and record combustible gas levels. Notify Regulatory Compliance Office, WSMR immediately if methane concentrations are detected at or near the limiting concentrations.

6.) Report all procedures used and the results in a quality that can be submitted to the State of New Mexico, Environment Department.

Sampling Plan

On June 18, 2007 SafeNet conducted monitoring operations for the possible migration of methane (CH_4) as directed by the WSMR Regulatory Compliance Office, in compliance with New Mexico Environmental Department, Solid Waste Bureau. A permit was obtained from WSMR as to the location of any buried utility lines (gas, water, electrical) at, near, or crossing the property boundary. The only utility identified was a phone line located in front of the guardhouse area. This area was avoided during the sampling event. Landfill gas monitoring points were then selected within the landfill area at the property boundary at approximately 300-foot intervals utilizing a Trumeter measuring wheel. A soil gas vapor probe was installed at each monitoring point utilizing the following procedures:

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- A pilot hole was first installed utilizing a heavy-duty hammer drill and soil probe, a 5/8-inch diameter rod with a stainless steel tip, which was driven approximately 2 ½ feet into the soil. Soils showed to be sandy with little silt.

- The soil probe was withdrawn to allow for the placement of the sampling tip (AMS Retract-A-Tip).

- Place the sampling tip onto the 5/8-inch hollow rod and a probe adapter that allowed for a ¼" ID Teflon sample tube to be attached. The heavy-duty hammer drill was used to drive the sample to a total depth of 3 feet below ground surface.

- The Landtec- GEM2000 was then attached to the Teflon tubing and a sample was collected. (See: GEM2000 *Infrared Gas Analyzer*).

- The probe was withdrawn from the hole and the screen checked for plugging or damage, when necessary probe screens were replaced as to insure appropriate consecutive readings and functionality of the probe.

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Note: Operators measured and recorded the depth of each probe to insure standardization with each probe placement.

(2) On-site structures

There are two on-site structures, one is a small concrete building used as a landfill office and the other is a vacant guardhouse. The monitoring measurement was taken 6 feet from the north wall of the vacant structure. Landscaping gravel has been placed around the landfill office; therefore the sample by the office was moved to approximately 30 feet north of the building. All results were data logged and downloaded to computer (See: *Results and Findings*).

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The probe condition was checked for structural integrity and suitability for monitoring before each use. After the probe had been driven to the desired sampling depth (3 feet), it was purged (evacuated) to remove ambient air. Typically purging can be accomplished using either a hand pump, peristaltic pump, or pump attached to the top of the probe via PVC or polyethylene tubing. The GEM2000 used in this event (see GEM2000 *Infrared Gas Analyzer*) was designed with an internal pump that did actively draw the vapor sample into the instrument for continual analysis.

The GEM2000 was used alone, due to the shallow depth of each probe in this monitoring event, for the purging of each probe point via the internal pump. Purge time was based on the volume of the probe sampling system, and purging done long enough to remove 1 to 5 casing volumes of air from the system. Purge volumes and times were recorded within the GEM2000, which are presented as Landfill Gas Monitoring Results, and also on field forms. A particulate-moisture trap was placed between the probe and the GEM2000 to prevent damage to the instrument. This trap was checked before each use or sampling point due to the soil make up (sand and silt) with the possible vacuum pickup of particulate from the probe. The GEM2000 was directly connected to the vapor probe with ¼" Teflon tubing.

Results and Findings

SAMPLE NUMBER SES-	CH_4%	Co_2 %	O_2%	ATMOSPHERIC PRESSURE "HG"	Temp. DegF	DEPTH FEET
1	0.1	0	20.5	30.06	98	3ft
2	0	0	20.7	30.06	98	3ft
3	0	0	20.7	30.05	98	3ft
4	0.1	0	20.9	30.06	98	3ft
5	0.1	0	20.8	30.06	98	3ft
6	0.1	0	20.8	30.05	98	3ft
7	0.1	0	20.9	30.05	98	3ft
8	0.1	0	21.0	30.04	98	3ft
9	0.1	0	21.2	30.05	98	3ft
10	0.1	0	20.8	30.05	98	3ft
11	0.1	0	20.7	30.05	98	3ft
12	0.1	0	20.7	30.04	98	3ft
13	0.2	0	21.3	30.04	98	3ft
14	0.1	0	21.0	30.05	98	3ft
15	0.2	0	21.1	30.05	98	3ft
16	0.2	0	21.1	30.04	98	3ft
17	0.2	0	21.1	30.04	98	3ft
18	0.3	0	21.0	30.05	98	3ft
19	0	0	20.9	30.04	98	3ft
20	0.1	0	21.1	30.03	98	3ft
21	0.1	0	21.2	30.03	98	3ft
22	0.2	0	21.0	30.02	98	3ft
23	0.2	0	21.0	30.01	98	3ft
24	0.2	0	21.0	30.02	98	3ft
25	0.2	0	21.1	30.01	98	3ft
26	0.2	0	21.2	30.01	98	3ft
27	0.2	0	20.8	30.01	98	3ft

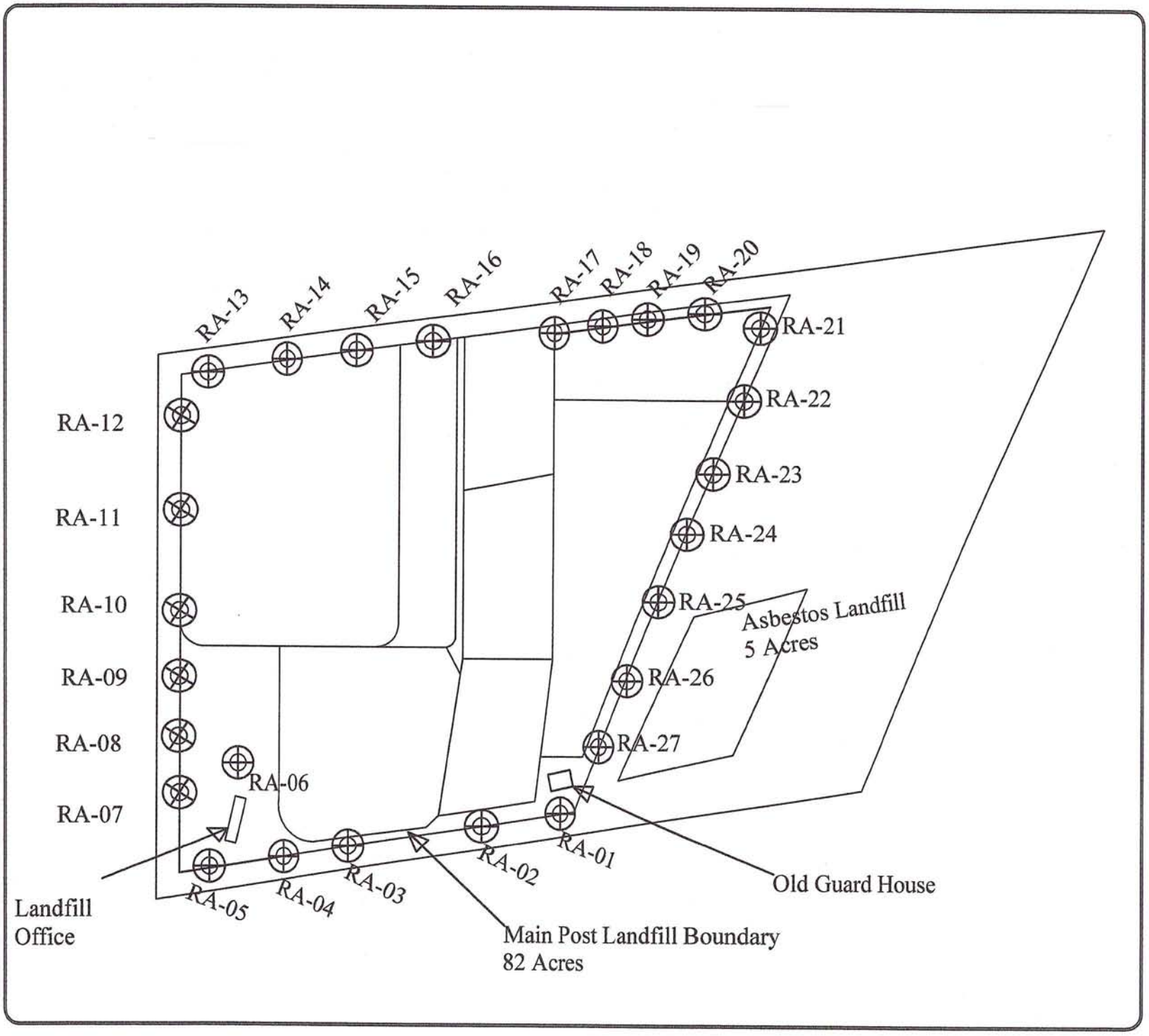
Discussion

This quarterly monitoring was conducted in accordance with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities. This field investigation as shown in the results, verified non-detectable levels of methane at the facility's property boundary and within all facility's structures.

Sincerely,

Oscar E. Ayala
SafeNet Services, LLC
cc: file

Appendix A



SafeNet
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(915) 587-6900

WHITE SANDS
MISSILE RANGE

METHANE
MONITORING

LOCATION
White Sands
Missile Range
Landfill

LEGEND

Samples
Location

REVISIONS

INSPECTED BY:
O.E. AYALA
DRAWN BY:
J.E. AYALA
DATE:
06/18/07
PROJECT#:

SHEET #:

QUARTERLY
LANDFILL METHANE MONITORING
THIRD QUARTER 2007
WHITE SANDS MISSILE RANGE

Submitted to:

Joe Talamantes

U.S. Army
White Sands Missile Range
National Range Support Directorate
Engineering Division
White Sands Missile Range, New Mexico 88002

Submitted by:

SafeNet Environmental Services, LLC
6500 Boeing Suite T-1
El Paso, Texas 79925

CH_4 Gas survey completed and prepared by:

Concurrence:

09/16/2007
Oscar E. Ayala

09/18/2007
Juan E. Ayala

QUARTERLY LANDFILL GAS MONITORING
THIRD QUARTER 2007
THE MAIN POST CONSTRUCTION AND DEMOLITION LANDFILL
WHITE SANDS MISSILE RANGE

Executive Summary

The following report pertains to the ongoing quarterly landfill gas monitoring for the landfill located at the Main Post Construction and Demolition Landfill, White Sands Missile Range, New Mexico. At the request of White Sands Missile Range, SafeNet Services, LLC (SafeNet) conducted the gas monitoring on September 18, 2007, for the Third quarter of 2007.

Findings:

Methane Gas- Results indicate that no methane gas was detected at any of the sampling points.

This facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence. The reported site lithology is a sandy soil with some silt to thirty feet. This quarterly monitoring was conducted in accordance with, and to comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities.

The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

1.) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
2.) The lower explosive limit for gases at the property boundary.

On September 18, 2007, SafeNet personnel conducted monitoring operations for the possible migration of methane (CH_4) as directed by the Regulatory Compliance Office, White Sands Missile Range (WSMR) and in compliance with New Mexico Environmental Department, Solid Waste Bureau. Landfill gas monitoring points were selected within the landfill area at the property boundary at approximately 300-foot intervals. Each sampling point was taken at a total depth of three (3) feet below ground surface (bgs.) utilizing soil gas sampling technology. Monitoring points are presented in the Methane Sampling Location Map located in the Appendix. This monitoring event also encompassed all buildings within the permitted facility. All gas-monitoring points were conducted by constructing monitoring probes using the soil gas vapor impact probe system, and a Landtec GEM2000 portable gas detection meter. The GEM2000 meter was properly calibrated as to the manufactures specifications and utilized within the instrument's manufactures criteria for monitoring landfill gas. Identical methodology was utilized throughout the gas-monitoring event.

A total of twenty-seven (27) gas-monitoring points were conducted, within the landfill permitted area. Results from our on-site field analyses are presented as Landfill Gas Monitoring Results, downloaded from the Landtec GEM2000.

Introduction and Scope

The Main Post Construction and Demolition Landfill (landfill facility) is located at White Sands Missile Range, New Mexico. The facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence with two buildings. One building is currently utilized as a guardhouse and the other is a vacant guardhouse within the property boundary and is represented in this report as "Methane Sampling Location Map" located in the Appendix. The stratigraphy beneath the site is a sandy soil with some silt to thirty feet, as reported by WSMR. Examination of the retained soil retrieved from around the soil vapor probes during the sampling process verified this to a depth of three feet.

To comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities, quarterly landfill gas monitoring must be conducted for explosive gases. The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

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To comply with the Main Post Landfill Operating Plan application permit, the quarterly landfill methane gas monitoring will be conducted in the following manner.

1.) Request and receive utility clearance from White Sands Missile Range.

2.) Non-discrete monitoring points will be installed along the facility perimeter at 300-foot intervals (27 collection points were identified).

3.) Monitoring points will include the inside of all facility structures; a Photo Ionization Detector (intrinsically safe) will be utilized before entering closed structures.

4.) Bar-hole or soil gas vapor probes will be installed for monitoring points to a depth of three feet.

5.) A Landtec GEM2000 Gas Analyzer or other combustible gas indicator (GEM2000) that utilizes the catalytic oxidation method or thermal conductivity will be used to detect and record combustible gas levels. Notify Regulatory Compliance Office, WSMR immediately if methane concentrations are detected at or near the limiting concentrations.

6.) Report all procedures used and the results in a quality that can be submitted to the State of New Mexico, Environment Department.

Sampling Plan

On September 18, 2007 SafeNet conducted monitoring operations for the possible migration of methane (CH_4) as directed by the WSMR Regulatory Compliance Office, in compliance with New Mexico Environmental Department, Solid Waste Bureau. A permit was obtained from WSMR as to the location of any buried utility lines (gas, water, electrical) at, near, or crossing the property boundary. The only utility identified was a phone line located in front of the guardhouse area. This area was avoided during the sampling event. Landfill gas monitoring points were then selected within the landfill area at the property boundary at approximately 300-foot intervals utilizing a Trumeter measuring wheel. A soil gas vapor probe was installed at each monitoring point utilizing the following procedures:

(1) Typical Soil Gas Vapor Probe Installation (27 each at 300' intervals):

- A pilot hole was first installed utilizing a heavy-duty hammer drill and soil probe, a 5/8-inch diameter rod with a stainless steel tip, which was driven approximately 2 ½ feet into the soil. Soils showed to be sandy with little silt.
- The soil probe was withdrawn to allow for the placement of the sampling tip (AMS Retract-A-Tip).
- Place the sampling tip onto the 5/8-inch hollow rod and a probe adapter that allowed for a ¼" ID Teflon sample tube to be attached. The heavy-duty hammer drill was used to drive the sample to a total depth of 3 feet below ground surface.
- The Landtec- GEM2000 was then attached to the Teflon tubing and a sample was collected. (See: GEM2000 *Infrared Gas Analyzer*).
- The probe was withdrawn from the hole and the screen checked for plugging or damage, when necessary probe screens were replaced as to insure appropriate consecutive readings and functionality of the probe.
- Each location was identified by a round marker attached with tin-plated wire onto the chain-linked or barbwire fence that surrounded the property, thus allowing for future sampling reference points.

Note: Operators measured and recorded the depth of each probe to insure standardization with each probe placement.

(2) On-site structures

There are two on-site structures, one is a small concrete building used as a landfill office and the other is a vacant guardhouse. The monitoring measurement was taken 6 feet from the north wall of the vacant structure. Landscaping gravel has been placed around the landfill office; therefore the sample by the office was moved to approximately 30 feet north of the building. All results were data logged and downloaded to computer (See: *Results and Findings*).

(3) GEM2000 **Infrared Gas Analyzer**

The Landtec GEM2000 is a compact field instrument that can and was configured to analyze the methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) levels in landfill gas (LFG). It is an approved instrument in monitoring migration gases, active and passive gas extraction systems and measuring LFG at flares or other approved control systems. This instrument uses computer technology that displays on-screen menus to provide a simplified user interface for accurate data analysis and recording. All information collected was dated and time stamped and readings were stored in memory. The data was later downloaded via a serial connection to a computer, then inserted into our table template and submitted into our report as Landfill Gas Monitoring Results.

This unit works with a vacuum sample pump that draws a quantity of gas through the sample hose, in-line water trap and the user replaceable particulate filter, into a sample chamber. An infrared beam is projected, via sapphire windows, through the gas sample. On the other side of the chamber, methane and carbon dioxide detectors sense the beam. A microprocessor calculates the amount of infrared light absorbed at different wavelengths and determines the various gas concentrations.

When a sufficient amount of gas has entered the sample chamber, gas concentration levels were shown on the display as it stabilizes (approximately 60 THIRDs). The SafeNet technician, with a few keystrokes, stores the measurement data in memory utilizing a unique I.D. code, as well as the date and time.

(4) Combustible Gas Instrument Field Calibration

The Landtec GEM2000 Gas Analyzer utilizes an internal pump to pull air into the calibration map that is accessed by its microprocessor for baseline reference data. This reference data, as stated by the manufacture, was programmed into the GEM2000 during the factory calibration using various gas mixtures in an environmental chamber. The GEM2000 can be cleared of user calibration settings and restored to "factory settings" as needed. The factory calibration has been designed to give the best possible results over a wide range of conditions. However, SafeNet technicians performed "field calibrations" to improve the instrument's accuracy for this monitoring event. Each field calibration on-site was performed at stabilized working temperature. Whenever temperature changes occurred during the operation, the GEM2000 was re-calibrated (example: the cool of the morning to the hottest part of the day). Field calibration was performed using the manufacturer's recommended gas mixture for low concentrations which are 15/15 (15% methane, 15% carbon dioxide), 4 % oxygen and balance nitrogen, 15/15% and 4.0% oxygen/nitrogen. (See Landtec GEM2000 Operation Manual for procedures)

(5) Probe Purging:

The probe condition was checked for structural integrity and suitability for monitoring before each use. After the probe had been driven to the desired sampling depth (3 feet), it was purged (evacuated) to remove ambient air. Typically purging can be accomplished using either a hand pump, peristaltic pump, or pump attached to the top of the probe via PVC or polyethylene tubing. The GEM2000 used in this event (see GEM2000 *Infrared Gas Analyzer*) was designed with an internal pump that did actively draw the vapor sample into the instrument for continual analysis.

The GEM2000 was used alone, due to the shallow depth of each probe in this monitoring event, for the purging of each probe point via the internal pump. Purge time was based on the volume of the probe sampling system, and purging done long enough to remove 1 to 5 casing volumes of air from the system. Purge volumes and times were recorded within the GEM2000, which are presented as Landfill Gas Monitoring Results, and also on field forms. A particulate-moisture trap was placed between the probe and the GEM2000 to prevent damage to the instrument. This trap was checked before each use or sampling point due to the soil make up (sand and silt) with the possible vacuum pickup of particulate from the probe. The GEM2000 was directly connected to the vapor probe with ¼" Teflon tubing.

Results and Findings

SAMPLE NUMBER SES-	CH_4%	CO_2 %	O_2%	ATMOSPHERIC PRESSURE "HG"	Temp. DegF	DEPTH FEET
1	0.1	0	20.9	29.90	79	3ft
2	0	0	20.3	29.90	79	3ft
3	0.1	0	20.9	29.90	79	3ft
4	0	0	21.3	29.90	79	3ft
5	0.1	0	21.1	29.90	79	3ft
6	0.1	0	20.9	29.90	79	3ft
7	0.1	0	20.9	29.90	79	3ft
8	0	0	21.1	29.90	79	3ft
9	0.2	0	20.8	29.90	79	3ft
10	0.1	0	20.7	29.90	79	3ft
11	0.1	0	20.9	29.90	79	3ft
12	0.3	0	20.9	29.90	79	3ft
13	0.1	0	21.1	29.90	79	3ft
14	0.1	0	21.1	29.90	79	3ft
15	0.1	0	21.0	29.90	79	3ft
16	0.0	0	20.8	29.90	79	3ft
17	0.1	0	20.9	29.90	79	3ft
18	0.1	0	21.1	29.90	79	3ft
19	0.2	0	21.2	29.90	79	3ft
20	0.1	0	21.0	29.90	79	3ft
21	0.1	0	20.9	29.90	79	3ft
22	0.1	0	21.2	29.90	79	3ft
23	0	0	21.1	29.90	79	3ft
24	0.2	0	20.9	29.90	79	3ft
25	0.1	0	21.1	29.90	79	3ft
26	0.1	0	21.1	29.90	79	3ft
27	0.0	0	20.1	29.90	79	3ft

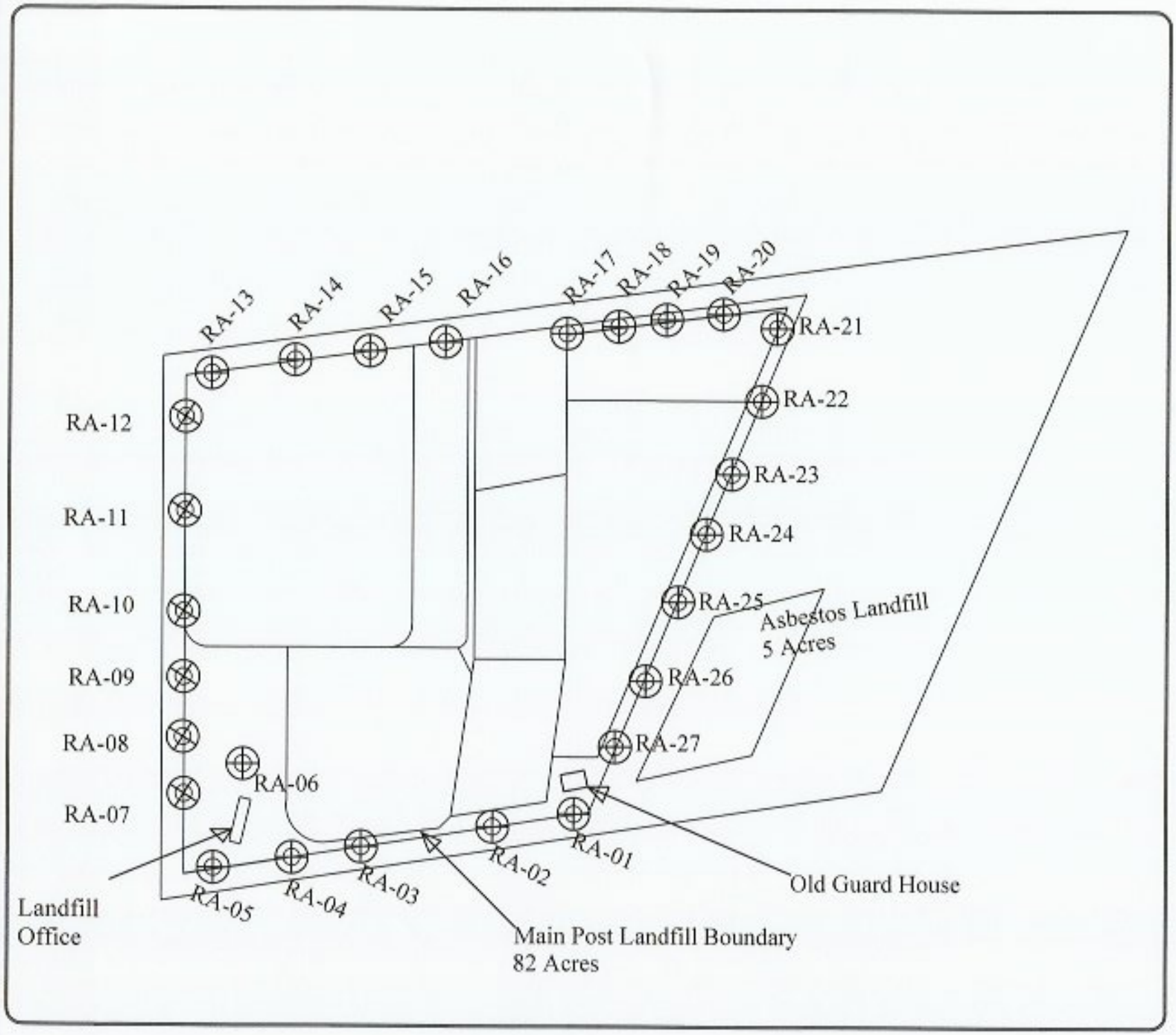
Discussion

This quarterly monitoring was conducted in accordance with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities. This field investigation as shown in the results, verified non-detectable levels of methane at the facility's property boundary and within all facility's structures.

Sincerely,

Oscar E. Ayala
SafeNet Services, LLC
cc: file

Appendix A



SafeNet

Environmental Services LLC
6500 Boeing Suite T-1
El Paso, Texas 79925
(915) 587-6900

WHITE SANDS MISSILE RANGE

METHANE MONITORING

LOCATION
White Sands Missile Range Landfill

LEGEND

Samples Location

REVISIONS

INSPECTED BY: O.E. AYALA
DRAWN BY: J.E. AYALA
DATE: 09/18/07
PROJECT #:
SHEET #:

QUARTERLY
LANDFILL METHANE MONITORING
FOURTH QUARTER 2007
WHITE SANDS MISSILE RANGE

Submitted to:

Joe Talamantes

U.S. Army
White Sands Missile Range
National Range Support Directorate
Engineering Division
White Sands Missile Range, New Mexico 88002

Submitted by:

SafeNet Environmental Services, LLC
6500 Boeing Suite T-1
El Paso, Texas 79925

CH_4 Gas survey completed and prepared by:

Concurrence:

12/04/2007
Oscar E. Ayala

12/04/2007
Juan E. Ayala

QUARTERLY LANDFILL GAS MONITORING
FOURTH QUARTER 2007
THE MAIN POST CONSTRUCTION AND DEMOLITION LANDFILL
WHITE SANDS MISSILE RANGE

Executive Summary

The following report pertains to the ongoing quarterly landfill gas monitoring for the landfill located at the Main Post Construction and Demolition Landfill, White Sands Missile Range, New Mexico. At the request of White Sands Missile Range, SafeNet Services, LLC (SafeNet) conducted the gas monitoring on December 4, 2007, for the Fourth quarter of 2007.

Findings:

Methane Gas- Results indicate that no methane gas was detected at any of the sampling points.

This facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence. The reported site lithology is a sandy soil with some silt to thirty feet. This quarterly monitoring was conducted in accordance with, and to comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities.

The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

1.) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
2.) The lower explosive limit for gases at the property boundary.

On December 4, 2007, SafeNet personnel conducted monitoring operations for the possible migration of methane (CH_4) as directed by the Regulatory Compliance Office, White Sands Missile Range (WSMR) and in compliance with New Mexico Environmental Department, Solid Waste Bureau. Landfill gas monitoring points were selected within the landfill area at the property boundary at approximately 300-foot intervals. Each sampling point was taken at a total depth of three (3) feet below ground surface (bgs.) utilizing soil gas sampling technology. Monitoring points are presented in the Methane Sampling Location Map located in the Appendix. This monitoring event also encompassed all buildings within the permitted facility. All gas-monitoring points were conducted by constructing monitoring probes using the soil gas vapor impact probe system, and a Landtec GEM2000 portable gas detection meter. The GEM2000 meter was properly calibrated as to the manufactures specifications and utilized within the instrument's manufactures criteria for monitoring landfill gas. Identical methodology was utilized throughout the gas-monitoring event.

A total of twenty-seven (27) gas-monitoring points were conducted, within the landfill permitted area. Results from our on-site field analyses are presented as Landfill Gas Monitoring Results, downloaded from the Landtec GEM2000.

Introduction and Scope

The Main Post Construction and Demolition Landfill (landfill facility) is located at White Sands Missile Range, New Mexico. The facility has a fence line of 2420.58 meters or 7941.54 feet enclosed by chain-linked and barbed wire fence with two buildings. One building is currently utilized as a guardhouse and the other is a vacant guardhouse within the property boundary and is represented in this report as "Methane Sampling Location Map" located in the Appendix. The stratigraphy beneath the site is a sandy soil with some silt to thirty feet, as reported by WSMR. Examination of the retained soil retrieved from around the soil vapor probes during the sampling process verified this to a depth of three feet.

To comply in part with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities, quarterly landfill gas monitoring must be conducted for explosive gases. The requirements are to ensure the concentration of explosive gases generated by this facility or practice comply with 20 NMAC 9.1, Subpart IV 403 C, and shall not exceed:

1.) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
2.) The lower explosive limit for gases at the property boundary.

The sampling probe used in this monitoring event is a patented, re-usable; AMS Retract-A-Tip designed as a survey tool for collection of discrete soil gas samples. It is constructed of hardened stainless steel and is designed to open when the drive extensions are retracted by 2 inches. The sampling probe was driven into the soil using a heavy duty Bosch 11245 rotary hammer drill with a 5/8-inch diameter x 3-foot long extension drive rod. Once installed, the drive extension was retracted 2 inches. In this open position, a gas sample was collected utilizing a Landtec GEM2000 meter. Teflon tubing was used in conjunction with the GEM2000 for soil gas transference media.

To comply with the Main Post Landfill Operating Plan application permit, the quarterly landfill methane gas monitoring will be conducted in the following manner.

1.) Request and receive utility clearance from White Sands Missile Range.

2.) Non-discrete monitoring points will be installed along the facility perimeter at 300-foot intervals (27 collection points were identified).

3.) Monitoring points will include the inside of all facility structures; a Photo Ionization Detector (intrinsically safe) will be utilized before entering closed structures.

4.) Bar-hole or soil gas vapor probes will be installed for monitoring points to a depth of three feet.

5.) A Landtec GEM2000 Gas Analyzer or other combustible gas indicator (GEM2000) that utilizes the catalytic oxidation method or thermal conductivity will be used to detect and record combustible gas levels. Notify Regulatory Compliance Office, WSMR immediately if methane concentrations are detected at or near the limiting concentrations.

6.) Report all procedures used and the results in a quality that can be submitted to the State of New Mexico, Environment Department.

Sampling Plan

On December 4, 2007 SafeNet conducted monitoring operations for the possible migration of methane (CH_4) as directed by the WSMR Regulatory Compliance Office, in compliance with New Mexico Environmental Department, Solid Waste Bureau. A permit was obtained from WSMR as to the location of any buried utility lines (gas, water, electrical) at, near, or crossing the property boundary. The only utility identified was a phone line located in front of the guardhouse area. This area was avoided during the sampling event. Landfill gas monitoring points were then selected within the landfill area at the property boundary at approximately 300-foot intervals utilizing a Trumeter measuring wheel. A soil gas vapor probe was installed at each monitoring point utilizing the following procedures:

(1) Typical Soil Gas Vapor Probe Installation (27 each at 300' intervals):

- A pilot hole was first installed utilizing a heavy-duty hammer drill and soil probe, a 5/8-inch diameter rod with a stainless steel tip, which was driven approximately 2 ½ feet into the soil. Soils showed to be sandy with little silt.

- The soil probe was withdrawn to allow for the placement of the sampling tip (AMS Retract-A-Tip).

- Place the sampling tip onto the 5/8-inch hollow rod and a probe adapter that allowed for a ¼" ID Teflon sample tube to be attached. The heavy-duty hammer drill was used to drive the sample to a total depth of 3 feet below ground surface.

- The Landtec- GEM2000 was then attached to the Teflon tubing and a sample was collected. (See: GEM2000 *Infrared Gas Analyzer*).

- The probe was withdrawn from the hole and the screen checked for plugging or damage, when necessary probe screens were replaced as to insure appropriate consecutive readings and functionality of the probe.

- Each location was identified by a round marker attached with tin-plated wire onto the chain-linked or barbwire fence that surrounded the property, thus allowing for future sampling reference points.

Note: Operators measured and recorded the depth of each probe to insure standardization with each probe placement.

(2) On-site structures

There are two on-site structures, one is a small concrete building used as a landfill office and the other is a vacant guardhouse. The monitoring measurement was taken 6 feet from the north wall of the vacant structure. Landscaping gravel has been placed around the landfill office; therefore the sample by the office was moved to approximately 30 feet north of the building. All results were data logged and downloaded to computer (See: *Results and Findings*).

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When a sufficient amount of gas has entered the sample chamber, gas concentration levels were shown on the display as it stabilizes (approximately 60 THIRDs). The SafeNet technician, with a few keystrokes, stores the measurement data in memory utilizing a unique I.D. code, as well as the date and time.

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The Landtec GEM2000 Gas Analyzer utilizes an internal pump to pull air into the calibration map that is accessed by its microprocessor for baseline reference data. This reference data, as stated by the manufacture, was programmed into the GEM2000 during the factory calibration using various gas mixtures in an environmental chamber. The GEM2000 can be cleared of user calibration settings and restored to "factory settings" as needed. The factory calibration has been designed to give the best possible results over a wide range of conditions. However, SafeNet technicians performed "field calibrations" to improve the instrument's accuracy for this monitoring event. Each field calibration on-site was performed at stabilized working temperature. Whenever temperature changes occurred during the operation, the GEM2000 was re-calibrated (example: the cool of the morning to the hottest part of the day). Field calibration was performed using the manufacturer's recommended gas mixture for low concentrations which are 15/15 (15% methane, 15% carbon dioxide), 4 % oxygen and balance nitrogen, 15/15% and 4.0% oxygen/nitrogen. (See Landtec GEM2000 Operation Manual for procedures)

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The probe condition was checked for structural integrity and suitability for monitoring before each use. After the probe had been driven to the desired sampling depth (3 feet), it was purged (evacuated) to remove ambient air. Typically purging can be accomplished using either a hand pump, peristaltic pump, or pump attached to the top of the probe via PVC or polyethylene tubing. The GEM2000 used in this event (see GEM2000 *Infrared Gas Analyzer*) was designed with an internal pump that did actively draw the vapor sample into the instrument for continual analysis.

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Results and Findings

SAMPLE NUMBER SES-	CH_4%	CO_2 %	O_2%	ATMOSPHERIC PRESSURE "HG"	Temp. DegF	DEPTH FEET
1	0.1	0	19.6	26.07	70	3ft
2	0	0	19.5	26.07	70	3ft
3	0.1	0	19.6	26.07	70	3ft
4	0	0	19.7	26.07	70	3ft
5	0.1	0	19.7	26.07	70	3ft
6	0.1	0	19.8	26.07	70	3ft
7	0.1	0	19.8	26.07	70	3ft
8	0.1	0	19.9	26.07	70	3ft
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10	0.1	0	19.8	26.07	70	3ft
11	0.1	0	20.0	26.07	70	3ft
12	0	0	20.2	26.07	70	3ft
13	0	0	19.9	26.07	70	3ft
14	0.1	0	19.8	26.07	70	3ft
15	0	0	19.6	26.07	70	3ft
16	0.1	0	20.0	26.07	70	3ft
17	0	0	20.0	26.07	70	3ft
18	0.2	0	20.1	26.07	70	3ft
19	0.1	0	20.1	26.07	70	3ft
20	0	0	20.3	26.07	70	3ft
21	0.1	0	20.5	26.07	70	3ft
22	0	0	20.2	26.07	70	3ft
23	0.1	0	20.1	26.07	70	3ft
24	0.2	0	20.4	26.07	70	3ft
25	0.1	0	19.6	26.07	70	3ft
26	0.1	0	19.8	26.07	70	3ft
27	0.0	0	20.2	26.07	70	3ft

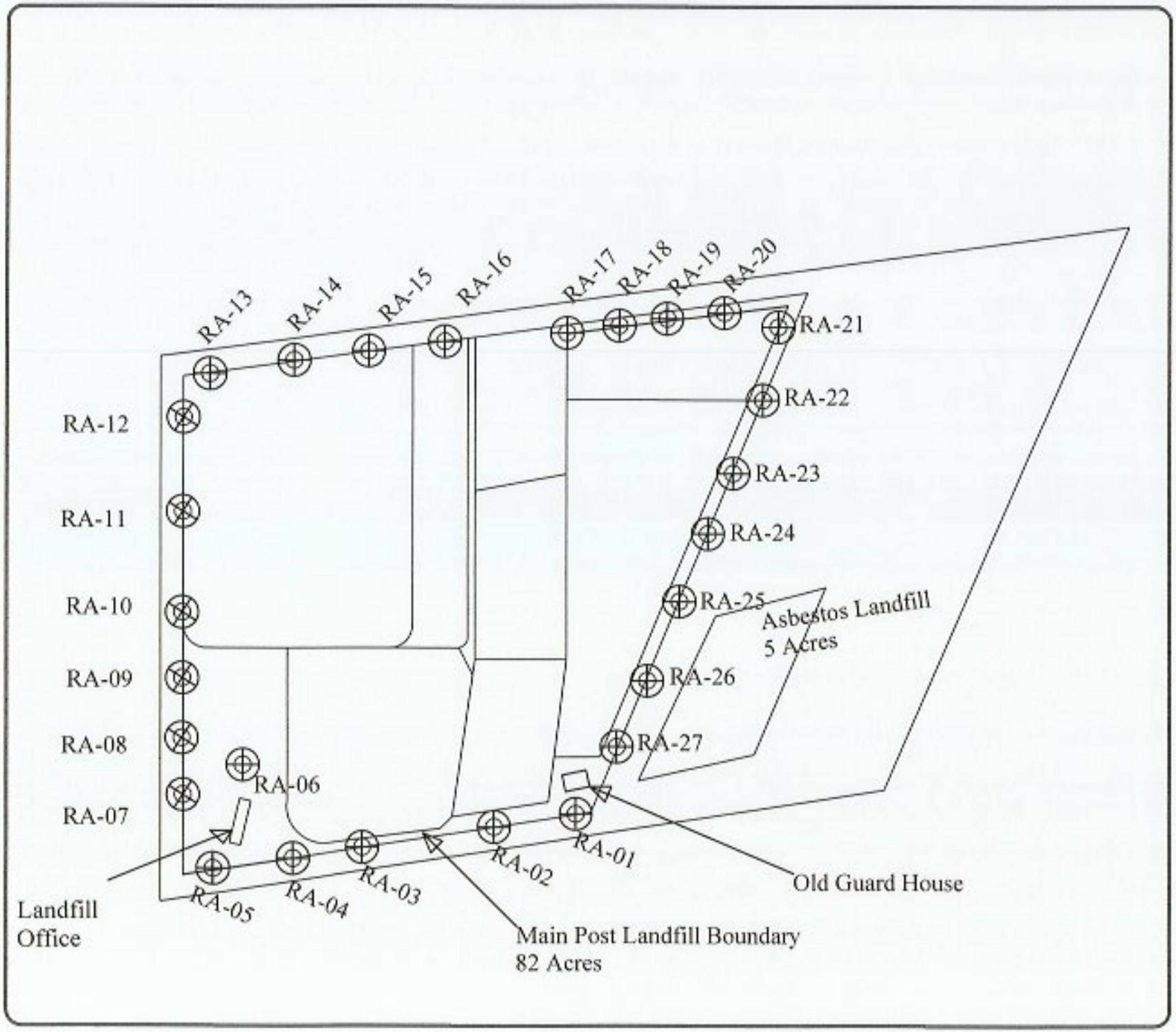
Discussion

This quarterly monitoring was conducted in accordance with the New Mexico Environmental Department, Solid Waste Bureau, 20 NMAC 9.1 permitting for solid waste facilities. This field investigation as shown in the results, verified non-detectable levels of methane at the facility's property boundary and within all facility's structures.

Sincerely,

Oscar E. Ayala
SafeNet Services, LLC
cc: file

Appendix A



SafeNet
Environmental Services LLC
6500 Boeing Suite T-1
El Paso, Texas 79925
(915) 587-6900

WHITE SANDS MISSILE RANGE

METHANE MONITORING

LOCATION
White Sands Missile Range Landfill

LEGEND
Samples Location

REVISIONS

INSPECTED BY: O.E. AYALA
DRAWN BY: J.E. AYALA
DATE: 12/04/2007
PROJECT #:
SHEET #:

I. 2007 General Information Form

Facility Information January 1-December 31, 2007

Permit/Registration #

County: Socorro Check One: ☑ Open Facility ☐ Closed Facility

Facility Name WSMR PHETS Landfill Phone 575-678-1007

Contact Person Javier Mendoza E-Mail Address javier.mendoza@us.army.mil

Facility Mailing Address 100 Headquarters Ave. ATTN: IMSW-WSM-PW

City: White Sands Missile Range (WSMR) State: NM Zip Code: 88002

Physical Location of Facility (City/County Road) Approximately 13 miles south of Stallion Range Center, between Range Roads 7 and 13, WSMR, NM. T 8 S, R 4 E, portions of Sections 13 & 14

Facility Operator US Army WSMR Phone 575-678-8966

Contact Person Thomas A. Ladd E-mail Address ta.ladd@us.army.mil

Street Address 100 Headquarters Ave. ATTN: IMSW-WSM-PW

City WSMR State: NM Zip Code: 88002

Facility Owner Same Phone

Contact Person E-mail Address

Street Address

City State: Zip Code:

Land Owner US Army WSMR Phone 575-678-2220

Contact Person Gary D. Giebel E-mail Address gary.giebel@us.army.mil

Street Address 100 Headquarters Ave. ATTN: IMSW-WSM-ZA

City WSMR State: NM Zip Code: 88002

Financial Assurance

☑ Check One Box

☐ Updated Financial Assurance Attached

☐ Financial Assurance required but not Attached (Explain on Comment Sheet)

☑ Financial Assurance not required (Explain on Comment Sheet)

Questions?
Call 505-827-0197,
or 505-476-3561

Landfills Only

Check One: ☑ Open Landfill ☐ Closed Landfill

Capacity Information for Open Landfills ***(If not provided explain on Comment Sheet)***

Provide Landfill Capacity **Used** during 2006 177 (Cubic Yards)

Provide **Remaining** Landfill Capacity 435103 (Cubic Yards) (See *V. Capacity Worksheet*.)

Provide **Remaining** Landfill Life 114 (Years) (See *V. Capacity Worksheet*.)

Number of acres at current site, not permitted, that could be used for diposal in the future

Were there any changes in operations that reduced the active life of the landfill by 25% or more?

☑ No ☐ Yes (Attach Notification)

Monitoring Results for Open Landfills (and Closed Landfill in Post-Closure Care)

☑ **No** ☐ **Yes** Summary of Landfill Gas Monitoring Results Enclosed (if not explain on Comment Sheet)

☑ **No** ☐ **Yes** Summary of Landfill Ground Water Monitoring Results Enclosed (if not explain on Comment Sheet)

☑ **No** ☐ **Yes** Summary of Leachate Generated & Treated or Disposed Enclosed (if not explain on Comment Sheet)

Closure and Post-Closure Activity Date of Closure

Total Acreage Used for Disposal (as of 12/31/06) (Acres)

Intermediate Cover (Acres) Area Seeded (Acres)

Total Acreage with Final Cover Installed (per Closure Plan) (Acres)

II. 2007 Material and Solid Waste Management Form

Facility Name: WSMR PHETS Landfill	**PRINT** Name, Title and Telephone # of the Person Completing Form: James Thompson, Task Coordinator, 575-678-1941
County: Dona Ana — Permit or Registration #	Facility Type: ☑ Landfill ☐ Recycling ☐ Composting ☐ Transfer/Convenience Center

	Material Type (See Instructions)	Method ☒ Mark One: Weighed	Method ☒ Mark One: Estimated	Waste Origin: Amount of In-State Material Received in **Tons** (a)	Waste Origin: Amount Out-of State Materials Received in **Tons** (b)	Managed On-Site: Landfilled or Treated (c)	Managed On-Site: Composted or Mulched (d)	Managed On-Site: Beneficially Used (e)	Sent Off-Site to be: Treated, Disposed, Incinerated (f)	Sent Off-Site to be: Recycled, Mulched, Composted (g)	Sent Off-Site to be: Beneficially Used (h)	Sent to: Provide Facility Name, City and State (i)
1	MSW											
2	C & D		x			96.05						WSMR PHETS Landfill, WSMR, NM
3	Clean Fill											
Special Wastes:												
4	Industrial Waste											
5	Regulated Asbestos											
6	Infectious Waste											
7	Ash											
8	PCS											
9	Offal											
10	Bio-Solids (Treated Sewage Sludge)											
11	Other Sludges											
12	Other Special Waste											
Other Materials:												
13	Brush/Green Waste											
14	Scrap Tires											
15	Motor Oil											
16	Antifreeze											
17	Lead Acid Batteries											
18	HHW											
19	Other Wastes											
20	**TOTAL**					96.05						

Please refer to the enclosed tables *Volume to Weight Conversion Factors* to convert cubic yards and gallons to TONS.

Questions?
Call 505-827-0197
or 505-476-3561

III. 2007 Recyclable Materials Form

Facility Name: WSMR PHETS Landfill	**PRINT** Name, Title & Telephone # of Person Completing Form: James Thompson, Task Coordinator, 575-678-1941
County: Socorro / Permit or Registration #	Facility Type: ☑ Landfill ☐ Recycling ☐ Composting ☐ Transfer/Convenience Center

	Type of Recyclable	Method ☒ Mark One: Weighed	Method: Estimated	Material Origin: Amount of In-State Materials Received in **Tons** (a)	Material Origin: Amount of Out-of-State Materials Received in **Tons** (b)	Managed On-Site: (c) Beneficially Used or Re-used	Sent Off-Site to be: (d) Recycled or Processed	Sent Off-Site to be: (e) Beneficially Used	Facility sent to: (f) Provide Facility Name and City/State
Paper:									
1	Mixed Paper								
2	Cardboard (OCC)								
3	Newspaper (ONP)								
4	Office Paper								
5	Phone Books								
6	Chip Board								
Containers:									
7	Plastics								
8	Aluminum								
9	Steel Cans								
10	Glass								
11	Mixed Containers								
Other Materials:									
12	Scrap Metals/ White Goods								
13	Carpet Padding								
14	Pallets								
15	Electronic Scrap								
16	Plastic Films								
17	Other Plastics								
18	Household Items								
19	Textiles/Clothing								
20	Other								
21	**TOTAL**								

Please refer to the enclosed tables *Volume to Weight Conversion Factors* to convert cubic yards and gallons to TONS.

Questions?
Call 505-827-0197
or 505-476-3561

IV. 2007 Comment Sheet

Name of Facility:	WSMR PHETS Landfill
Name of Person completing form:	James Thompson, White Sands Technical Services, LLC

Financial Assurance not enclosed because:

Not necessary since WSMR is a Federal government facility and is exempt from this requirement.

Gas Monitoring Results not enclosed because:

C&D Landfills are exempt from gas monitoring.

Ground Water Monitoring Results not enclosed because:

C&D Landfills are exempt from groundwater monitoring.

Leachate Generation Report not enclosed because:

C&D Landfills are exempt from leachate generation reporting.

No leachate collection system exists.

Capacity Information not provided because:

Calculations from the capacity worksheet showed greater than 1000 years life. Thus, WSMR maintained the 114 years calculated in 2006.

Questons?
Call 505-827-0197or 505-476-3561

Revised 12/13/07

V. Capacity Worksheet

Landfill Capacity Calculation Worksheet for__ WSMR PHETS Landfill

All owners operators are required to provide information regarding landfill capacity. To calculate your landfill's remaining capacity you may use this Excel worksheet, a terrain computer model program such as "TerraModel ToolPak", or hire an engineering firm to complete the calculations. If you use the worksheet it will calculate the values K, L and M for you, all you need to do is input the information as requested for Items A through J. A completed SAMPLE is also provided for your reference and to understand the process. Once completed include this form as part of your Annual Report.

There are threesheets in this data base. Click on the labeled tabs below to acess sheets

Enter your data here

Landfill information

(A)	Total landfill area	32.8	Acres
(B)	Total permitted volume (gross capacity)	952,512	Cubic yards
(C)	Thickness of liner protective soil layer	0.0	Feet
(D)	Thickness of final cover	2.5	Feet
(E)	Estimated percentage of gross capacity taken by daily and intermediate covers (if unknown, use default value of 25%)	25.0	%

Waste Information

Note: The worksheet allows you to enter the amount of received waste based on combination of two different types of records: tonnage and gate-yards. Combined, these records should represent the total received waste. Mark appropriate boxes if values are actual or estimated .

				Actual	Estimated
(F)	Waste received through 2006 based on tonnage (if no tonnage receipts, enter 0)	0.0	Tons	☐	☐
(G)	Waste received through 2006 based on gate-yards (if no gate-yard receipts, enter 0)	293,394	Cubic yards	☐	X
(H)	Waste received in 2007 based on tonnage (if no tonnage receipts, enter 0)	97.1	Tons	☐	X
(I)	Waste received in 2007 based on gate-yards (if no gate-yard receipts, enter 0)		Cubic yards	☐	☐
(J)	Compaction rate of emplaced waste (for example, enter 3 for 3 to 1 compaction). If wastes are being compacted but compaction rate is unknown, enter default value of 2 for a conservative result. If no compaction, enter 1.	2.0			

Calculations

Note: If the calculations are not performed automatically by the worksheet, complete them manually using the provided formulas.

Do not add values for K, L, and M

(K)	**Net waste capacity** K=B - A*(C+D)*4840/3 - B*E/100	582,091	Cubic yards
(L)	**Remaining permitted waste capacity** L=K - (F+H)*6/J - (G+I)/J	435,103	Cubic yards
(M)	**Estimated remaining site life** M=L/(H*6/J + I/J)	1,494.4	Years

Notes:

K: 4,840 = square yards in acre

L: 6 = number of uncompacted cubic yards in 1 ton

Form Completed by:___James Thompson_____

Telephone number:_____575-678-1941_____

I. 2007 General Information Form

Facility Information January 1-December 31, 2007

Permit/Registration #

County: Socorro — Check One: ☑ Open Facility ☐ Closed Facility

Facility Name WSMR Stallion Range Center Landfill — Phone 575-678-1007

Contact Person Javier Mendoza — E-Mail Address javier.mendoza@us.amry.mil

Facility Mailing Address 100 Headquarters Ave. ATTN: IMSW-WSM-PW

City: White Sands Missile Range (WSMR) — State: NM — Zip Code: 88002

Physical Location of Facility (City/County Road) Range Road 7, near Stallion Range Center, WSMR, NM

Facility Operator US Army WSMR — Phone 575-678-8966

Contact Person Thomas A. Ladd — E-mail Address ta.ladd@us.army.mil

Street Address 100 Headquarters Ave. ATTN: IMSW-WSM-PW

City WSMR — State: NM — Zip Code: 88002

Facility Owner Same — Phone

Contact Person — E-mail Address

Street Address

City — State: — Zip Code:

Land Owner US Army WSMR — Phone 575-678-2220

Contact Person Gary D. Giebel — E-mail Address gary.giebel@us.army.mil

Street Address 100 Headquarters Ave. ATTN: IMSW-WSM-ZA

City WSMR — State: NM — Zip Code: 88002

Financial Assurance

☑ Check One Box

☐ Updated Financial Assurance Attached

☐ Financial Assurance required but not Attached (Explain on Comment Sheet)

☑ Financial Assurance not required (Explain on Comment Sheet)

Questions?
Call 505-827-0197,
or 505-476-3561

Landfills Only

Check One: ☑ Open Landfill ☐ Closed Landfill

Capacity Information for Open Landfills ***(If not provided explain on Comment Sheet)***

Provide Landfill Capacity **Used** during 2006 819.9 (Cubic Yards)

Provide **Remaining** Landfill Capacity 34761 (Cubic Yards) (See *V. Capacity Worksheet*.)

Provide **Remaining** Landfill Life 42.4 (Years) (See *V. Capacity Worksheet*.)

Number of acres at current site, not permitted, that could be used for diposal in the future 40

Were there any changes in operations that reduced the active life of the landfill by 25% or more?

☑ No ☐ Yes (Attach Notification)

Monitoring Results for Open Landfills (and Closed Landfill in Post-Closure Care)

☑ **No** ☐ **Yes** Summary of Landfill Gas Monitoring Results Enclosed (if not explain on Comment Sheet)

☑ **No** ☐ **Yes** Summary of Landfill Ground Water Monitoring Results Enclosed (if not explain on Comment Sheet)

☑ **No** ☐ **Yes** Summary of Leachate Generated & Treated or Disposed Enclosed (if not explain on Comment Sheet)

Closure and Post-Closure Activity — Date of Closure

Total Acreage Used for Disposal (as of 12/31/06) (Acres)

Intermediate Cover 0 (Acres) — Area Seeded 0 (Acres)

Total Acreage with Final Cover Installed (per Closure Plan) 0 (Acres)

II. 2007 Material and Solid Waste Management Form

Facility Name: WSMR Stallion Range Center Landfill	**PRINT** Name, Title and Telephone # of the Person Completing Form: James Thompson, Task Coordinator, 575-678-1941
County: Socorro — Permit or Registration #	Facility Type: ☑ Landfill ☐ Recycling ☐ Composting ☐ Transfer/Convenience Center

	Material Type (See Instructions)	Method ☒ Mark One: Weighed	Method ☒ Mark One: Estimated	Waste Origin: Amount of In-State Material Received in **Tons** (a)	Waste Origin: Amount Out-of State Materials Received in **Tons** (b)	Managed On-Site: Landfilled or Treated (c)	Managed On-Site: Composted or Mulched (d)	Managed On-Site: Beneficially Used (e)	Sent Off-Site to be: Treated, Disposed, Incinerated (f)	Sent Off-Site to be: Recycled, Mulched, Composted (g)	Sent Off-Site to be: Beneficially Used (h)	Sent to: Provide Facility Name, City and State (i)
1	MSW											
2	C & D											
3	Clean Fill											
Special Wastes:												
4	Industrial Waste											
5	Regulated Asbestos											
6	Infectious Waste											
7	Ash											
8	PCS											
9	Offal											
10	Bio-Solids (Treated Sewage Sludge)											
11	Other Sludges											
12	Other Special Waste											
Other Materials:												
13	Brush/Green Waste											
14	Scrap Tires											
15	Motor Oil											
16	Antifreeze											
17	Lead Acid Batteries											
18	HHW											
19	Other Wastes		x			273.30						Office waste deposited at WSMR Stallion Landfill, WSMR, NM
20	**TOTAL**					273.30						

Please refer to the enclosed tables *Volume to Weight Conversion Factors* to convert cubic yards and gallons to TONS.

Questions?
Call 505-827-0197
or 505-476-3561

III. 2007 Recyclable Materials Form

Facility Name: WSMR Stallion Range Center Landfill	**PRINT** Name, Title & Telephone # of Person Completing Form: James Thompson, Task Coordinator, 575-678-1941
County: Socorro / Permit or Registration #	Facility Type: ☑ Landfill ☐ Recycling ☐ Composting ☐ Transfer/Convenience Center

	Type of Recyclable	Method ☒ Mark One: Weighed	Method: Estimated	Material Origin: Amount of In-State Materials Received in **Tons** (a)	Material Origin: Amount of Out-of-State Materials Received in **Tons** (b)	Managed On-Site: (c) Beneficially Used or Re-used	Sent Off-Site to be: (d) Recycled or Processed	Sent Off-Site to be: (e) Beneficially Used	Facility sent to: (f) Provide Facility Name and City/State
Paper:									
1	Mixed Paper								
2	Cardboard (OCC)								
3	Newspaper (ONP)								
4	Office Paper								
5	Phone Books								
6	Chip Board								
Containers:									
7	Plastics								
8	Aluminum								
9	Steel Cans								
10	Glass								
11	Mixed Containers								
Other Materials:									
12	Scrap Metals/ White Goods								
13	Carpet Padding								
14	Pallets								
15	Electronic Scrap								
16	Plastic Films								
17	Other Plastics								
18	Household Items								
19	Textiles/Clothing								
20	Other								
21	**TOTAL**								

Please refer to the enclosed tables *Volume to Weight Conversion Factors* to convert cubic yards and gallons to TONS.

Questions?
Call 505-827-0197
or 505-476-3561

IV. 2007 Comment Sheet

Name of Facility:	WSMR Stallion Range Center Landfill
Name of Person completing form:	James Thompson, White Sands Technical Services, LLC

Financial Assurance not enclosed because:

Not necessary since WSMR is a Federal government facility and is exempt from this requirement.

Gas Monitoring Results not enclosed because:

None. Exempt (NMAC 20.9.1.108.B)

Ground Water Monitoring Results not enclosed because:

None. Exempt (NMAC 20.9.1.108.B)

Leachate Generation Report not enclosed because:

None. Exempt (NMAC 20.9.1.108.B)

No leachate collection system exists.

Capacity Information not provided because:

Questons?
Call 505-827-0197or 505-476-3561

Revised 12/13/07

V. Capacity Worksheet

Landfill Capacity Calculation Worksheet for__ WSMR Stallion Range Center Landfill

All owners operators are required to provide information regarding landfill capacity. To calculate your landfill's remaining capacity you may use this Excel worksheet, a terrain computer model program such as "TerraModel ToolPak", or hire an engineering firm to complete the calculations. If you use the worksheet it will calculate the values K, L and M for you, all you need to do is input the information as requested for Items A through J. A completed SAMPLE is also provided for your reference and to understand the process. Once completed include this form as part of your Annual Report.

There are threesheets in this data base. Click on the labeled tabs below to acess sheets

Enter your data here

Landfill information

(A)	Total landfill area	5.0	Acres
(B)	Total permitted volume (gross capacity)	82,280	Cubic yards
(C)	Thickness of liner protective soil layer	0.0	Feet
(D)	Thickness of final cover	2.5	Feet
(E)	Estimated percentage of gross capacity taken by daily and intermediate covers (if unknown, use default value of 25%)	25.0	%

Waste Information

Note: The worksheet allows you to enter the amount of received waste based on combination of two different types of records: tonnage and gate-yards. Combined, these records should represent the total received waste. Mark appropriate boxes if values are actual or estimated .

				Actual	Estimated
(F)	Waste received through 2006 based on tonnage (if no tonnage receipts, enter 0)	1,987.5	Tons	☐	X
(G)	Waste received through 2006 based on gate-yards (if no gate-yard receipts, enter 0)		Cubic yards	☐	☐
(H)	Waste received in 2007 based on tonnage (if no tonnage receipts, enter 0)	273.3	Tons	☐	X
(I)	Waste received in 2007 based on gate-yards (if no gate-yard receipts, enter 0)		Cubic yards	☐	☐
(J)	Compaction rate of emplaced waste (for example, enter 3 for 3 to 1 compaction). If wastes are being compacted but compaction rate is unknown, enter default value of 2 for a conservative result. If no compaction, enter 1.	2.0			

Calculations

Note: If the calculations are not performed automatically by the worksheet, complete them manually using the provided formulas.

Do not add values for K, L, and M

(K)	**Net waste capacity** K=B - A*(C+D)*4840/3 - B*E/100	41,543	Cubic yards
(L)	**Remaining permitted waste capacity** L=K - (F+H)*6/J - (G+I)/J	34,761	Cubic yards
(M)	**Estimated remaining site life** M=L/(H*6/J + I/J)	42.4	Years

Notes:

K: 4,840 = square yards in acre

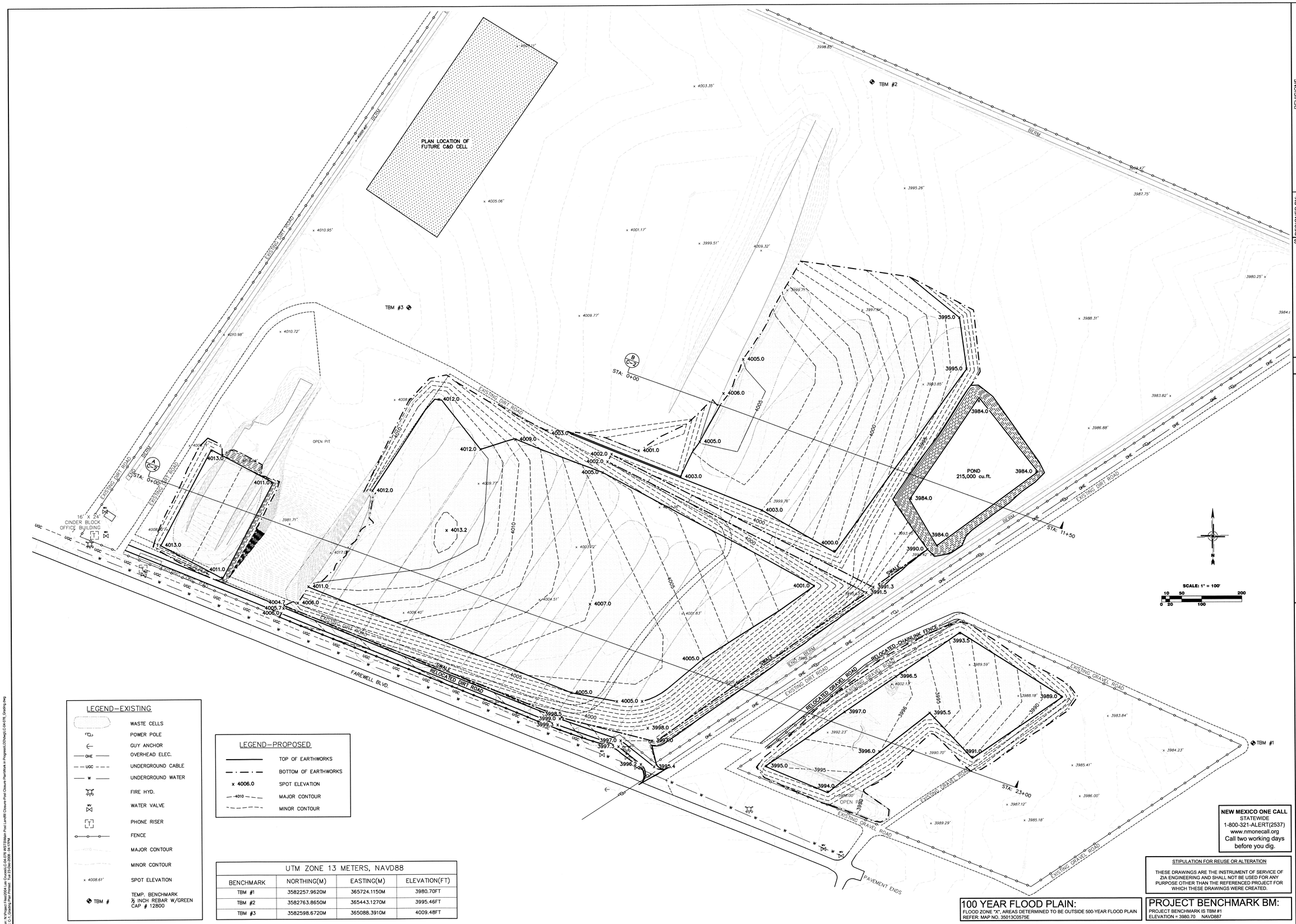
L: 6 = number of uncompacted cubic yards in 1 ton

Form Completed by:___James Thompson_____

Telephone number:_____575-678-1941_____

APPENDIX C

Construction Drawings [in pocket]



LEGEND–EXISTING

- WASTE CELLS
- POWER POLE
- GUY ANCHOR
- OVERHEAD ELEC.
- UNDERGROUND CABLE
- UNDERGROUND WATER
- FIRE HYD.
- WATER VALVE
- PHONE RISER
- FENCE
- MAJOR CONTOUR
- MINOR CONTOUR
- x 4008.61' SPOT ELEVATION
- TBM # TEMP. BENCHMARK ½ INCH REBAR W/GREEN CAP # 12800

LEGEND–PROPOSED

- TOP OF EARTHWORKS
- BOTTOM OF EARTHWORKS
- x 4006.0 SPOT ELEVATION
- 4010 MAJOR CONTOUR
- MINOR CONTOUR

UTM ZONE 13 METERS, NAVD88			
BENCHMARK	NORTHING(M)	EASTING(M)	ELEVATION(FT)
TBM #1	3582257.9620M	365724.1150M	3980.70FT
TBM #2	3582763.8650M	365443.1270M	3995.46FT
TBM #3	3582598.6720M	365088.3910M	4009.48FT

NEW MEXICO ONE CALL
STATEWIDE
1-800-321-ALERT(2537)
www.nmonecall.org
Call two working days before you dig.

STIPULATION FOR REUSE OR ALTERATION

THESE DRAWINGS ARE THE INSTRUMENT OF SERVICE OF ZIA ENGINEERING AND SHALL NOT BE USED FOR ANY PURPOSE OTHER THAN THE REFERENCED PROJECT FOR WHICH THESE DRAWINGS WERE CREATED.

100 YEAR FLOOD PLAIN:
FLOOD ZONE "X", AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN
REFER: MAP NO. 35013C0575E

PROJECT BENCHMARK BM:
PROJECT BENCHMARK IS TBM #1
ELEVATION = 3980.70 NAVD887

REVISIONS

DATE:	COMMENT

DESIGNED BY: K.F.
DRAWN BY: K.C.
APPROVED BY: K.S.
DATE: 12-23-08

Seal: NEW MEXICO 16185 LICENSED PROFESSIONAL ENGINEER 12-23-2008

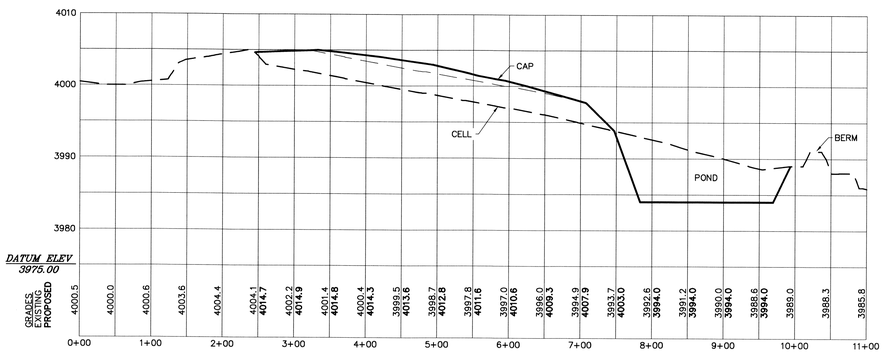
LC-04-076

ZIA ENGINEERING & ENVIRONMENTAL CONSULTANTS, LLC.
755 S. TELSHOR BLVD., SUITE F-201
LAS CRUCES, NEW MEXICO 88011
PHONE: (575) 532-1526
FAX: (575)532-1587

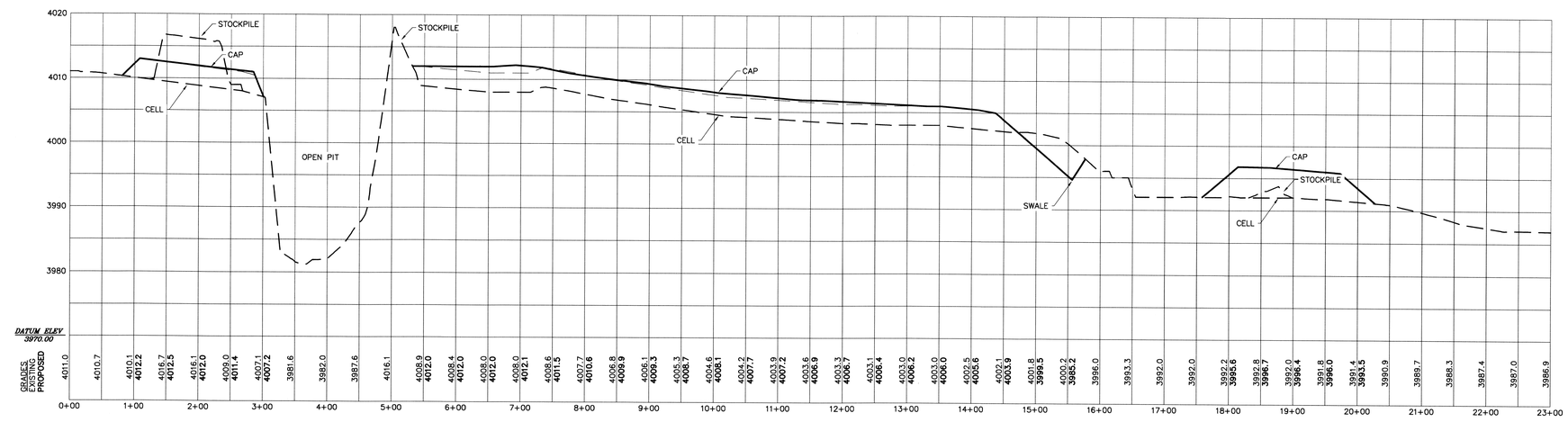
FINAL COVER GRADING SHEET
MAIN POST LANDFILL CLOSURE/POST CLOSURE PLAN
U.S. ARMY WHITE SANDS MISSLE RANGE

C-101

Location: V:\Project\Navy2004 Las Cruces\LC-04-076 WSTS\Main Post Landfill Closure-Post Closure Plan\Work in Progress\LC0\dwg\LC-04-076_Grading.dwg
Layout: C-101 Grading Plan Photo Date: 12-23-2008 9:57 AM



B
C-1
NORTHERN CAP SECTION
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'



A
C-1
SOUTHERN CAP SECTION
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'

SCALE: 1" = 100'
10 50 200
0 20 100

NEW MEXICO ONE CALL
STATEWIDE
1-800-321-ALERT(2537)
www.nmonecall.org
Call two working days before you dig.

STIPULATION FOR REUSE OR ALTERATION

THESE DRAWINGS ARE THE INSTRUMENT OF SERVICE OF ZIA ENGINEERING AND SHALL NOT BE USED FOR ANY PURPOSE OTHER THAN THE REFERENCED PROJECT FOR WHICH THESE DRAWINGS WERE CREATED.

100 YEAR FLOOD PLAIN:
FLOOD ZONE "X", AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN
REFER: MAP NO. 35013C0575E

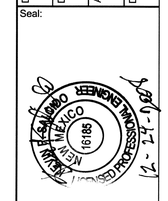
PROJECT BENCHMARK BM:
PROJECT BENCHMARK IS TBM #1
ELEVATION = 3980.70 NAVD887

REVISIONS

DATE:	COMMENT

DESIGNED BY: K.F.
DRAWN BY: K.C.
APPROVED BY: K.S.
DATE: 12-23-08

Seal:



LC-04-076

ZIA ENGINEERING & ENVIRONMENTAL CONSULTANTS, LLC.
755 S. TELSHOR BLVD., SUITE F-201
LAS CRUCES, NEW MEXICO 88011
PHONE: (575) 532-1526
FAX: (575)532-1587

FINAL COVER SECTIONS SHEET

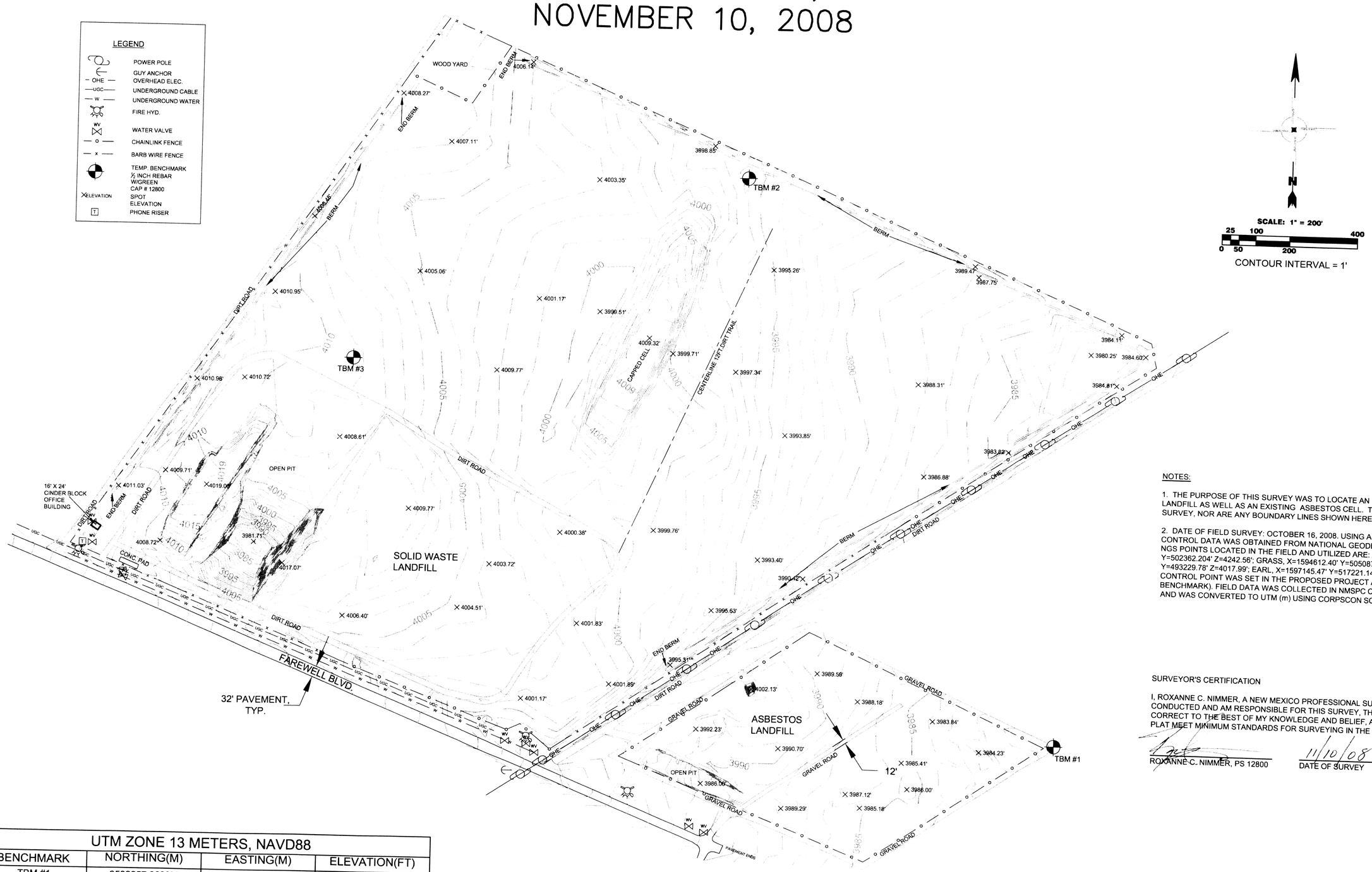
MAIN POST LANDFILL CLOSURE/POST CLOSURE PLAN

U.S. ARMY WHITE SANDS MISSLE RANGE

C-102

Location: N:\Project Files\2004 Lab Closure\LC-04-076 WSTM\Main Post Landfill Closure-Post Closure Plan\Work in Progress\LDO\dwg\LC-04-076_Sections.dwg
Input: C-2_Sections Printed: Tue 23-Dec-2008 04:36PM

TOPOGRAPHIC SURVEY OF MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE
DONA ANA COUNTY, NM
NOVEMBER 10, 2008



NOTES:

1. THE PURPOSE OF THIS SURVEY WAS TO LOCATE AN EXISTING SOLID WASTE LANDFILL AS WELL AS AN EXISTING ASBESTOS CELL. THIS IS NOT A BOUNDARY SURVEY, NOR ARE ANY BOUNDARY LINES SHOWN HEREON.

2. DATE OF FIELD SURVEY: OCTOBER 16, 2008. USING A LEICA RTK GPS SYSTEM 1200, CONTROL DATA WAS OBTAINED FROM NATIONAL GEODETIC SURVEY DATA SHEETS. NGS POINTS LOCATED IN THE FIELD AND UTILIZED ARE: A 336, X=1569586.614' Y=502362.204' Z=4242.56'; GRASS, X=1594612.40' Y=505087.22' Z=3977.3'; C, X=1601225.97 Y=493229.78' Z=4017.99'; EARL, X=1597145.47' Y=517221.14' Z=3981.8'. INTERVISIBLE CONTROL POINT WAS SET IN THE PROPOSED PROJECT AREA (SHOWN AS TEMP. BENCHMARK). FIELD DATA WAS COLLECTED IN NMSPC CENTRAL ZONE (ft) (NAD 83) AND WAS CONVERTED TO UTM (m) USING CORPSCON SOFTWARE.

SURVEYOR'S CERTIFICATION

I, ROXANNE C. NIMMER, A NEW MEXICO PROFESSIONAL SURVEYOR CERTIFY THAT I CONDUCTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT THE SURVEY AND PLAT MEET MINIMUM STANDARDS FOR SURVEYING IN THE STATE OF NEW MEXICO.

ROXANNE C. NIMMER, PS 12800

11/10/08
DATE OF SURVEY

ROXANNE C. NIMMER
NEW MEXICO
12800
REGISTERED PROFESSIONAL SURVEYOR

UTM ZONE 13 METERS, NAVD88			
BENCHMARK	NORTHING(M)	EASTING(M)	ELEVATION(FT)
TBM #1	3582257.9620M	365724.1150M	3980.70FT
TBM #2	3582763.8650M	365443.1270M	3995.46FT
TBM #3	3582598.6720M	365088.3910M	4009.48FT

Zia Engineering & Environmental Consultants, Inc.
755 S. Telshor Blvd., Suite F-201
Las Cruces, New Mexico 88011
Phone: (575) 532-1526
Fax: (575) 532-1587

File ID: u\survey\shared\LC 04-076
MPL Landfill Topo

APPENDIX D

HELP Analysis

2008 HELP MODEL ANALYSIS
MAIN POST LANDFILL

INTRODUCTION

The Hydrologic Evaluation of Landfill Performance (HELP) Model computer program is a quasi-two-dimensional hydrologic model of water movement across, into, through, and out of landfills. The program was developed to conduct water balance analysis of landfill, cover systems and solid waste disposal and containment facilities. The HELP program was developed by the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, for the U.S. Environmental Protection Agency (EPA).

The New Mexico Solid Waste Management Regulations require that municipal landfill cells have an infiltration layer of at least 18 inches of earthen material having a saturated hydraulic conductivity no greater than 1 x 10-5 centimeters per second (cm/sec). An erosion protection layer that consists of a minimum of six inches of topsoil for vegetative cover is also required. This is known as a prescriptive cover.

If an alternative cover design is proposed it must achieve an equivalent reduction in infiltration as the infiltration layer of a prescriptive cover. The HELP Model simulation can be used to demonstrate that the design of the alternative cover provides equivalent reduction in infiltration as the prescriptive cover.

White Sands Missile Range intends to close all existing municipal and construction and demolition cells utilizing an alternative cover design. Native earthen material will be used for cover material. The hydraulic conductivity of the soils at the site varies from 4.0 x l0-4 to 2.6 x 10-6 cm/sec. To meet the requirements for closure, White Sands will use the HELP Model to demonstrate that 30 inches of cover with a hydraulic conductivity of 4.0 x 10-4 cm/sec or less provides an equivalent reduction in infiltration as a prescriptive cover design. The HELP Model was run for two simulations, one for a prescriptive cover and the other for an alternative cover. Several parameters required to run the HELP model are site specific weather data, soil data, and design data.

Two modifications to the 1999 HELP Model were made to run the 2008 simulation for the prescriptive and alternative cover. The minimum slope was adjusted from 2 percent to 5 percent and the slope length was adjusted from 1,500 feet to 750 feet. The aforementioned changed caused the SCS runoff curve number to change from 86.2 to 87.0 for the prescriptive cover and from 77.9 to 79.2 for the alternative cover.

WEATHER DATA

The weather data required for the HELP Model is classified into four groups: evapotranspiration, precipitation, temperature, and solar radiation data. The user may enter weather data using several options: data provided for selected U.S. cities that the user may select as default data, or the user may manually input data.

The Whites Sands National Monument weather station, which is approximately 20 miles north of the Main Post Landfill, was used to provide the precipitation and temperature data. Evapotranspiration and solar radiation data was generated by the model based on the precipitation data and latitude, and by using default data from El Paso, Texas. Climatological input parameters are provided as Attachment A and precipitation and temperature data used are provided in Attachment B.

SOIL DATA

The soil data required by the HELP Model includes the number of layers, layer types, properties of the layers, and initial moisture contents for each layer. For the purposes of modeling, the Main Post Landfill was divided into two layers, a 6-inch vegetative layer and a cover component.

For the prescriptive cover, 18 inches of earthen material with a hydraulic conductivity of 1 x 10-5 cm/sec and 6 inches of soil that is capable of sustaining native plant growth is prescribed. The topsoil was assigned a soil texture number of 7, which is a soil with a hydraulic conductivity of 1.9 x 10-5 cm/sec.

For the alternative cover, the cover material was assigned a user hydraulic conductivity value of 4.0 x 10-4 cm/sec. The hydraulic conductivity value for the cover material was obtained from soil sampling results, which is provided as Attachment C. These soil samples were taken from several locations on site for physical parameters. The value used in the model (4.0 x 10-4cm/sec) is the greatest hydraulic conductivity value and can therefore be considered a conservative value. A soil texture number of 6 were assigned to the topsoil cover, which is associated with a hydraulic conductivity of 7.2 x 10-4 cm/sec. This value is higher than the 30-inch cover-material hydraulic conductivity because the topsoil percent compaction will be lower than that of the lower layer.

The initial moisture contents for each layer was assigned, which were based on typical values for soils and municipal solid waste in semi-arid climates. Layer types also had to be specified and are described in the table below. The table below represents the values for each of the layers for a prescriptive and alternative cover.

Layer	Layer Type*	Soil Texture Number	Layer Thickness (inches)	Total Porosity (vol/vol)	Field Capacity (vol/vol)	Wilting Point (vol/vol)	Saturated Hydraulic Conductivity (cm/sec)	Initial Soil Water Content (vol/vol)
Vegetative Cover for Prescriptive Cover	1	9	6	0.501	0.284	0.135	1.9x10-5	0.172
Cover Material for Prescriptive Cover	1	**	18	0.419	0.307	0.18	1.0x10-5	0.212
Vegetative Cover for Alternative Cover	1	6	6	0.501	0.284	0.135	7.2x10-4	0.111
Cover Material for Alternative Cover	1	**	30	0.398	0.244	0.136	4.0x10-4	0.134

* The four types of layers and their code number in the HELP Model are vertical percolation (I), lateral drainage (2), barrier soil liner (3), and geomembrane liner (4).
** Hydraulic conductivity manually inputted-see text for details.

The area allowing run-off was estimated to be 100 percent based on the Guidance Document provided by the New Mexico Solid Waste Bureau in Attachment D. Soil input parameters are provided as Attachment A.

HELP MODEL RESULTS

Two simulations of the HELP Model were run for a 5-year duration using data from 1984 to 1988. The first simulation was for a prescriptive cover, the second for an alternative cover. The HELP Model generated output data for the average annual precipitation, amount of runoff evapotranspiration, percolation/leakage through the cover, and change in water storage for the different layers. Evapotranspiration is the most significant factor in removal of moisture, amounting to 13.531 inches of the 14.38 inches of rainfall occurring at the site. Runoff was minimal due to high evapotranspiration rates. The HELP Model results are provided in Attachment E.

SUMMARY

Based on the HELP Model results, there is minimal potential for the generation of leachate through the Main Post Landfill. The average annual total value for percolation through the alternative cover over the existing municipal cells is predicted at 0.13521 inches per year, versus 0.18749 inches from a prescriptive cover. Therefore, the HELP Model successfully demonstrated that the alternative cover described in the sections above provides equivalent reduction in infiltration as the prescriptive cover.

Attachment A

Summary of Help Model Input Parameters

SUMMARY OF HELP MODEL INPUT PARAMETERS
MAIN POST LANDFILL
WHITE SANDS MISSILE RANGE, NEW MEXICO

Climatological Data:
Most Representative HELP Model Default City: El Paso, Texas

- 50 years of rainfall data utilizing site specific (White Sands National Monument) data as provided by SWB as HELP files data (Attachment C):
    - White Sands National Monument, NM daily precipitation data
    - White Sands National Monument, NM normal mean monthly temperature data
    - Main Post Landfill, White Sands Missile Range, NM Latitude: 32'22'
- Leaf Index: 0.8 (conservative value, within range of typical default parameters for the area)
- Evaporative Zone Depth-24 inches (input value actually 28 inches but only 24 inches available)
- All other parameters remain at El Paso, TX default settings (growing season, humidity, etc.)

General Design Data
Default Soil Characteristics utilized with the following modifications:

- Topsoil layer is modeled as Soil Texture No. 9, with a saturated hydraulic conductivity of 1.9 x 1 0-4 centimeters per second.
- Cover layer modeled as Soil type No. 23, with a modified saturated hydraulic conductivity of 1.0 x 10-5 centimeters per second.
- Both layers classified as a layer type No. 1.
- Curve Number: Computed from default soil data using a soil texture of No. 9, cover is a poor stand of grass, slope=5 percent and a slope length of 750 feet. The resulting CN=87.0.
- Area allowing runoff: 100 percent
- Model Area: 40 acres
- Initial moisture conditions specified-calculated using recommended equation.

Simulation Data
5 year simulated model run:

- Topsoil Cover is modeled as Soil Texture No. 6, with a hydraulic conductivity of 7.2 x 10-4 centimeters per second.
- Final cover: 30 inches with a hydraulic conductivity of 4.4 x 10-4 centimeters per second - (to simulate the soils predominant in the area).
- CN changes to 79.2 due to soil texture type.

Attachment B

White Sands National Monument Temperature and Precipitation Data

Station	WHITE SANDS NATIONAL MONUMENT			Parameter	
County	OTERO			Record Cnt	
State	NM			Coverage 5	years
Id	299686	Latitude	32:47:00 N	Begin Dat	Jan-84
Elevation	3994 ft.	Longtitude	106:11:00 W	End Date	Jan-90

Daily Precipitation in inches

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	1.64	0	0.19	0	0	0	0	
3	0.02	0	0	0	0	0	0	0.13	0.06	0.3	0	0	
4	0	0	0	0	0	0	0	0.09	0	0.25	0	0.51	
5	0	0	0	0	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0.1	0	0	0	0	
8	0.29	0	0	0	0	0	0	0	0	0	0	0.03	
9	0	0	0	0	0	0	0	0.25	0	0	0	0	
10	0	0	0	0	0	0	0	0.59	0	0	0	0	
11	0	0	0	0	0	0	0.68	0.02	0	0.1	0	0	
12	0	0	0	0	0	0	0	0	0	0.11	0	0.26	
13	0	0	0	0	0	0.08	0	0.13	0	0	0	0.6	
14	0	0	0	0	0	0	0	0	0	0	0	0.6	
15	0	0	0	0	0.11	0.89	0	0	0	0.08	0	0.28	
16	0	0	0	0	0.72	0.3	0	0	0	0	0	0	
17	0	0	0	0	0.03	0.01	0	0	0	0	0.33	0	
18	0	0	0	0	0	0	0.47	0	0	0.12	0.06	0	
19	0	0	0	0	0	0.82	0	0	0	0	0.04	0.08	
20	0	0	0	0	0	0	0	0	0	0.04	0.07	0	
21	0	0	0	0	0	0	0.15	0	0	0.14	0	0	
22	0	0	0	0	0	0	0	0	0	0.06	0	0	
23	0	0	0	0	0	0	0	0.21	0	0.27	0	0	
24	0	0	0	0	0	0.08	0.14	0.27	0	0.45	0.61	0	
25	0	0	0	0	0	0	0	0.67	0	0	0.02	0	
26	0	0	0	0	0	0	0	0.19	0.12	0.11	0	0	
27	0	0	0	0	0	0	0.14	0	0.06	0	0	0	
28	0	0	0	0	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	0	0	0	0	
30	0	*****	0	0	0	0	0	0.1	0	0	0	0	
31	0	*****	0	*****	0	*****	0	0	*****	0	*****	0	
Total	0.31	0	0	0	0.86	2.18	1.58	2.84	0.24	2.03	1.13	2.36	13.53
Mean	0.01	0	0	0	0.03	0.13	0.05	0.09	0.01	0.07	0.04	0.08	0.04
Max	0.29	0	0	0	0.72	1.64	0.68	0.67	0.12	0.45	0.61	0.6	0.48

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	0	0.01	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0.22	0.31	0	0	0	0	
3	0	0	0	0	0	0	0	0.5	0.16	0	0	0	
4	0	0.17	0	0	0	0	0.03	0.03	0	0	0	0	
5	0	0	0	0	0	0.38	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	1.01	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0.3	0	0.07	0	0	
10	0	0	0	0	0	0	0	0	0.11	0	0	0	
11	0	0	0	0	0	0	0	0.31	0	1.06	0	0	
12	0.03	0	0	0	0	0	0	0	0	0	0	0.05	
13	0.36	0	0	0	0	0	0	0	0	0	0	0	
14	0.04	0	0	0	0	0	0	0	0.04	0	0	0	
15	0	0	0.16	0	0	0	0.23	0	0.03	0.07	0	0	
16	0.28	0	0	0	0	0	0	0	0	0.12	0	0	
17	0	0	0	0	0.45	0	0	0	0	1.77	0	0	
18	0	0	0	0	0.05	0	0.13	1.24	0	0	0	0	
19	0	0	0.08	0	0	0.14	0.05	0	0.42	0	0	0	
20	0	0	0.1	0	0	0	0	0	0.5	0	0	0	
21	0	0	0	0	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0.45	0	0	0	0	0	
23	0	0.21	0	0	0	0	0.02	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0.33	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	0	0	0	0	
27	0	0	0	0.22	0	0	0.25	0	0	0	0	0	
28	0	0.03	0	0.6	0	0	0	0	0.16	0	0	0	
29	0	*****	0	0	0	0	0.08	0	0	0.03	0	0	
30	0	*****	0	0	0	0	0.31	0	0	0	0.05	0	
31	0	*****	0	*****	0	*****	0.05	0	*****	0	*****	0	
Total	0.71	0.42	0.24	0.82	0.5	0.85	1.82	2.69	1.42	4.13	0	0.05	13.65

Mean	0.04	0.02	0.01	0.03	0.02	0.03	0.06	0.09	0.05	0.13	0	0	0.04
Max	0.36	0.21	0.16	0.6	0.45	0.38	0.45	1.24	0.5	1.77	0.05	0.05	0.52

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	0.01	0	0	0	0	0	0	0	0	0	0	0	
2	0	0.02	0	0	0	0	0	0	0	0.24	1.13	0	
3	0	0	0	0	0	0	0.06	0	0	0.26	1.31	0	
4	0	0.16	0	0	0	0	0	0	0.06	0	0	0	
5	0	0.04	0	0	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	0.11	0.1	0	0	
7	0.01	0.05	0	0	0	0	0.02	0	0	0	0	0.11	
8	0	0.01	0	0	0	0	0	0	0	0	0	0.52	
9	0	0.05	0	0	0	0	0.03	0	0	0	0	0	
10	0	0.24	0	0	0	0	0.16	0	0	0.1	0	0.15	
11	0	0	0.07	0	0	0	0	0	0	0.05	0	0	
12	0	0	0	0	0	0	0	0	0.12	0.14	0	0	
13	0	0	0.11	0	0	0	0	0	0	0	0.24	0	
14	0	0	0.13	0	0	0	0	0.85	0	0	0	0	
15	0	0	0	0	0	0	0	0.05	0.5	0	0	0	
16	0	0	0	0	0	0	0	0	0	0.05	0	0.22	
17	0	0	0	0	0.03	0	0.27	0	0	0	0	0.5	
18	0	0	0	0	0	0.12	0.02	0	0	0	0	0	
19	0	0	0.04	0	0	0.08	0	0	0	0.03	0.34	0	
20	0	0	0	0	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0.23	0	0	0	0	0	
22	0	0	0	0	0	0	0.26	0	0	0	0	0	
23	0	0	0	0	0	0.02	0	0.37	0.21	0	0	0.09	
24	0	0	0	0.01	0	0.46	0	0	0.8	0	0	0	
25	0	0	0	0	0	0.48	0	0	0	0	0	0	
26	0	0	0	0	0	0.32	0	0	0	0	0	0	
27	0	0	0	0	0.05	0	0	0.01	0	0	0	0	
28	0	0	0	0	0.02	0	0	0	0	0	0	0	
29	0	*****	0	0	0	0	0	0	0	0	0	0	
30	0	*****	0	0	0.27	0	0	0.46	0	0	0	0	
31	0	*****	0	*****	0	*****	0	0	*****	0	*****	0	
Total	0.02	0.57	0.35	0.01	0.37	1.48	1.06	1.74	1.8	0.97	3.02	1.59	12.98
Mean	0	0.02	0.01	0	0.01	0.05	0.03	0.06	0.06	0.03	0.1	0.05	0.03
Max	0.01	0.24	0.13	0.01	0.27	0.48	0.27	0.85	0.8	0.26	1.31	0.52	0.43

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	0	0	0	0	0	0	0	0	0	0	0.35	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0.04	0	0	0	0	
4	0	0	0	0.03	0	0	0	0.63	0.05	0	0	0	
5	0	0	0	0	0	0	0	0	0	0	0.11	0	
6	0	0	0	0	0	0	0	0	0	0	0.14	0	
7	0	0	0	0	0	0.35	0	0	0	0	0	0	
8	0	0	0	0	0	0.03	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0.6	0	0	0	0	
10	0	0	0.04	0	0	0	0	0	0	0	0	0	
11	0	0	0.05	0	0	0	0	0.3	0	0	0	0	
12	0	0	0	0	0.1	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0.67	
14	0	0	0	0	0	0	0	0	0.22	0	0	0.45	
15	0	0	0	0	0.03	0.04	0	0	0	0.09	0	0	
16	0	0	0	0	0	0	0	0	0	0	0	0	
17	0.21	0	0	0	0	0	0	0	0	0	0	0	
18	0	0.28	0	0	0	0	0	0*	0.02	0	0	0.11	
19	0	0	0	0	0.13	0	0	0	0	0	0	0.01	
20	0	0.07	0	0	0	0	0	0	0	0	0	0	
21	0	0.38	0	0	0	0	0.22	0	0	0	0	0	
22	0	0	0	0	0	0	0	0.01	0	0	0	0	
23	0	0	0	0	0.3	0	0.04	0	0	0.17	0	0	
24	0	0	0	0	0.15	0	0	1.9	0	0	0	0	
25	0	0	0	0	0.1	0.13	0.03	0	0.15	0	0	*****	
26	0	0	0	0	0	0	0	0.15	0	0	0	0.5	
27	0	0	0	0	0	1.4	0	0	0	0	0	0.02	
28	0	0	0	0	0	0	0	0	0	0	0	0	
29	0	*****	0.51	0	0	0	0.29	0	0.12	0	0	0	
30	0	*****	0	0.06	0	0	0	0	0	0	0	0	
31	0	*****	0	*****	0	*****	0	0	*****	0	*****	0	
Total	0.21	0.73	0.6	0.09	0.81	1.95	0.58	3.63	0.56	0.26	0.6	1.76	11.78
Mean	0.01	0.03	0.02	0	0.03	0.07	0.02	0.12	0.02	0.01	0.02	0.06	0.03
Max	0.21	0.38	0.51	0.06	0.3	1.4	0.29	1.9	0.22	0.17	0.35	0.67	0.54

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0.05	0.1	0	0	0	

3	0	0	0.1	0	0	0	0	0.1	0	0	0	0	
4	0	0.02	0	0	0	0	0.02	0.98	0	0	0	0	
5	0	1.21	0	0	0	0	0	0	0	0	0	0	
6	0.12	0	0	0	0	0	0.51	0.83	0	0	0	0	
7	0	0	0	0	0	0	0	0.57	0	0	0	0	
8	0	0	0	0	0	0	0	2.25	0	0	0	0	
9	0	0	0	0	0	0	0.38	0	0	0.05	0	0.68	
10	0	0	0	0	0	0	0.07	0	0	0.06	0	0	
11	0	0	0	0	0	0.15	0	0.35	0	0	0	0	
12	0	0	0	0	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0.25	0	0	0	0	
15	0	0	0	0	0	0.76	0	1.22	0	0	0	0	
16	0	0	0	0.04	0.13	0	0	1.22	0	0	0	0	
17	0	0	0	0	0	0	0.31	0.13	0	0	0	0	
18	0.08	0.14	0	0	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0.15	0	0	0	0	0.54	
20	0.02	0	0	0	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	0.77	0.12	0	0	
22	0	0	0	0	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0.46	0	0	0	0	
24	0	0	0	0	0	0	0	0	0	0	0	0	
25	0	0	0	0	0.05	0.33	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0.59	0	0	0	0	
27	0	0	0	0	0	0	0	0.2	0	0	0	0	
28	0	0	0	0	0	0	0	0.2	0	0	0	0	
29	0	0	0	0.04	0	0	0	0.38	0	0	0	0	
30	0	*****	0	0	0	0	0	0	0	0	0	0	
31	0	*****	0	*****	0	*****	0	0	*****	0	*****	0	
Total	0.22	1.37	0.1	0.08	0.18	1.24	1.5	9.78	0.87	0.23	0	1.22	16.79
Mean	0.01	0.05	0	0	0.01	0.04	0.05	0.32	0.03	0.01	0	0.04	0.05
Max.	0.08	1.21	0.1	0.04	0.13	0.76	0.38	2.25	0.77	0.12	0	0.68	0.54

1989	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	
4	0.03	0	0.2	0	0	0	0	0	0	0	0	0	
5	0.01	0	0	0	0	0	0	0	0.63	0	0	0	
6	0	0	0	0	0	0	0	0	1.17	0	0	0	
7	0	0.25	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	0	0	0	
10	0	0	0	0	0.46	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0.15	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	0	0	0	0	
16	0	0.5	0	0	0.02	0	0.19	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0.15	0	0	0	0	
19	0	0	0	0	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	0	0	0	0	
21	0	0	0.1	0	0	0	0	0	0	0	0.12	0	
22	0	0	0	0	0	0	0.79	0	0.16	0	0	0	
23	0	0	0	0	0	0	0.23	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0.05	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	0	0	0	0	
27	0.2	0	0.15	0	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0.52	1.5	0	0	0	0.12	
29	0	*****	0	0	0	0	0.19	0	0	0	0	0.32	
30	0	*****	0	0	0	0	0	0.11	0	0	0	0	
31	0	*****	0	*****	0	*****	0	0	*****	0	*****	0	
Total	0.24	0.75	0.45	0	0.48	0	1.97	1.76	2.11	0	0.12	0.44	8.32
Mean	0.01	0.03	0.01	0	0.02	0	0.06	0.06	0.07	0	0	0.01	0.02
Max.	0.2	0.5	0.2	0	0.46	0	0.79	1.5	1.17	0	0.12	0.32	0.44

Station	WHITE SANDS NATIONAL MONUMENT			Parameter	
County	OTERO			Record Cnt	
State	NM			Coverage	5 years
Id	299686	Latitude	32:47:00 N	Begin Date	Jan-84
Elevation	3994 ft.	Longtitude	106:11:00 W	End Date	Jan-90

Daily Maximum Temperature, in degrees Farenheit

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	58	62	73	78	83	97	100	97	92	83	73	55	
2	55	63	74	66	83	91	94	93	90	84	72	64	
3	51	66	73	66	88	83	100	92	90	79	75	57	
4	57	62	73	72	91	88	100	90	88	73	77	48	
5	62	59	63	80	91	81	99	89	87	74	73	52	
6	66	63	50	80	91	88	98	94	87	80	70	56	
7	65	66	61	73	86	92	98	91	93	81	76	55	
8	61	62	70	78	79	92	98	90	96	80	78	63	
9	62	66	72	78	90	92	103	79	99	81	72	64	
10	61	70	68	73	96	100	101	81	101	77	65	65	
11	55	68	72	87	95	97	96	83	98	71	64	57	
12	54	57	73	84	100	100	92	90	97	68	65	48	
13	53	66	79	84	99	96	96	80	96	64	75	43	
14	56	72	80	76	94	92	100	89	97	79	72	38	
15	55	63	81	77	84	88	103	89	93	73	68	40	
16	57	68	81	79	76	88	102	86	88	71	68	54	
17	56	65	83	88	82	88	93	90	91	72	50	58	
18	51	57	80	85	87	85	89	93	91	72	57	50	
19	62	57	67	83	90	83	96	94	89	70	50	54	
20	51	49	75	82	93	91	96	95	89	62	54	55	
21	45	60	82	75	98	95	92	96	89	58	57	58	
22	55	68	80	80	97	96	93	95	89	55	57	49	
23	54	67	62	82	96	97	95	90	94	50	55	52	
24	56	67	72	86	95	95	96	86	93	45	46	52	
25	59	68	73	79	99	96	89	86	86	49	52	57	
26	58	61	70	66	99	98	88	88	79	53	50	61	
27	58	55	66	84	101	96	93	95	77	54	43	63	
28	64	58	62	85	93	93	94	97	76	69	55	63	
29	66	59	74	78	92	98	94	98	71	73	62	64	
30	62	*****	73	80	93	97	94	95	75	76	62	64	
31	59	*****	73	*****	97	*****	96	92	*****	71	*****	56	
Mean	58	63	72	79	92	92	96	90	89	69	63	55	77
Max.	66	72	82	88	101	100	103	98	101	84	78	65	87

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	56	23	70	70	85	93	102	97	99	64	71	60	
2	40	42	68	80	85	96	100	93	97	75	63	62	
3	38	43	60	83	87	94	95	90	96	84	71	66	
4	58	48	59	82	89	92	99	94	85	83	74	65	
5	60	55	72	82	89	88	103	96	87	76	78	61	
6	61	56	78	82	90	94	102	100	89	85	73	65	
7	56	55	73	79	87	100	102	101	92	87	70	62	
8	63	62	82	74	91	103	100	96	89	77	75	69	
9	59	60	80	78	94	103	98	97	92	74	70	67	
10	59	62	83	81	94	102	101	91	93	78	73	59	
11	52	59	82	84	82	97	98	87	92	76	72	51	
12	47	64	74	86	84	90	100	91	87	73	68	37	
13	37	65	62	86	85	95	100	94	89	77	58	43	
14	35	64	63	85	76	102	103	96	86	75	51	44	
15	45	67	58	87	89	105	97	96	83	74	57	48	
16	40	76	62	90	90	105	97	96	89	68	64	55	
17	46	75	62	90	89	102	98	96	92	68	73	55	
18	58	76	72	88	83	97	101	91	90	65	64	56	
19	66	71	66	88	88	91	98	89	87	70	59	59	
20	58	68	66	84	86	96	91	90	83	71	56	55	
21	38	74	72	83	88	100	92	96	82	76	69	57	
22	42	68	72	73	82	99	92	99	87	76	71	65	
23	49	56	70	75	88	96	91	101	86	76	69	61	
24	59	67	79	87	91	96	96	95	87	79	73	57	
25	59	65	82	85	96	92	90	98	87	80	71	59	
26	50	74	78	83	96	92	90	100	80	78	62	60	
27	60	67	76	77	98	90	85	96	89	78	66	62	
28	62	66	77	73	97	93	95	96	87	77	64	64	

29	61	*****	72	75	97	98	94	96	73	77	64	64	
30	60	*****	54	85	91	99	99	96	74	75	60	67	
31	49	*****	64	*****	88	*****	97	95	*****	75	*****	64	
Mean	52	62	68	82	89	97	97	95	88	76	67	59	78
Max.	66	76	83	90	98	105	103	101	99	87	78	69	88

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	61	65	74	81	94	81	97	101	91	87	79	57	
2	59	59	76	78	89	84	84	100	91	83	73	59	
3	59	63	66	73	89	86	91	98	90	77	51	63	
4	60	63	71	73	90	91	94	97	88	78	64	61	
5	50	51	75	80	87	96	94	96	91	76	61	56	
6	62	56	78	82	87	96	97	98	92	77	67	58	
7	59	51	75	89	85	98	94	98	90	74	63	59	
8	48	43	79	86	83	96	95	94	86	82	65	59	
9	49	45	72	83	78	97	92	92	90	78	60	53	
10	58	47	69	82	82	92	90	89	88	74	64	48	
11	59	55	67	80	89	91	96	93	90	71	56	38	
12	61	65	67	84	90	96	100	95	89	68	57	45	
13	60	69	55	85	91	97	100	97	88	61	58	50	
14	54	71	55	87	91	100	98	94	88	70	47	54	
15	64	74	62	87	90	100	94	93	87	72	48	55	
16	62	70	73	86	89	103	92	96	89	70	59	55	
17	64	71	72	81	86	100	89	101	90	76	71	46	
18	68	79	58	74	77	96	89	98	92	83	65	44	
19	66	83	55	67	87	90	93	99	95	81	69	48	
20	72	76	65	78	93	95	94	101	93	80	66	52	
21	71	73	71	87	97	96	91	100	93	77	67	52	
22	62	65	76	90	96	97	84	99	90	74	67	52	
23	70	72	79	86	92	87	89	94	86	75	59	45	
24	68	76	83	86	93	71	91	84	73	74	59	51	
25	64	80	82	87	94	80	96	91	79	74	57	50	
26	58	82	83	83	93	83	101	91	79	73	54	50	
27	64	77	82	80	90	90	100	89	85	74	56	51	
28	68	65	83	84	87	95	102	84	84	77	61	49	
29	72	*****	77	86	90	97	101	87	84	73	64	54	
30	73	*****	83	89	89	98	103	86	84	76	61	56	
31	70	*****	85	*****	*****	*****	101	92	*****	80	*****	56	
Mean	62	66	73	82	86	92	95	94	88	76	62	52	77
Max.	73	83	85	90	97	103	103	101	95	87	79	63	88

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	58	60	59	76	83	93	101	98	87	81	74	58	
2	63	68	65	74	82	95	102	103	87	88	74	64	
3	56	71	69	70	78	92	103	101	89	82	76	69	
4	58	67	69	65	82	86	102	99	79	84	76	69	
5	67	67	70	62	82	85	101	94	84	90	72	71	
6	58	62	74	61	82	87	100	98	87	88	75	64	
7	62	61	77	63	82	84	100	98	90	89	70	68	
8	57	63	75	69	81	80	101	96	89	89	66	64	
9	50	65	68	76	83	87	102	92	91	87	62	64	
10	52	72	66	80	87	82	99	87	92	92	63	69	
11	56	73	62	83	85	89	97	90	92	87	63	72	
12	62	71	69	82	87	93	100	89	94	87	66	67	
13	62	70	78	77	89	98	100	92	93	87	68	56	
14	62	67	74	73	86	97	95	95	87	86	73	38	
15	57	61	76	85	88	101	95	94	83	76	65	26	
16	52	58	73	88	90	101	89	94	87	78	51	28	
17	44	56	63	92	91	102	93	97	88	77	62	39	
18	33	55	71	91	89	101	94	100	80	79	58	43	
19	36	52	72	88	81	98	98	100	84	80	60	51	
20	39	45	70	77	82	98	90	99	89	78	65	51	
21	41	37	72	76	84	98	94	98	88	73	72	52	
22	42	44	70	72	87	98	98	96	85	77	68	57	
23	47	55	62	80	83	102	97	91	83	75	71	67	
24	54	59	62	81	83	103	98	88	86	74	66	59	
25	58	64	60	76	85	102	95	85	84	82	69	*****	
26	64	62	65	81	84	91	95	81	84	79	62	30	
27	66	52	67	82	83	88	93	82	88	82	50	25	
28	68	55	63	80	81	92	95	83	87	83	54	34	
29	71	*****	49	82	85	97	96	85	87	81	60	37	
30	72	*****	49	78	90	95	94	89	82	82	56	60	
31	68	*****	67	*****	87	*****	99	89	*****	76	*****	49	

Mean	56	60	67	77	85	94	97	93	87	82	66	53	76
Max.	72	73	77	92	91	103	103	103	94	92	76	72	82

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	45	67	74	62	87	87	92	95	87	85	78	57	
2	48	70	70	78	82	94	94	94	88	84	79	61	
3	50	70	59	84	80	93	97	90	84	84	80	66	
4	55	59	64	86	82	91	98	87	81	85	84	61	
5	48	42	70	82	90	94	94	83	80	83	79	56	
6	58	37	73	83	89	96	91	91	83	83	81	62	
7	55	53	73	87	82	96	95	87	87	83	82	57	
8	56	60	69	89	78	96	92	88	92	82	83	48	
9	53	62	69	88	85	100	88	79	94	81	77	35	
10	57	64	71	77	89	97	81	83	95	78	77	40	
11	51	62	65	78	89	97	91	91	87	64	74	53	
12	58	65	56	86	85	97	97	91	88	77	69	50	
13	55	71	57	88	93	94	100	94	87	80	78	54	
14	58	67	59	87	95	94	99	94	86	83	78	60	
15	62	61	71	84	96	88	96	89	89	82	74	55	
16	61	71	69	83	94	91	100	87	90	84	58	58	
17	59	70	66	64	94	96	97	87	91	87	67	52	
18	59	55	65	72	87	97	92	89	91	86	67	56	
19	41	47	70	79	78	98	96	90	91	85	56	54	
20	39	56	78	79	80	98	86	89	88	84	55	53	
21	45	64	80	78	82	97	88	94	86	85	59	62	
22	45	69	82	79	83	99	96	92	84	82	61	56	
23	50	66	81	74	89	98	100	92	78	82	66	55	
24	49	73	86	74	89	97	100	95	83	84	70	56	
25	47	71	84	78	90	93	98	96	86	84	70	64	
26	58	75	85	83	90	85	97	94	88	83	57	57	
27	59	72	89	85	96	87	94	90	89	83	51	47	
28	65	75	85	84	95	93	91	79	88	76	56	48	
29	66	77	79	78	92	96	91	68	89	79	58	51	
30	67	*****	81	87	86	96	93	86	78	78	56	45	
31	67	*****	78	*****	78	*****	93	88	*****	78	*****	52	
Mean	54	64	73	81	87	95	94	89	87	82	69	54	77
Max.	67	77	89	89	96	100	100	96	95	87	84	66	87

1989	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	59	66	73	84	81	96	105	91	88	90	68	52	
2	60	65	67	82	89	95	106	95	89	91	64	54	
3	55	66	67	83	93	92	107	97	93	92	67	54	
4	55	68	63	84	94	90	100	96	95	90	73	59	
5	59	71	45	82	91	91	100	97	87	82	75	65	
6	59	67	59	87	93	92	100	94	87	83	74	65	
7	59	29	79	91	99	94	98	89	88	80	74	60	
8	43	39	80	91	99	94	97	87	92	81	71	53	
9	46	50	85	92	95	93	97	91	92	82	70	61	
10	54	63	85	88	88	95	96	95	89	84	73	70	
11	65	74	88	77	85	95	95	100	92	86	78	67	
12	60	71	89	83	85	97	100	98	92	87	75	43	
13	41	69	85	80	80	92	100	94	85	89	75	50	
14	49	60	81	80	83	86	99	93	79	90	75	57	
15	56	59	80	86	84	92	101	95	84	89	71	62	
16	56	52	82	88	84	102	101	94	87	81	64	54	
17	59	57	83	89	72	102	99	94	90	79	66	55	
18	64	53	82	87	87	102	106	92	92	68	67	61	
19	63	65	83	91	92	105	103	94	93	64	65	59	
20	58	65	80	93	95	105	96	89	92	68	71	58	
21	53	60	65	96	101	104	94	91	92	75	69	59	
22	60	65	72	96	100	98	92	92	93	78	67	44	
23	67	70	75	89	102	96	89	92	77	80	63	44	
24	67	76	77	88	101	96	77	94	82	82	71	55	
25	60	80	77	85	101	98	82	85	89	85	70	59	
26	60	80	74	82	94	100	90	91	89	84	70	56	
27	56	80	66	82	92	102	87	91	84	77	67	60	
28	56	70	74	80	94	103	88	91	83	76	57	59	
29	56	*****	82	80	94	101	88	83	86	75	46	55	
30	59	*****	81	81	94	100	88	86	88	70	50	51	
31	68	*****	75	*****	93	*****	89	84	*****	64	*****	49	
Mean	57	64	76	86	91	97	96	92	88	81	68	56	79
Max.	68	80	89	96	102	105	107	100	95	92	78	70	90

Station	WHITE SANDS NATIONAL MONUMENT			Parameter	
County	OTERO			Record Cnt	
State	NM			Coverage 5	years
Id	299686	Latitude	32:47:00 N	Begin Dat	Jan-84
Elevation	3994 ft.	Longtitude	106:11:00 W	End Date	Jan-90

Daily Minimum Temperature, in degrees Farenheit

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	23	9	14	45	38	53	69	61	60	49	35	20	
2	28	15	21	25	49	49	70	63	58	53	30	20	
3	34	14	26	25	43	48	69	61	55	54	30	22	
4	20	20	27	22	43	51	64	61	51	46	29	28	
5	17	14	26	27	65	52	62	65	43	45	27	29	
6	25	13	19	36	62	56	60	62	46	42	28	23	
7	23	14	18	46	48	64	62	62	44	39	49	22	
8	30	20	21	28	56	62	65	57	50	38	42	30	
9	27	10	27	42	36	63	70	63	50	41	48	30	
10	26	23	30	29	51	55	70	64	52	45	27	23	
11	20	27	40	45	44	64	64	62	57	53	19	36	
12	20	12	35	40	42	65	60	65	62	43	24	39	
13	30	9	39	30	52	69	64	62	56	41	28	38	
14	22	23	34	34	48	55	62	59	59	34	28	29	
15	25	25	36	29	55	61	59	60	64	47	33	26	
16	22	12	47	32	53	58	68	54	50	39	30	19	
17	21	35	28	29	46	61	66	53	49	45	34	22	
18	18	14	34	63	49	61	63	55	50	46	35	28	
19	14	22	24	55	48	58	64	60	48	43	28	30	
20	20	18	24	47	51	59	68	60	53	46	22	31	
21	5	6	27	29	46	59	63	58	52	42	24	28	
22	12	11	52	33	51	63	62	58	53	39	23	28	
23	13	26	23	28	54	62	59	57	51	41	27	21	
24	21	10	23	35	55	64	56	59	60	39	30	29	
25	10	32	35	40	58	65	57	56	53	35	34	28	
26	12	27	34	31	48	63	55	60	52	36	32	30	
27	14	16	42	25	55	67	57	59	54	39	19	33	
28	21	14	21	25	58	63	57	65	51	33	19	50	
29	15	15	18	38	52	61	59	59	49	34	31	38	
30	22	*****	39	29	52	56	58	56	48	34	19	28	
31	17	*****	23	*****	51	*****	65	57	*****	38	*****	26	
Mean	20	35	39	35	50	60	63	60	53	42	29	26	43
Min.	5	6	14	22	36	48	55	53	43	33	19	19	29

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	29	14	30	35	44	60	67	67	61	40	46	28	
2	15	6	32	25	55	49	73	64	72	43	28	22	
3	11	15	28	29	48	59	53	65	67	45	30	33	
4	14	30	20	29	50	51	58	61	62	41	31	24	
5	18	25	15	40	54	50	55	62	56	37	37	22	
6	19	17	27	42	52	45	61	63	54	41	44	27	
7	24	15	37	42	47	57	60	63	53	57	35	26	
8	35	18	35	41	48	63	61	61	48	57	32	24	
9	29	29	42	38	49	59	58	65	51	54	50	34	
10	24	37	42	47	68	58	58	65	62	55	48	38	
11	20	18	40	39	43	60	70	63	62	52	48	17	
12	24	16	46	53	44	69	60	65	59	37	35	14	
13	22	25	38	41	46	55	55	62	57	41	34	7	
14	10	20	31	47	32	60	62	56	59	41	32	7	
15	23	28	38	38	31	65	68	66	63	36	21	15	
16	27	28	32	40	54	63	57	57	55	52	21	13	
17	19	24	27	60	55	60	59	59	57	45	25	10	
18	23	30	25	52	49	57	62	61	60	41	36	13	
19	24	36	40	49	49	61	63	63	56	39	32	14	
20	25	44	35	46	47	65	59	65	56	44	17	15	
21	12	37	31	46	46	59	57	68	50	48	20	15	
22	19	35	33	47	47	63	60	62	46	46	33	17	
23	29	29	25	36	47	59	57	62	49	46	32	17	
24	30	28	25	28	52	72	63	63	47	36	32	20	
25	33	25	33	51	54	66	67	60	48	40	43	16	
26	28	26	48	46	47	55	65	59	44	41	52	20	
27	33	29	53	44	50	47	65	63	48	42	32	17	
28	36	46	52	49	51	58	65	64	57	38	26	16	

29	30	*****	45	37	53	57	71	62	47	39	38	16	
30	40	*****	26	45	54	63	66	60	44	41	44	18	
31	24	*****	22	*****	60	*****	62	53	*****	38	*****	28	
Mean	24	26	34	42	49	59	61	62	55	44	34	19	42
Min.	10	6	15	25	31	45	53	53	44	36	17	7	29

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	30	36	21	54	48	45	63	62	68	38	45	21	
2	21	42	31	45	47	53	65	61	60	62	43	18	
3	19	28	37	42	57	57	68	65	62	56	42	19	
4	19	35	26	30	50	57	67	62	53	50	34	19	
5	22	31	26	29	*****	58	65	64	54	53	28	30	
6	18	26	29	36	47	59	67	69	53	52	29	41	
7	26	37	41	35	56	64	64	64	60	45	44	44	
8	13	22	40	48	49	71	69	65	58	43	36	42	
9	10	26	49	50	34	58	63	73	58	48	29	29	
10	13	26	35	39	35	53	61	65	51	51	29	28	
11	14	21	42	49	39	48	61	62	46	48	28	14	
12	14	33	35	54	44	59	66	65	52	44	30	17	
13	16	34	37	50	42	68	70	70	59	31	32	18	
14	16	32	39	41	43	62	64	65	55	31	30	21	
15	22	42	29	52	45	59	68	68	59	29	30	23	
16	20	46	31	54	49	68	62	62	56	43	33	38	
17	19	31	40	50	48	63	62	66	54	37	33	37	
18	27	38	29	32	34	63	60	63	54	43	36	35	
19	20	36	33	39	44	66	56	60	57	45	38	25	
20	19	43	21	30	45	62	55	73	60	50	37	24	
21	33	36	21	37	53	62	62	61	63	45	30	32	
22	28	23	25	47	53	66	62	72	67	29	36	32	
23	21	21	23	46	49	62	60	61	61	36	32	32	
24	20	32	28	48	54	61	59	64	55	37	18	24	
25	23	30	37	49	54	62	56	60	45	35	20	22	
26	15	29	31	56	57	62	60	65	46	33	22	21	
27	14	39	31	44	60	64	59	65	46	27	22	20	
28	15	28	40	36	51	59	63	63	50	31	21	30	
29	17	*****	37	55	56	66	64	64	48	34	23	23	
30	19	*****	37	58	50	68	63	63	38	33	33	26	
31	29	*****	38	*****	53	*****	62	59	*****	40	*****	16	
Mean	20	32	33	45	48	61	62	65	55	41	31	26	43
Min.	10	21	21	29	34	45	55	60	38	27	18	14	31

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	21	26	19	25	46	57	65	64	53	42	51	12	
2	26	22	22	33	49	58	55	62	52	42	48	13	
3	22	21	24	25	44	61	61	70	52	45	39	20	
4	18	35	25	37	42	49	58	68	55	39	38	23	
5	25	39	25	30	44	51	57	66	60	39	44	31	
6	23	20	24	27	44	54	54	62	52	45	53	26	
7	24	17	25	29	45	60	62	70	55	44	32	22	
8	34	16	33	25	40	57	58	63	54	46	31	18	
9	18	27	33	32	40	55	58	64	58	43	28	12	
10	18	26	42	37	48	56	65	67	55	52	25	20	
11	12	26	32	31	50	54	69	68	53	50	22	22	
12	13	31	28	60	55	52	62	64	51	46	27	22	
13	18	25	28	29	54	56	59	63	61	55	22	28	
14	18	40	38	25	49	63	65	58	60	53	41	20	
15	37	31	41	27	49	59	61	61	47	50	33	-5	
16	29	38	33	35	56	59	63	56	46	38	21	-5	
17	19	27	30	37	57	52	66	50	48	44	17	6	
18	1	29	20	39	59	53	63	53	60	43	36	26	
19	4	32	39	38	58	53	62	53	42	38	11	29	
20	17	26	45	43	49	51	69	58	48	38	10	35	
21	12	28	27	52	48	47	65	71	52	35	19	24	
22	10	19	36	44	45	62	65	61	48	49	24	25	
23	16	21	28	30	54	52	68	65	47	53	21	34	
24	17	21	28	41	48	56	67	64	43	40	30	29	
25	23	29	23	39	47	68	65	62	54	43	19	*****	
26	20	40	29	39	64	62	61	61	47	43	33	19	
27	20	22	28	43	46	62	70	58	55	36	13	-5	
28	34	21	28	42	49	59	69	53	49	48	12	0	
29	31	*****	25	42	46	56	63	54	48	46	13	5	
30	25	*****	19	46	39	56	64	50	47	43	16	5	
31	36	*****	21	*****	48	*****	64	52	*****	48	*****	26	

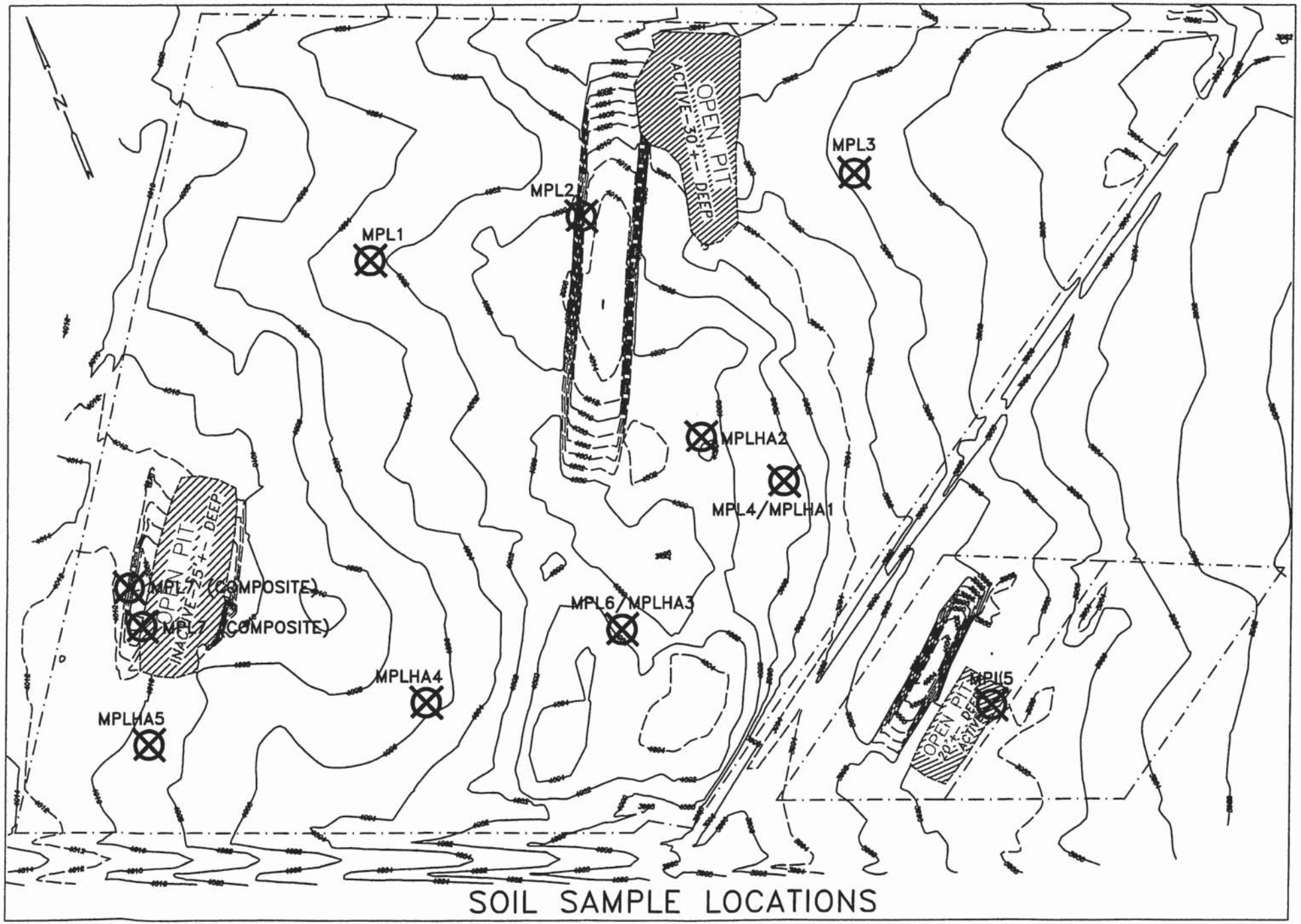
Mean	21	26	29	36	49	56	63	61	52	44	28	18	40
Min.	1	16	19	25	39	47	55	50	42	35	10	-5	28

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	28	33	43	32	50	36	68	67	60	39	33	13	
2	32	43	33	33	36	46	61	66	61	43	46	15	
3	23	43	36	33	30	54	66	70	58	42	35	13	
4	26	42	26	33	37	55	63	64	54	47	29	15	
5	29	32	26	37	49	65	64	63	44	41	36	25	
6	41	29	32	37	55	56	66	58	46	44	29	19	
7	26	34	35	38	38	62	65	65	44	44	30	21	
8	22	24	35	47	41	49	67	65	48	46	50	28	
9	23	27	25	40	35	46	63	62	47	49	49	23	
10	22	26	41	29	41	48	63	65	54	52	33	32	
11	23	23	28	27	48	63	63	65	52	38	44	25	
12	31	22	19	31	44	61	61	63	61	36	29	23	
13	20	21	16	35	47	63	63	61	57	41	35	23	
14	21	32	11	40	51	72	72	63	57	42	42	21	
15	15	21	21	32	50	68	68	63	44	54	42	19	
16	38	21	32	43	52	70	70	63	52	42	18	32	
17	28	29	33	35	60	64	64	60	58	43	17	19	
18	29	35	21	28	60	67	67	60	57	45	18	25	
19	34	37	13	34	59	60	60	65	45	47	25	43	
20	21	21	16	45	41	67	67	66	55	52	14	25	
21	13	20	19	44	42	58	58	63	57	48	12	21	
22	23	23	29	47	42	62	56	68	57	46	12	26	
23	13	27	29	31	48	59	56	62	50	42	17	31	
24	19	29	39	35	48	68	62	66	40	36	37	20	
25	8	27	29	31	54	59	65	65	45	35	47	23	
26	20	47	31	37	49	62	59	65	46	36	38	43	
27	19	40	38	42	56	65	65	66	47	38	17	16	
28	23	31	43	49	55	62	66	62	44	39	11	8	
29	21	31	34	45	60	62	61	60	42	37	15	8	
30	35	*****	26	38	63	60	57	61	44	37	10	11	
31	25	*****	32	*****	44	*****	57	59	*****	32	*****	11	
Mean	24	30	29	36	48	58	63	64	51	42	29	22	41
Min.	8	20	11	27	30	36	56	58	40	32	10	8	28

1989	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1	11	45	38	36	42	51	70	67	60	42	29	24	
2	29	40	33	40	41	62	58	67	59	41	20	15	
3	26	35	50	50	44	59	62	68	58	54	19	13	
4	35	35	27	32	42	50	62	68	59	51	22	14	
5	39	51	20	42	46	46	69	72	64	55	32	12	
6	30	14	19	32	47	49	69	66	64	46	34	17	
7	30	16	31	35	47	51	58	67	64	44	26	21	
8	13	13	28	41	49	47	60	61	61	46	29	17	
9	6	24	31	55	51	48	60	58	52	42	17	12	
10	9	24	35	40	57	48	72	56	58	39	22	28	
11	24	24	33	24	59	52	65	53	51	38	24	17	
12	24	41	35	36	49	57	60	67	64	42	24	-2	
13	22	31	42	44	41	51	65	69	52	40	28	0	
14	7	32	38	36	41	52	63	63	52	35	28	3	
15	10	33	32	41	40	62	73	59	48	49	28	11	
16	9	28	31	44	40	66	74	58	47	39	16	27	
17	9	30	39	44	44	55	70	57	51	40	19	14	
18	23	41	32	42	38	53	60	68	60	33	21	26	
19	13	29	34	45	48	58	75	59	65	33	20	19	
20	20	35	38	42	44	59	65	60	65	25	35	12	
21	14	31	28	45	44	76	60	59	55	42	34	10	
22	24	16	22	56	50	66	63	59	58	49	32	9	
23	25	23	24	57	52	51	63	58	50	32	25	0	
24	32	25	40	49	52	71	65	63	45	32	21	7	
25	24	27	34	46	51	64	63	66	47	42	37	12	
26	16	28	40	43	45	62	61	62	48	42	37	9	
27	29	38	40	34	64	50	57	63	44	27	34	16	
28	23	32	30	26	64	62	61	63	37	36	27	40	
29	22	*****	30	35	60	71	62	65	38	36	24	26	
30	16	*****	36	41	56	70	63	64	43	26	20	31	
31	22	*****	27	*****	54	*****	63	60	*****	27	*****	25	
Mean	21	30	33	41	48	57	64	63	54	40	26	16	41
Min.	6	13	19	24	38	46	57	53	37	25	16	-2	28

Attachment C

Soil Sampling Results



SOIL SAMPLE LOCATIONS

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

Moisture Density Relations of Soils

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Date: OCTOBER 22, 1999

Project: MEVATEC Q.C.
MPL SAMPLES

PEI File No.: 99-121

Date Sampled: 9-9-99

Soil Type: SILTY SAND

Sample Location: MPL 1

Laboratory Test Method: ASTM D-698-A

Trial No.	Wet Density pcf	Dry Density pcf	Moisture Percent
1	133.1	123.0	8.2
2	135.0	123.7	9.1
3	138.2	125.3	10.3
4	138.4	124.4	11.3
5	137.2	122.4	12.1

Maximum Dry Density 125.3 Optimum Moisture Content 10.3%

Remarks:

Lab No.: 36393

Reviewed By: D. W. B.

Reviewed By:

Certified By: Willie H. Bagley

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

Particle Size Analysis of Soils
(ASTM D-422)

MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Project: MEVATEC Q.C.
MPL SAMPLES
File No.: 99-121
Date: Oct 22, 1999

	UNIFIED	AASHTO
Soil Type and Class.: SILTY SAND	SM	A-2-4

Sampled From: MPL 1

Lab No.: 36393

BEFORE WASH		POST WASH	
Dry + Container	221.80	Dry + Container	156.30
Container Wt.		Container Wt.	
Dry Soil Wt.	221.80	Dry Soil Wt.	156.30
WT PASSING #4		Init. Prop. Wt.	

SIEVE NUMBER	WT. RETAINED	% RETAINED	% PASSING	SPEC.
3"				
2"				
1-1/2				
1				
3/4				
1/2				
3/8	.00	.0	100.0	
#4	4.80	2.2	97.8	
#10	22.50	10.1	89.9	
#20	50.10	22.6	77.4	
#40	77.40	34.9	65.1	
#60	101.00	45.5	54.5	
#140	142.60	64.3	35.7	
#200	155.30	70.0	30.0	
PAN	156.20			

SOIL LOST= .10 PERCENT ERROR= .05

Remarks: SANDY/NON-PLASTIC
LL:
PL:
PI:

Reviewed By: Reviewed By: Certified By:

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

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

PROJECT: MEVETEC Q.C
MPL SAMPLES

FILE NO.: 99-121

DATE OF REPORT: OCTOBER 21, 1999

SAMPLE LOCATION: MPL 1

LAB NO.: 36393

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 127.2 PCF % MOISTURE: 10.3
DRY UNIT WEIGHT: 115.2 PCF % COMPACTION: 92.0

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY: 125.3
OPTIMUM MOISTURE CONTENT: 10.3

COEFFICIENT OF PERMEABILITY (cm/sec.): k_{20}= 2.8 X 10^{-5}

Remarks:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William H. Brayley

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

Moisture Density Relations of Soils

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Date: OCTOBER 22, 1999

Project: MEVATEC Q.C.
MPL SAMPLES

PEI File No.: 99-121

Date Sampled: 9-9-99

Soil Type: SILTY SAND

Sample Location: MPL 2

Laboratory Test Method: ASTM D-698-A

Trial No.	Wet Density pcf	Dry Density pcf	Moisture Percent
1	125.3	114.6	9.4
2	130.9	118.0	11.0
3	136.2	121.4	12.2
4	134.0	117.4	14.1
5	133.1	115.4	15.3

Maximum Dry Density 121.4 Optimum Moisture Content 12.2%

Remarks:

Lab No.: 36394

Reviewed By: K.W.G.

Reviewed By:

Certified By: William H. Bagley

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

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

PROJECT: MEVETEC Q.C
MPL SAMPLES

FILE NO.: 99-121

DATE OF REPORT: OCTOBER 21, 1999

SAMPLE LOCATION: MPL 2

LAB NO.: 36394

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 125.3 PCF % MOISTURE: 12.2
DRY UNIT WEIGHT: 111.7 PCF % COMPACTION: 92.0

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY: 121.4
OPTIMUM MOISTURE CONTENT: 12.2

COEFFICIENT OF PERMEABILITY (cm/sec.): k_{20}= 2.4 X 10^{-5}

Remarks:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William H. Dingley

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

Particle Size Analysis of Soils
(ASTM D-422)

MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Project: MEVATEC Q.C.
MPL SAMPLES
File No.: 99-121
Date: Oct 22, 1999

	UNIFIED	AASHTO
Soil Type and Class.: SILTY SAND	SM	A-2-4

Sampled From: MPL 2

Lab No.: 36394

BEFORE WASH		POST WASH	
Dry + Container	300.20	Dry + Container	217.60
Container Wt.		Container Wt.	
Dry Soil Wt.	300.20	Dry Soil Wt.	217.60
WT PASSING #4		Init. Prop. Wt.	

SIEVE NUMBER	WT. RETAINED	% RETAINED	% PASSING	SPEC.
3"				
2"				
1-1/2				
1				
3/4				
1/2	.00	.0	100.0	
3/8	2.90	1.0	99.0	
#4	12.70	4.2	95.8	
#10	38.70	12.9	87.1	
#20	70.90	23.6	76.4	
#40	110.00	36.6	63.4	
#60	142.80	47.6	52.4	
#140	195.60	65.2	34.8	
#200	214.80	71.6	28.4	
PAN	217.40			

SOIL LOST= .20 PERCENT ERROR= .07

Remarks: SANDY/NON-PLASTIC
LL:
PL:
PI:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William H. Kingsley

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

Moisture Density Relations of Soils

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Date: OCTOBER 22, 1999

Project: MEVATEC Q.C.
MPL SAMPLES

PEI File No.: 99-121

Date Sampled: 9-9-99

Soil Type: SILTY SAND

Sample Location: MPL 3

Laboratory Test Method: ASTM D-698-A

Trial No.	Wet Density pcf	Dry Density pcf	Moisture Percent
1	130.5	121.6	7.3
2	138.3	127.3	8.7
3	138.1	125.8	9.7
4	137.3	124.0	10.7
5	136.0	121.7	11.8

Maximum Dry Density 127.3 Optimum Moisture Content 8.7%

Remarks:

Lab No.: 36395

Reviewed By: J. W. S.

Reviewed By:

Certified By: William H. Hagley

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

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

PROJECT: MEVETEC Q.C
MPL SAMPLES

FILE NO.: 99-121

DATE OF REPORT: OCTOBER 21, 1999

SAMPLE LOCATION: MPL 3

LAB NO.: 36395

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 127.3 PCF % MOISTURE: 9.0
DRY UNIT WEIGHT: 116.8 PCF % COMPACTION: 91.8

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY: 127.3
OPTIMUM MOISTURE CONTENT: 8.7

COEFFICIENT OF PERMEABILITY (cm/sec.): $k_{20} = 2.6 \times 10^{-6}$

Remarks:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William H. Rangley

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

Particle Size Analysis of Soils
(ASTM D-422)

MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Project: MEVATEC Q.C.
MPL SAMPLES
File No.: 99-121
Date: Oct 22, 1999

	UNIFIED	AASHTO
Soil Type and Class.: SILTY SAND	SM	A-4

Sampled From: MPL 3

Lab No.: 36395

BEFORE WASH		POST WASH	
Dry + Container	182.50	Dry + Container	98.60
Container Wt.		Container Wt.	
Dry Soil Wt.	182.50	Dry Soil Wt.	98.60
WT PASSING #4		Init. Prop. Wt.	

SIEVE NUMBER	WT. RETAINED	% RETAINED	% PASSING	SPEC.
3"				
2"				
1-1/2				
1				
3/4				
1/2				
3/8	.00	.0	100.0	
#4	3.20	1.8	98.2	
#10	13.90	7.6	92.4	
#20	29.70	16.3	83.7	
#40	46.90	25.7	74.3	
#60	61.70	33.8	66.2	
#140	87.50	47.9	52.1	
#200	97.70	53.5	46.5	
PAN	98.60			

SOIL LOST= 0 PERCENT ERROR= 0

Remarks: SANDY/NON-PLASTIC
LL:
PL:
PI:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William R. Pogeley

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

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

PROJECT: MEVETEC Q.C
MPL SAMPLES

FILE NO.: 99-121

DATE OF REPORT: OCTOBER 21, 1999

SAMPLE LOCATION: MPL 4

LAB NO.: 36396

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 126.5 PCF
DRY UNIT WEIGHT: 115.4 PCF
% MOISTURE: 9.7
% COMPACTION: 92.3

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY: 125.1
OPTIMUM MOISTURE CONTENT: 9.9

COEFFICIENT OF PERMEABILITY (cm/sec.): $k_{20} = 4.2 \times 10^{-6}$

Remarks:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William H. Bagley

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

Moisture Density Relations of Soils

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Date: OCTOBER 22, 1999

Project: MEVATEC Q.C.
MPL SAMPLES

PEI File No.: 99-121

Date Sampled: 9-9-99

Soil Type: SILTY SAND

Sample Location: MPL 4

Laboratory Test Method: ASTM D-698-A

Trial No.	Wet Density pcf	Dry Density pcf	Moisture Percent
1	122.9	115.0	6.9
2	133.7	123.0	8.7
3	137.4	125.0	9.9
4	137.4	124.0	10.8
5	137.3	122.8	11.8

Maximum Dry Density 125.0 Optimum Moisture Content 9.9%

Remarks:

Lab No.: 36396

Reviewed By: B. W. G.

Reviewed By:

Certified By: William H. Kingsley

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

Particle Size Analysis of Soils
(ASTM D-422)

MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Project: MEVATEC Q.C.
MPL SAMPLES
File No.: 99-121
Date: Oct 22, 1999

	UNIFIED	AASHTO
Soil Type and Class.: SILTY SAND	SM	A-2-4

Sampled From: MPL 4

Lab No.: 36396

BEFORE WASH		**POST WASH**	
Dry + Container	203.40	Dry + Container	153
Container Wt.		Container Wt.	
Dry Soil Wt.	203.40	Dry Soil Wt.	153
WT PASSING #4		Init. Prop. Wt.	

SIEVE NUMBER	**WT. RETAINED**	**% RETAINED**	**% PASSING**	**SPEC.**
3"				
2"				
1-1/2				
1				
3/4				
1/2	.00	.0	100.0	
3/8	2.60	1.3	98.7	
#4	11.10	5.5	94.5	
#10	25.40	12.5	87.5	
#20	46.80	23.0	77.0	
#40	76.40	37.6	62.4	
#60	100.40	49.4	50.6	
#140	137.30	67.5	32.5	
#200	151.10	74.3	25.7	
PAN	153.00			

SOIL LOST= 0 PERCENT ERROR= 0

Remarks: SANDY/NON-PLASTIC
LL:
PL:
PI:

Reviewed By: A. W. B.

Reviewed By:

Certified By: William H. Bingley

OCT 27 1999
DIVISION II

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

Moisture Density Relations of Soils

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Date: OCTOBER 22, 1999

Project: MEVATEC Q.C.
MPL SAMPLES

PEI File No.: 99-121

Date Sampled: 9-9-99

Soil Type: SILTY SAND

Sample Location: MPL 5

Laboratory Test Method: ASTM D-698-A

Trial No.	Wet Density pcf	Dry Density pcf	Moisture Percent
1	122.0	111.1	9.9
2	124.0	111.6	11.1
3	126.1	112.9	11.8
4	125.9	111.0	13.5
5	125.2	108.9	14.9

Maximum Dry Density 112.9 Optimum Moisture Content 11.8%

Remarks:

Lab No.: 36397

Reviewed By: D.W.B.

Reviewed By:

Certified By:

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

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

PROJECT: MEVETEC Q.C
MPL SAMPLES

FILE NO.: 99-121

DATE OF REPORT: OCTOBER 21, 1999

SAMPLE LOCATION: MPL 5

LAB NO.: 36397

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 116.1 PCF
DRY UNIT WEIGHT: 103.9 PCF
% MOISTURE: 11.8
% COMPACTION: 92.0

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY: 112.9
OPTIMUM MOISTURE CONTENT: 11.8

COEFFICIENT OF PERMEABILITY (cm/sec.): $k_{20} = 4.0 \times 10^{-4}$

Remarks:

Reviewed By: B.W.B.

Reviewed By:

Certified By: William H. Hughes

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

Particle Size Analysis of Soils
(ASTM D-422)

MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Project: MEVATEC Q.C.
MPL SAMPLES
File No.: 99-121
Date: Oct 22, 1999

	UNIFIED	AASHTO
Soil Type and Class.: SILTY SAND	SM	A-2-4

Sampled From: MPL 5

Lab No.: 36397

BEFORE WASH		POST WASH	
Dry + Container	221.70	Dry + Container	190.0
Container Wt.		Container Wt.	
Dry Soil Wt.	221.70	Dry Soil Wt.	190.0
WT PASSING #4		Init. Prop. Wt.	

SIEVE NUMBER	WT. RETAINED	% RETAINED	% PASSING	SPEC.
3"				
2"				
1-1/2				
1				
3/4				
1/2				
3/8	.00	.0	100.0	
#4	2.20	1.0	99.0	
#10	7.50	3.4	96.6	
#20	23.80	10.7	89.3	
#40	62.60	28.2	71.8	
#60	104.10	47.0	53.0	
#140	174.90	78.9	21.1	
#200	189.00	85.3	14.7	
PAN	190.00			

SOIL LOST= 0 PERCENT ERROR= 0

Remarks: SANDY/NON-PLASTIC
LL:
PL:
PI:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William [illegible]

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

Moisture Density Relations of Soils

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Date: OCTOBER 22, 1999

Project: MEVATEC O.C.
MPL SAMPLES

PEI File No.: 99-121

Date Sampled: 9-9-99

Soil Type: SILTY SAND

Sample Location: MPL 6

Laboratory Test Method: ASTM D-698-A

Trial No.	Wet Density pcf	Dry Density pcf	Moisture Percent
1	128.1	116.7	9.8
2	132.0	119.0	10.9
3	135.6	120.6	12.5
4	135.0	119.1	13.3
5	133.6	117.0	14.2

Maximum Dry Density 120.6 Optimum Moisture Content 12.5%

Remarks:

Lab No.: 36398

Reviewed By: B. W. B.

Reviewed By:

Certified By: William H. Kingsley

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

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

PROJECT: MEVETEC Q.C
MPL SAMPLES

FILE NO.: 99-121

DATE OF REPORT: OCTOBER 21, 1999

SAMPLE LOCATION: MPL 6

LAB NO.: 36398

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 124.7 PCF
DRY UNIT WEIGHT: 110.9 PCF
% MOISTURE: 12.5
% COMPACTION: 91.9

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY: 120.6
OPTIMUM MOISTURE CONTENT: 12.4

COEFFICIENT OF PERMEABILITY (cm/sec.): $k_{20} = 5.8 \times 10^{-6}$

Remarks:

Reviewed By: G. W. G.

Reviewed By:

Certified By: William H. Bradley

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

Particle Size Analysis of Soils
(ASTM D-422)

MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Project: MEVATEC Q.C.
MPL SAMPLES
File No.: 99-121
Date: Oct 22, 1999

	UNIFIED	AASHTO
Soil Type and Class.: SILTY SAND	SM	A-2-4

Sampled From: MPL 6

Lab No.: 36398

BEFORE WASH		POST WASH	
Dry + Container	208.60	Dry + Container	138.0
Container Wt.		Container Wt.	
Dry Soil Wt.	208.60	Dry Soil Wt.	138.0
WT PASSING #4		Init. Prop. Wt.	

SIEVE NUMBER	WT. RETAINED	% RETAINED	% PASSING	SPEC.
3"				
2"				
1-1/2				
1				
3/4				
1/2				
3/8	.00	.0	100.0	
#4	5.00	2.4	97.6	
#10	19.00	9.1	90.9	
#20	40.90	19.6	80.4	
#40	66.20	31.7	68.3	
#60	87.54	42.0	58.0	
#140	122.30	58.6	41.4	
#200	136.30	65.3	34.7	
PAN	138.00			

SOIL LOST= 0 PERCENT ERROR= 0

Remarks: SANDY/NON-PLASTIC
LL:
PL:
PI:

Reviewed By: B. W. B.

Reviewed By:

Certified By: William A. Bingaley

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

Moisture Density Relations of Soils

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Date: OCTOBER 22, 1999

Project: MEVATEC Q.C.
MPL SAMPLES

PEI File No.: 99-121

Date Sampled: 9-9-99

Soil Type: SILTY SAND

Sample Location: MPL 7

Laboratory Test Method: ASTM D-698-A

Trial No.	Wet Density pcf	Dry Density pcf	Moisture Percent
1	129.6	119.4	8.6
2	132.2	121.2	9.1
3	137.1	124.9	9.8
4	137.5	123.9	11.0
5	137.0	122.3	12.0

Maximum Dry Density 124.9 Optimum Moisture Content 9.8%

Remarks:

Lab No.: 36399

Reviewed By: B.W.B.

Reviewed By:

Certified By:

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

DEC 17 '99

COEFFICIENT OF PERMEABILITY
FALLING HEAD

ATTN: MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

PROJECT: MEVETEC Q.C
MPL SAMPLES

FILE NO.: 99-121

DATE OF REPORT: OCTOBER 21, 1999

SAMPLE LOCATION: MPL 7

LAB NO.: 36399

TEST SPECIMEN CONDITIONS AT BEGINNING OF TEST:
WET UNIT WEIGHT: 126.2 PCF % MOISTURE: 9.8
DRY UNIT WEIGHT: 114.9 PCF % COMPACTION: 92.0

PROCTOR INFORMATION:
MAXIMUM DRY DENSITY: 124.9
OPTIMUM MOISTURE CONTENT: 9.8

COEFFICIENT OF PERMEABILITY (cm/sec.): $k_{20} = 1.1 \times 10^{-4}$

Remarks:

Reviewed By: B.W.B.

Reviewed By:

Certified By: William H. Bingeley

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

Particle Size Analysis of Soils
(ASTM D-422)

#N/A!
MS. BRIGITTE BURCHFIELD
MEVATEC CORPORATION
BUILDING S-146W
P.O. BOX 399
WSMR, NM 88002

Project: MEVATEC Q.C.
MPL SAMPLES
File No.: 99-121
Date: Oct 22, 1999

	UNIFIED	AASHTO
Soil Type and Class.: SILTY SAND	SM	A-2-4

Sampled From: MPL 7

Lab No.: 36399

BEFORE WASH		POST WASH	
Dry + Container	214.80	Dry + Container	161.6
Container Wt.		Container Wt.	
Dry Soil Wt.	214.80	Dry Soil Wt.	161.6
WT PASSING #4		Init. Prop. Wt.	

SIEVE NUMBER	WT. RETAINED	% RETAINED	% PASSING	SPEC.
3"				
2"				
1-1/2				
1				
3/4				
1/2				
3/8	.00	.0	100.0	
#4	6.10	2.8	97.2	
#10	19.40	9.0	91.0	
#20	40.40	18.8	81.2	
#40	70.24	32.7	67.3	
#60	98.10	45.7	54.3	
#140	146.20	68.1	31.9	
#200	160.10	74.5	25.5	
PAN	161.50			

SOIL LOST= .10 PERCENT ERROR= .05

Remarks: SANDY/NON-PLASTIC
LL:
PL:
PI:

Reviewed By: B. W. G.

Reviewed By:

Certified By: William H. Kenyon Jr.

Attachment D

Summary of Help Model Input Parameters

Guidance Document

for

Performance Demonstration for an Alternate Cover Design under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

and

Performance Demonstration for an Alternate Liner Design under Section 306.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

This document is for guidance only and is subject to change. However, any deviations from this document must be fully justified to the satisfaction of the Department.

Prepared by the
New Mexico Environment Department
Solid Waste Bureau
Permit Section
April 1, 1998

Under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

1. Existing Solid Waste Landfills without a Liner System:

A prescriptive landfill cover system must, in accordance with Section 502.A.1, consist of an infiltration layer comprised of a minimum of 18 inches of earthen material with the required hydraulic conductivity (K) and a minimum of 6 inches of soil that is capable of sustaining native plant growth as an erosion layer (Figure 1). The cover component of 18 inches of earthen material must be equivalent to the least hydraulically conductive natural subsoils or a saturated hydraulic conductivity of no greater than 1×10^{-5} cm/sec. For example, if the hydraulic conductivity of the natural subsoils is 5×10^{-6} cm/sec, then the K of the infiltration layer material must be equivalent to these soils. *However, this example is for modeling purposes only. If the K of the underlying subsoils is less than 1×10^{-5} cm/sec (e.g., 5×10^{-6} cm/sec), then an alternative cover design must be proposed since 1×10^{-5} cm/sec is the lowest acceptable actual K for soils used in covers due to desiccation and root penetration (see example below).* If the hydraulic conductivity of the natural subsoils is greater than 1×10^{-5} cm/sec (e.g., 1×10^{-4} cm/sec), the K of the infiltration layer material must equate to the 1×10^{-5} cm/sec requirement.

If the infiltration layer meets the minimum hydraulic conductivity of 1×10^{-5} cm/sec or that of the natural subsoils and the minimum 18 inch condition then a Hydrologic Evaluation of Landfill Performance (HELP) Model simulation is not required. If an alternative cover design is proposed, it must achieve an equivalent reduction in infiltration as the infiltration layer specified in Section 502.A.1.a. Therefore, a HELP Model simulation is required to demonstrate that the design of such a cover provides equivalent reduction in infiltration as the prescriptive cover design. If the natural subsoils have a hydraulic conductivity of less than 1×10^{-5} cm/sec (e.g., 5×10^{-6} cm/sec), then the cover must achieve equivalent reduction in infiltration as that of the prescriptive cover but with an 18 inch infiltration layer with a hydraulic conductivity of 5×10^{-6} cm/sec.

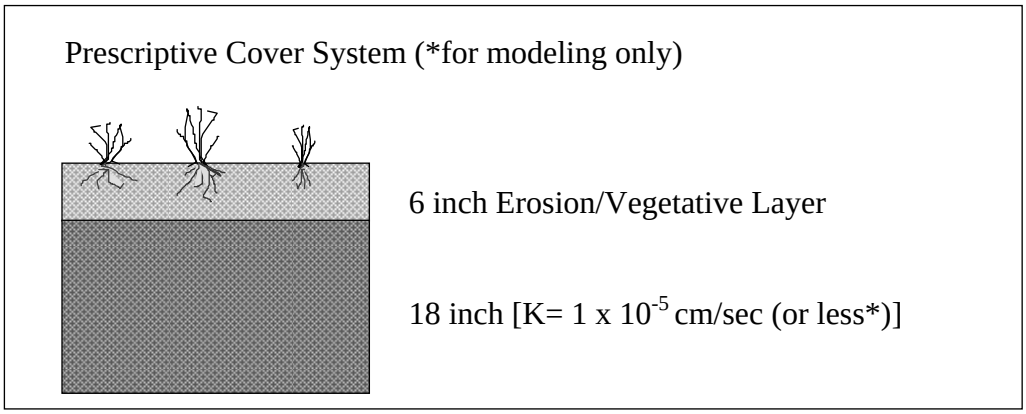


Figure 1. Prescriptive Cover System

A demonstration of equivalent reduction in infiltration is determined by using the EPA HELP Model. The HELP Model simulations need to compare the prescriptive cover and the alternative cover design (Figure 2). The simulation for the prescriptive cover must include the erosion, infiltration and intermediate cover layers. The alternative cover design simulation includes the intermediate and alternative cover layers. The two designs are to be simulated for years 1 through 5 with "poor" vegetation during the post-closure care period to demonstrate equivalency (Simulations #1 & #2). In New Mexico, it is assumed for a conservative value that the vegetation will be between "bare ground" and "fair vegetation" designated as "poor vegetation". Precipitation (wettest 5 consecutive year period using Climatedata CD or NOAA data files: discs or manual entry), evapotranspiration, temperature (use values associated with wettest 5 consecutive years of precipitation), and solar radiation data must be site specific and identical for both alternative and prescriptive cover designs simulations. Provide justification for all input parameters in the model utilizing the attached forms. Indicate characteristics of on-site or other sources of soil proposed for the construction of cover and the parameter values in the model. It is anticipated that the entire area of the landfill or cell will be modeled. The Department recommends initializing the soil moisture content to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point]. Other values deviating from this range may be used but must be fully justified. The leaf area index may be between 0.8 and 1.6 depending on the site location. The evaporative zone depth may be between 18" and 28" depending on the site location.

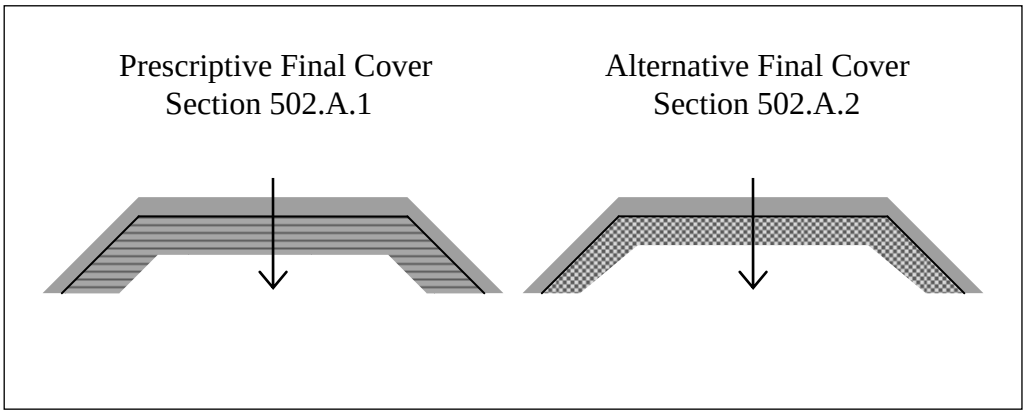


Figure 2

For example, comparing the prescriptive cover of:

1) 6 inches of topsoil
2) 18 inches of compacted soil ($K = 5 \times 10^{-6}$ cm/sec* - to meet natural subsoils $K = 5 \times 10^{-6}$)
3) Intermediate cover layer (optional* for modeling purposes) [*unless an intermediate cover layer is used for modeling purposes with a proposed alternative cover system (see below), then an intermediate cover layer must be used for modeling purposes]

with a proposed alternative cover system of:

1) 6 inches of topsoil
2) 30 inches of compacted ($K = 1 \times 10^{-5}$ cm/sec*)
3) Intermediate cover layer (optional for modeling purposes)

* K = 5 x 10^{-6} cm/sec is for modeling purposes only since 1 x 10^{-5} cm/sec is the lowest acceptable actual K for soils used in covers. Even if soils with K = 5 x 10^{-6} cm/sec are available for use in the cover, over time the K will increase to 1 x 10^{-5} cm/sec due to desiccation and root penetration.

Input Parameters for HELP Simulation #1 (Prescriptive Cover)

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18" to 28" corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20"; Santa Fe and Roswell would be 24"; Las Cruces, Albuquerque, and Farmington would be 28")

Maximum leaf area index: 0.8 to 1.6 corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for "poor"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, 18" of infiltration layer, 12" of intermediate cover layer* [*optional for modeling purposes (unless an intermediate cover layer is used for modeling purposes with a proposed alternative cover system in Simulation #2, then an intermediate cover layer must be used for modeling purposes)]

Layer type: "1" vertical percolation layer for all cover materials

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): The K of the infiltration layer must be the greatest actual value (unless greater than $1x\ 10^{-5}$ cm/sec*) of the underlying soil [e.g., If the actual (two tested samples - different locations) K of the underlying soil = $1x\ 10^{-6}$ cm/sec and 2×10^{-6}, then model 18" of 2×10^{-6} cm/sec for the infiltration layer; *If the K of the underlying soil = 5×10^{-5} cm/sec, then model 18" of $1x\ 10^{-5}$ cm/sec].

Input Parameters for HELP Simulation #2 (Proposed Alternate Cover)

Weather data (must be the same as Simulation #1)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18" to 28" corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20"; Santa Fe and Roswell would be 24"; Las Cruces, Albuquerque, and Farmington would be 28")

Maximum leaf area index: 0.8 to 1.6 corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for "poor"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, 18" to proposed thickness of infiltration layer, 12" of intermediate cover layer* (*optional for modeling purposes)

Layer type: "1" vertical percolation layer for all* cover materials including GCLs used (*consult with the Department if a FML is proposed to be used in the cover)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1×10^{-5} cm/sec* (e.g., If the tested K is 5×10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5×10^{-5} cm/sec. However, if the tested K is 2×10^{-6}, the lowest value to be modeled would be 1×10^{-5} cm/sec). *1×10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24" at 3×10^{-9} cm/sec).

2. New Solid Waste Landfills:

As in the above case, the cover for the proposed landfill with a prescriptive or alternative liner must achieve an equivalent protection as the liner. If an alternative final cover is proposed for the landfill, then a demonstration must be submitted to the Bureau for approval pursuant to Section 502.A. It must be determined by this demonstration that the proposed final cover design includes an infiltration layer that achieves an equivalent reduction in infiltration as the bottom liner (Figure 3). A HELP Model simulation comparison is acceptable for this demonstration for a 5 year period with vegetation. Precipitation (wettest 5 consecutive year period using Climatedata CD or NOAA data

files: discs or manual entry), evapotranspiration, temperature (use values associated with wettest 5 consecutive years of precipitation) , and solar radiation data must be site specific and identical for both liner and cover design simulations. Provide justification for all input parameters in the model utilizing the attached forms. Demonstrate the relationship of the characteristics of on-site or other sources of soil proposed for the construction of cover or liner and the parameter values in the model. It is anticipated that the entire area of the landfill or cell will be modeled. The Department recommends initializing the soil moisture content to be at least the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point]. Other values deviating from this range may be used but must be fully justified.

For example, the comparison must include a HELP Model simulation for the liner and the proposed final cover systems as below (see Simulations #4 & #3, respectively).

The simulation for an alternative liner system* could include:

1) the drainage/protective layer of the liner with leachate collection system,
2) the 60-mil HDPE FML,
3) the 0.25 inch ($K = 3 \times 10^{-9}$) GCL (geosynthetic clay liner),
4) the 6 inches of compacted in situ soil used as the prepared subgrade, and
5) with the solid waste cell open and no runoff.

*Any alternative liner system must meet the demonstration as described in the "Performance Demonstration For An Alternative Liner Design under Section 306.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling".

A liner system is compared with a HELP Model simulation for a proposed final cover:

1) 18 inches non-compacted material (6 inches of topsoil with poor grass and 12 inches of non-compacted soil),
2) the 0.25 inch GCL ($K = 3 \times 10^{-9}$),
3) 12 inches of intermediate cover (6 inches of compacted soil and 6 inches of non-compacted soil), and
4) with the solid waste cell closed and final placement of the cover to include runoff.

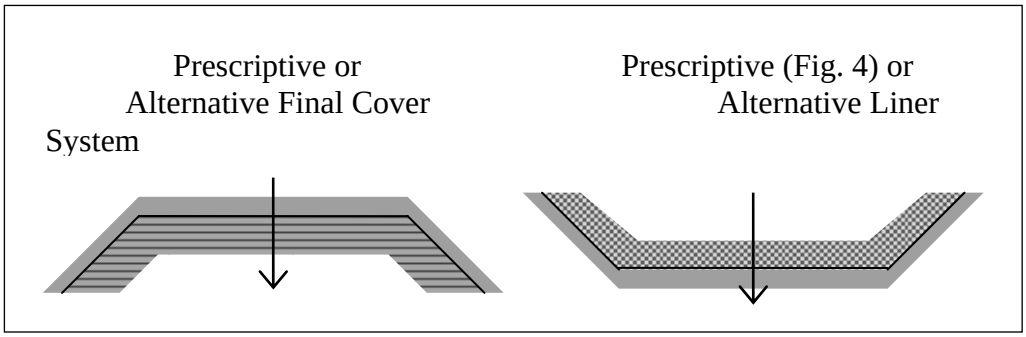


Figure 3

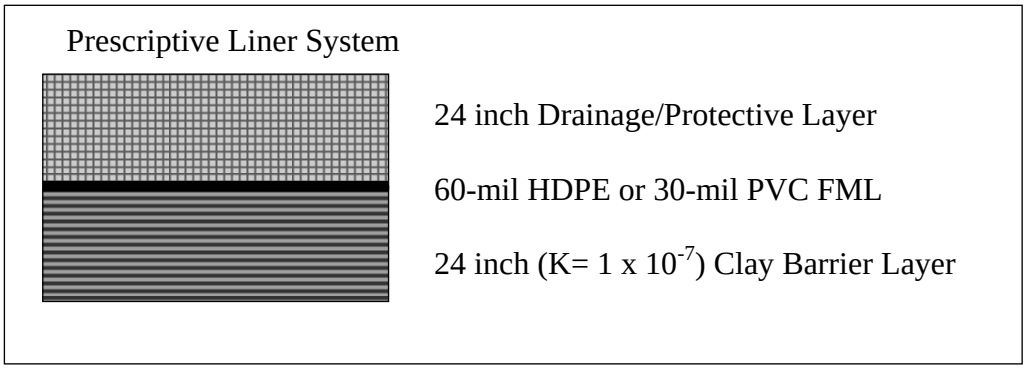


Figure 4

Input Parameters for HELP Simulation #3 (Proposed Alternate Cover)

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18" to 28" corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20"; Santa Fe and Roswell would be 24"; Las Cruces, Albuquerque, and Farmington would be 28")

Maximum leaf area index: 0.8 to 1.6 corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for "poor"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, Proposed thickness of infiltration layer or rooting medium or drainage layer, Possible GCL (0.24") or FML, subgrade thickness for GCL or FML (minimum of 6"), 12" of intermediate cover layer* (*optional for modeling purposes)

Layer type: Type "1" - vertical percolation layer for all* cover materials including GCLs used (*consult with the Department if a FML is proposed to be used in the cover)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1 x 10^{-5} cm/sec* (e.g., If the tested K is 5 x 10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5 x 10^{-5} cm/sec. However, if the tested K is 2 x 10^{-6}, the lowest value to be modeled would be 1 x 10^{-5} cm/sec). *1 x 10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24" at 3 x 10^{-9} cm/sec).

<u>Input Parameters for HELP Simulation #4 (Prescriptive Liner or Proposed Alternate Liner - Tier I)</u>

Weather data (must be the same as Simulation #3)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12" to 18" corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14"; Las Cruces, Albuquerque, and Farmington would be 18")

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 1 for "bare ground"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 0%; "open"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 24" of drainage/protection layer, possible geonet*, FML, 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner. (*A demonstration that no more than one foot of head will be on the liner must be made for this simulation. Therefore, a geonet may be necessary if the 24" drainage layer material is incapable of transmitting leachate so 12" of head is not on the liner.)

Layer type: Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): For the 24" of drainage/protection layer use the tested K* for modeling the prescriptive liner design and for a proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K* value which is the greatest value from the manufacture's specifications; 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL (3 x 10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner. (*must be the same value in both Simulation #5 & #6)

Performance Demonstration for an Alternate Liner Design under Section 306.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

1. Permit applicants proposing an alternate liner in accordance with Section 306.A.2 must demonstrate the liner "... provides equivalent protection as the composite liner ... and ensures concentration values listed in Section 1110 will not be exceeded in the uppermost aquifer ... ". This requires that a two tier demonstration be made:

Tier 1 - the alternative liner provides equivalent protection, and

Tier 2 - the alternate liner ensures the uppermost aquifer will be protected.

The first tier of this demonstration may be satisfied through mathematical modeling using the EPA Hydrologic Evaluation of Landfill Performance (HELP) model. Two computer modeling analyses must be performed - (1) an analysis of the composite liner as specified in Section 306.A.1 and (2) an analysis of the proposed alternate liner as specified in Section 306.A.2. Each of these analyses must be performed under identical hydrologic and climatologic loading conditions of five years with no solid waste in the landfill (see Simulations #5 & 6). This time period is necessary to adequately evaluate the performance of the two liners. A successful demonstration of equivalent protection has been made when the analyses show equal or less percolation/leakage through the bottom layer of the proposed alternate liner than the percolation/leakage through the bottom layer of the Section 306.A.1 composite liner (Figure 5).

The second tier of the demonstration must include HELP modeling of the actual design conditions and the entire operational development of the landfill as closely as possible by doing a succession of model simulations which consider the factors in Section 306.A.2.a. To aid in accomplishing this, each successive computer simulation must use the previous simulation's moisture content output as the input for the following simulation (Figure 6). The modeling design method must be fully described. If no leakage is indicated at the end of the second simulation (#8) and subsequent simulations (#9 & #10) continue to indicate no leakage, then a successful demonstration has been made that the uppermost aquifer will be protected as required by Section 306.A.2 and it will not be necessary to perform a fate and transport modeling.

2. Justification for all input parameters in the HELP modeling must be provided utilizing the attached forms. Demonstrate the relationship of the characteristics of the soil proposed for the construction and operation of the landfill and the parameter values used in the model. Show justification for the soil and waste moisture content parameters as well as geomembrane liner data and storm water runoff fractions. The initial moisture content of the soil should be initialized by the use in the HELP model. The Department recommends initializing the soil moisture content to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point]. Other values deviating from this range may be used but must be fully justified.

3(1) First Tier of the Demonstration

Two simulations must be made, one of the Section 306.A.1 specified liner and one of the proposed alternate liner, both using the same precipitation (wettest 5 consecutive year period using Climatedata or NOAA tapes), temperature (use values associated with 5 wettest consecutive years), solar radiation, and evapotranspiration data (see Simulations #5 & #6). Current historic NOAA weather data from the nearest representative weather station as published by the National Climatic Data Center in Asheville, North Carolina must be used for the precipitation and temperature files. Both simulations must be made for the landfill in the open condition with no run-off and a Leaf Area Index of zero. *Simulations:*

#5 a A simulation for the specified liner design must be performed using a 24 inch protective layer, lateral drainage layer (which may be integral with the protective layer), an FML, and a 24 inch barrier layer of soil with a saturated hydraulic conductivity of 1 x 10^{-7} cm/sec. This simulation must be performed using no solid waste and for a five year period.

#6 A simulation for the proposed alternate liner design must be performed using a 24 inch protective layer, a lateral drainage layer (which may be integral with the protective layer), and the other proposed liner layer (the bottom layer must be modeled as a barrier layer). This simulation must be performed using no solid waste and for a five year period.

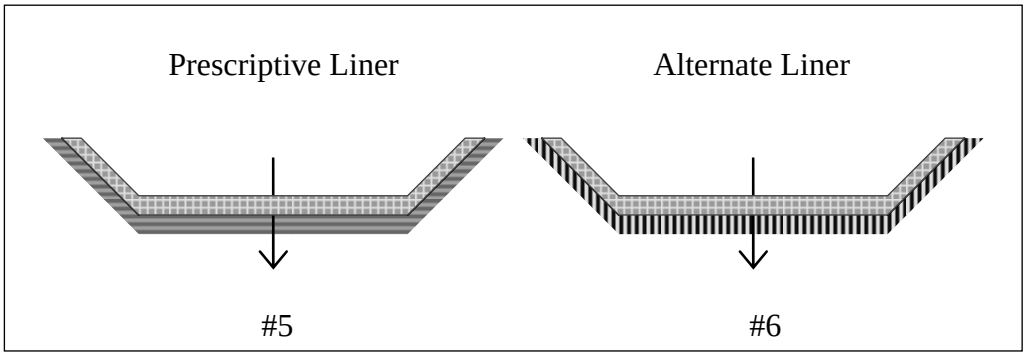


Figure 5

Compare the average annual percolation from the bottom layer of the two simulations. If the percolation is equivalent, a successful demonstration has been made for the first tier.

<u>Input Parameters for HELP Simulation #5* (Prescriptive Liner - Tier I)</u>

same as Simulation #4 with prescriptive liner design

<u>Input Parameters for HELP Simulation #6* (Proposed Alternate Liner - Tier I)</u>

same as Simulation #4 with proposed alternate liner design

*One of these simulations will also serve for the alternate cover design equivalency demonstration.

3(2) Second Tier of the Demonstration

Four simulations encompassing the entire life cycle of the facility to model actual design conditions and operational development as closely as possible must be performed (see Simulations #7, #8, #9 & #10). This is accomplished through a succession of four model simulations: one simulation of the open landfill, a second with the landfill partially filled with solid waste, a third with the landfill in the closed condition with bare ground, and a fourth with the landfill in the closed condition with "poor" vegetation. *Simulations:*

#7 The initial simulation must model the open landfill at start-up when the landfill contains no solid waste. The time period should extend for the anticipated duration of this condition (a minimum of two years).

#8 A succeeding simulation to model conditions of the partially filled landfill for a five year period*. This would incorporate daily and intermediate covers. (*This period may vary in accordance with anticipated operations.)

#9 Model the landfill in the closed condition with bare ground (a minimum of a two years).

#10 Finally, perform a simulation to model the landfill in the closed condition with poor vegetation for remainder of the post-closure care period (a minimum of 28 years).

If the simulations indicate no leakage after the third simulation (#9) and the subsequent simulation (#10), then the simulations have served to demonstrate the concentration values delineated in Section 1110 of the Regulations will not be exceeded in the uppermost aquifer at the relative point of compliance. Therefore, a successful demonstration has been made for the second tier.

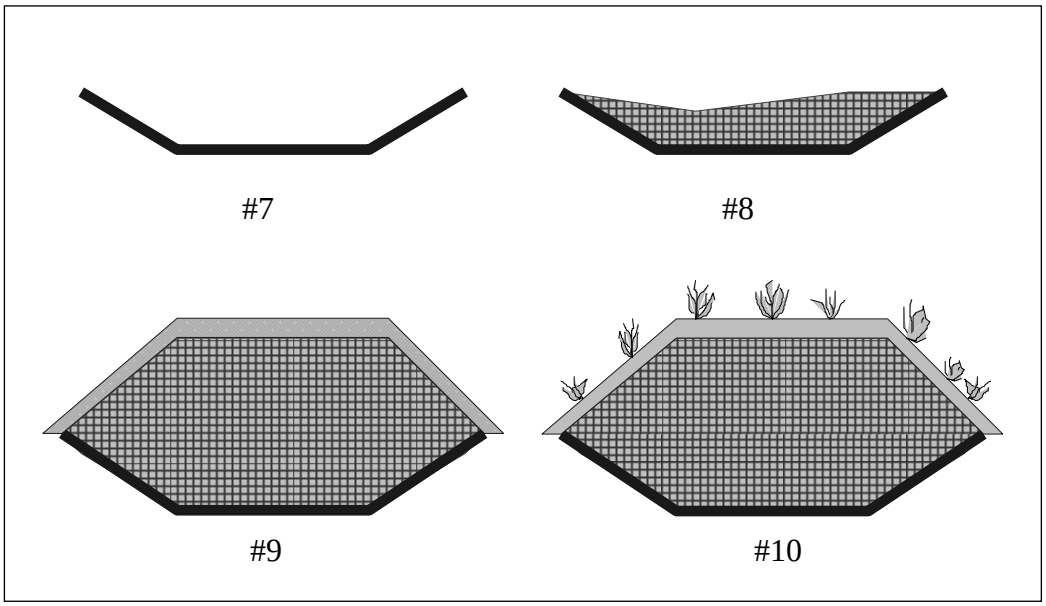


Figure 6

Input Parameters for HELP Simulation #7 (Proposed Alternate Liner - Tier II)

Weather data (must be the same as Simulation #3)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12" to 18" corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14"; Las Cruces, Albuquerque, and Farmington would be 18")

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 2 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with 2 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 1 for "bare ground"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 0%; "open"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 24" of drainage/protection layer, possible geonet, FML, 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): For the 24" of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K value which is the greatest value from the manufacture's specifications; GCL (3 x 10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

<u>Input Parameters for HELP Simulation #8 (Proposed Alternate Liner - Tier II)</u>

Weather data (must be the same as Simulation #3)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12” to 18” corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14”; Las Cruces, Albuquerque, and Farmington would be 18”)

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 2 to 5* consecutive years for the appropriate weather reporting station (*may vary with landfill operations)

Temperature: daily* minimum and maximum temperatures corresponding with 2 to 5 years (same years as precipitation) for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: bare ground

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 0%; “open”

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 240” of solid waste (this thickness may vary depending on landfill operations); 24” of drainage/protection layer; possible geonet*; FML; 24” of 1×10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type “1”, vertical percolation layer, must be used for solid waste. Type “2” for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type “4” for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of “good”; Type “3” for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User’s Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content must be initialized to be the value of the previous simulation’s (from Simulation #7) moisture content output as the input for the following simulation (Simulation #8). For compacted municipal solid waste with a HELP soil texture number of “18” use 20%* by volume/volume (which is greater than per mass basis - see EPA HELP User’s Guide for Version 3 for conversion) (*a lower value may be used if justified)

Saturated hydraulic conductivity (K): For compacted municipal solid waste with a HELP soil texture number of “18” will have a K of 1×10^{-3} cm/sec. For the 24” of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture’s specifications; for the FML use a K value which is the greatest value from the manufacture’s specifications; GCL (3×10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

<u>Input Parameters for HELP Simulation #9 (Proposed Alternate Liner - Tier II)</u>

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12” to 18” corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14”; Las Cruces, Albuquerque, and Farmington would be 18”)

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 2 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with 2 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 1 for "bare ground"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, Proposed thickness of infiltration layer or rooting medium or drainage layer, Possible GCL (0.24") or FML, subgrade thickness for GCL or FML (minimum of 6"), 12" of intermediate cover layer* (*optional for modeling); Proposed thickness of solid waste (this thickness will vary depending on landfill design); 24" of drainage/protection layer; possible geonet*; FML; 24" of 1×10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type “1” - vertical percolation layer for all* cover materials including GCLs used in the cover (*consult with the Department if a FML is proposed to be used in the cover).Type “1”, vertical percolation layer, must be used for solid waste. Type “2” for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type “4” for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of “good”; Type “3” for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User’s Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content must be initialized to be the value of the previous simulation’s (from Simulation #8) moisture content output as the input for the following simulation (Simulation #9).

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1×10^{-5} cm/sec* (e.g., If the tested K is 5×10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5×10^{-5} cm/sec. However, if the tested K is 2×10^{-6}, the lowest value to be modeled would be 1×10^{-5} cm/sec). *1×10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24” at 3×10^{-9} cm/sec). For compacted municipal solid waste with a HELP soil texture number of “18” will have a K of 1×10^{-3} cm/sec. For the 24” of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture’s specifications; for the FML use a K value which is the greatest value from the manufacture’s specifications; GCL (3×10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

<u>Input Parameters for HELP Simulation #10 (Proposed Alternate Liner - Tier II)</u>

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18” to 28” corresponding with “poor” vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20”; Santa Fe and Roswell would be 24”; Las Cruces, Albuquerque, and Farmington would be 28”)

Maximum leaf area index: 0.8 to 1.6 corresponding with “poor” vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 28 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with 28 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for “poor”

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; “closed”

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6” of topsoil, Proposed thickness of infiltration layer or rooting medium or drainage layer, Possible GCL (0.24”) or FML, subgrade thickness for GCL or FML (minimum of 6”), 12” of

intermediate cover layer* (*optional for modeling); Proposed thickness of solid waste (this thickness will vary depending on landfill design); 24" of drainage/protection layer; possible geonet*; FML; 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type "1" - vertical percolation layer for all* cover materials including GCLs used (*consult with the Department if a FML is proposed to be used in the cover). Type "1", vertical percolation layer, must be used for solid waste. Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content must be initialized to be the value of the previous simulation's (from Simulation #9) moisture content output as the input for the following simulation (Simulation #10).

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1 x 10^{-5} cm/sec* (e.g., If the tested K is 5 x 10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5 x 10^{-5} cm/sec. However, if the tested K is 2 x 10^{-6}, the lowest value to be modeled would be 1 x 10^{-5} cm/sec). *1 x 10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24" at 3 x 10^{-9} cm/sec). For compacted municipal solid waste with a HELP soil texture number of "18" will have a K of 1 x 10^{-3} cm/sec. For the 24" of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K value which is the greatest value from the manufacture's specifications; GCL (3 x 10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

Equivalency Demonstrations

Typical "New" Landfill:

Alternate Cover Design Equivalency Demonstration (two simulations)

Simulation #3 & (either Simulation #5 or #6)

Average Annual Percolation from bottom layer of Simulation #3 must be less than or equal to (equivalent*) the Average Annual Percolation from the bottom layer of Simulation #5 or #6 (depending on the proposed liner design).

Alternate Liner Design Equivalency Demonstration

Tier I (two simulations) - Simulation #5 & Simulation #6

Average Annual Percolation from bottom layer of Simulation #6 must be less than or equal to (equivalent*) the Average Annual Percolation from the bottom layer of Simulation #5.

Tier II (four simulations) - Simulations #7, #8, #9, #10

Average Annual Percolation from bottom layer of Simulation #7 must decrease to zero for Simulations #9 & #10.

For closing an "old" (no liner system) landfill:

Alternate Cover Design Equivalency Demonstration (two simulations)

Simulation #1 & Simulation #2

Average Annual Percolation from bottom layer of Simulation #2 must be less than or equal to (equivalent*) the Average Annual Percolation from the bottom layer of Simulation #1

Submit hardcopies of all output files and submit all input files on 3.5" diskette.

*If the two Average Annual Percolation values are within 0.00001" of each other, then the demonstration is successful since these values are practically equal (the definition of equivalent) and well within modeling uncertainty.

Attachment E

Summary of Help Model Input Parameters

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******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP3\WTSMODEL\WS.D4
TEMPERATURE DATA FILE:      C:\HELP3\WTSMODEL\WS.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\WTSMODEL\WS.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\WTSMODEL\WS.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\WTSMODEL\WS.D10
OUTPUT DATA FILE:           C:\HELP3\WTSMODEL\WSA.OUT


TIME:  16:45     DATE:  12/18/2008


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

     TITLE:  WHITE SANDS MISSILE RANGE ALTERNATIVE COVER

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


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


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   6
          THICKNESS                  =      6.00   INCHES
          POROSITY                   =      0.4530 VOL/VOL
          FIELD CAPACITY             =      0.1900 VOL/VOL
          WILTING POINT              =      0.0850 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.1113 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.720000011000E-03 CM/SEC
       NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


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

```
            TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER   0
  THICKNESS                    =     30.00   INCHES
  POROSITY                     =      0.4730 VOL/VOL
  FIELD CAPACITY               =      0.2220 VOL/VOL
  WILTING POINT                =      0.1040 VOL/VOL
  INITIAL SOIL WATER CONTENT   =      0.1335 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =  0.440000003000E-03 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

```
 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A
          POOR STAND OF GRASS, A SURFACE SLOPE OF  5.%
          AND A SLOPE LENGTH OF  750. FEET.

SCS RUNOFF CURVE NUMBER             =     79.20
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =     40.000  ACRES
EVAPORATIVE ZONE DEPTH              =     28.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      3.605  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =     13.124  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      2.798  INCHES
INITIAL SNOW WATER                  =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS    =      4.673  INCHES
TOTAL INITIAL WATER                 =      4.673  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

```
 NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          EL PASO               TEXAS

     STATION LATITUDE                       =  32.22 DEGREES
     MAXIMUM LEAF AREA INDEX                =   0.80
     START OF GROWING SEASON (JULIAN DATE)  =     66
     END OF GROWING SEASON (JULIAN DATE)    =    315
     EVAPORATIVE ZONE DEPTH                 =  28.0  INCHES
     AVERAGE ANNUAL WIND SPEED              =   9.20 MPH
     AVERAGE 1ST QUARTER RELATIVE HUMIDITY  =  40.00 %
     AVERAGE 2ND QUARTER RELATIVE HUMIDITY  =  27.00 %
     AVERAGE 3RD QUARTER RELATIVE HUMIDITY  =  46.00 %
     AVERAGE 4TH QUARTER RELATIVE HUMIDITY  =  48.00 %


 NOTE:  PRECIPITATION DATA FOR     White Sands Natl MonNew Mexico
          WAS ENTERED FROM A EARTH INFO CLIMATEDATA.


 NOTE:  TEMPERATURE DATA FOR     White Sand Natl     Mon New Mexico
          WAS ENTERED FROM A EARTH INFO CLIMATEDATA.
```

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.22 DEGREES

LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

****

DAILY OUTPUT FOR YEAR 1984

DAY	AIR -	SOIL -	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.102	0.1251	0.0000	.0000E+00	.0000E+00
2			0.00	0.000	0.105	0.1213	0.0000	.0000E+00	.0000E+00
3			0.02	0.000	0.111	0.1181	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.078	0.1153	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.061	0.1131	0.0000	.0000E+00	.0000E+00
6			0.00	0.000	0.052	0.1113	0.0000	.0000E+00	.0000E+00
7			0.00	0.000	0.046	0.1096	0.0000	.0000E+00	.0000E+00
8			0.29	0.000	0.035	0.1187	0.0000	.0000E+00	.0000E+00
9			0.00	0.000	0.038	0.1174	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.035	0.1161	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.033	0.1149	0.0000	.0000E+00	.0000E+00
12			0.00	0.000	0.031	0.1138	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.030	0.1127	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.029	0.1117	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.027	0.1107	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.026	0.1098	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.025	0.1089	0.0000	.0000E+00	.0000E+00
18			0.00	0.000	0.025	0.1080	0.0000	.0000E+00	.0000E+00
19			0.00	0.000	0.024	0.1072	0.0000	.0000E+00	.0000E+00
20			0.00	0.000	0.023	0.1063	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.016	0.1058	0.0000	.0000E+00	.0000E+00
22			0.00	0.000	0.009	0.1054	0.0000	.0000E+00	.0000E+00
23			0.00	0.000	0.004	0.1053	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.002	0.1052	0.0000	.0000E+00	.0000E+00
25			0.00	0.000	0.001	0.1052	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.001	0.1051	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.001	0.1051	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.001	0.1051	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.001	0.1051	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.000	0.1051	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
33			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
35			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
36			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
38			0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00

39	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
40	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
41	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
42	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
49	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
51	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
54	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
59	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
63	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.000	0.1050	0.0000	.0000E+00	.0000E+00
65	0.32	0.000	0.003	0.1163	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.007	0.1161	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.007	0.1158	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.006	0.1156	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.007	0.1153	0.0000	.0000E+00	.0000E+00
70	0.00	0.000	0.008	0.1151	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.009	0.1147	0.0000	.0000E+00	.0000E+00
72	0.00	0.000	0.009	0.1144	0.0000	.0000E+00	.0000E+00
73	0.00	0.000	0.009	0.1141	0.0000	.0000E+00	.0000E+00
74	0.00	0.000	0.009	0.1137	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.009	0.1134	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.009	0.1130	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.009	0.1127	0.0000	.0000E+00	.0000E+00
78	0.00	0.000	0.009	0.1124	0.0000	.0000E+00	.0000E+00
79	0.00	0.000	0.009	0.1120	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.009	0.1117	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.009	0.1114	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.009	0.1110	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.009	0.1107	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.009	0.1104	0.0000	.0000E+00	.0000E+00
85	0.00	0.000	0.009	0.1100	0.0000	.0000E+00	.0000E+00
86	0.00	0.000	0.009	0.1097	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.009	0.1094	0.0000	.0000E+00	.0000E+00
88	0.00	0.000	0.009	0.1090	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.009	0.1087	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.009	0.1084	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.009	0.1081	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.009	0.1077	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.009	0.1074	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.009	0.1071	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.009	0.1067	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.009	0.1064	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.009	0.1061	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.009	0.1058	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.009	0.1054	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.011	0.1051	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.010	0.1047	0.0000	.0000E+00	.0000E+00

102	0.00	0.000	0.003	0.1046	0.0000	.0000E+00	.0000E+00
103	0.00	0.000	0.002	0.1045	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.002	0.1044	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.002	0.1044	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.002	0.1043	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.002	0.1042	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.002	0.1042	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.003	0.1041	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.003	0.1040	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.003	0.1039	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.002	0.1038	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.002	0.1037	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.002	0.1037	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.002	0.1036	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.003	0.1035	0.0000	.0000E+00	.0000E+00
117	0.00	0.000	0.002	0.1034	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.003	0.1033	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.003	0.1032	0.0000	.0000E+00	.0000E+00
120	0.00	0.000	0.002	0.1031	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.002	0.1031	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.003	0.1030	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.003	0.1029	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.003	0.1027	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.003	0.1026	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.004	0.1025	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.004	0.1024	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.003	0.1022	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.004	0.1021	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.004	0.1020	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.004	0.1018	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.004	0.1017	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.004	0.1015	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.004	0.1014	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.005	0.1012	0.0000	.0000E+00	.0000E+00
136	0.11	0.000	0.007	0.1049	0.0000	.0000E+00	.0000E+00
137	0.72	0.000	0.010	0.1302	0.0000	.0000E+00	.0000E+00
138	0.03	0.000	0.139	0.1263	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.273	0.1166	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.161	0.1109	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.061	0.1087	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.063	0.1064	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.055	0.1045	0.0000	.0000E+00	.0000E+00
144	0.00	0.000	0.052	0.1026	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.037	0.1013	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.020	0.1005	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.009	0.1002	0.0000	.0000E+00	.0000E+00
148	0.00	0.000	0.008	0.1000	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
154	1.64	0.009	0.019	0.1575	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.243	0.1488	0.0000	.0000E+00	.0000E+00
156	0.00	0.000	0.261	0.1395	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.287	0.1292	0.0000	.0000E+00	.0000E+00
158	0.00	0.000	0.273	0.1195	0.0000	.0000E+00	.0000E+00
159	0.00	0.000	0.333	0.1076	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.157	0.1020	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.044	0.1004	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.012	0.1000	0.0000	.0000E+00	.0000E+00
163	0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00

165		0.08	0.000	0.009	0.1025	0.0000	.0000E+00	.0000E+00
166		0.00	0.000	0.005	0.1023	0.0000	.0000E+00	.0000E+00
167		0.89	0.000	0.027	0.1331	0.0000	.0000E+00	.0000E+00
168		0.30	0.000	0.177	0.1375	0.0000	.0000E+00	.0000E+00
169		0.01	0.000	0.239	0.1293	0.0000	.0000E+00	.0000E+00
170		0.00	0.000	0.271	0.1197	0.0000	.0000E+00	.0000E+00
171		0.82	0.000	0.243	0.1403	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.348	0.1278	0.0000	.0000E+00	.1101E-05
173		0.00	0.000	0.316	0.1165	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.356	0.1038	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.101	0.1002	0.0000	.0000E+00	.0000E+00
176		0.08	0.000	0.021	0.1023	0.0000	.0000E+00	.0000E+00
177		0.00	0.000	0.011	0.1020	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.017	0.1013	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.013	0.1009	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.013	0.1004	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.011	0.1000	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.002	0.1000	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
185		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
188		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
189		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
190		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
191		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
193		0.68	0.000	0.023	0.1234	0.0000	.0000E+00	.0000E+00
194	*	0.00	0.000	0.087	0.1203	0.0000	.0000E+00	.0000E+00
195		0.00	0.000	0.251	0.1113	0.0000	.0000E+00	.0000E+00
196		0.00	0.000	0.159	0.1056	0.0000	.0000E+00	.0000E+00
197		0.00	0.000	0.089	0.1024	0.0000	.0000E+00	.0000E+00
198		0.00	0.000	0.059	0.1003	0.0000	.0000E+00	.0000E+00
199		0.00	0.000	0.009	0.1000	0.0000	.0000E+00	.0000E+00
200		0.47	0.000	0.038	0.1154	0.0000	.0000E+00	.0000E+00
201		0.00	0.000	0.184	0.1089	0.0000	.0000E+00	.0000E+00
202		0.00	0.000	0.046	0.1072	0.0000	.0000E+00	.0000E+00
203		0.15	0.000	0.048	0.1109	0.0000	.0000E+00	.0000E+00
204		0.00	0.000	0.226	0.1028	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.045	0.1012	0.0000	.0000E+00	.0000E+00
206		0.14	0.000	0.030	0.1051	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.013	0.1046	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.026	0.1037	0.0000	.0000E+00	.0000E+00
209		0.14	0.000	0.039	0.1074	0.0000	.0000E+00	.0000E+00
210		0.00	0.000	0.036	0.1061	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.027	0.1051	0.0000	.0000E+00	.1070E-05
212		0.00	0.000	0.036	0.1038	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.039	0.1025	0.0000	.0000E+00	.0000E+00
214	*	0.00	0.000	0.024	0.1016	0.0000	.0000E+00	.0000E+00
215		0.19	0.000	0.016	0.1078	0.0000	.0000E+00	.0000E+00
216	*	0.13	0.000	0.120	0.1082	0.0000	.0000E+00	.0000E+00
217	*	0.09	0.000	0.104	0.1077	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.023	0.1069	0.0000	.0000E+00	.0000E+00
219		0.00	0.000	0.033	0.1057	0.0000	.0000E+00	.0000E+00
220		0.10	0.000	0.039	0.1079	0.0000	.0000E+00	.0000E+00
221		0.00	0.000	0.132	0.1032	0.0000	.0000E+00	.0000E+00
222	*	0.25	0.000	0.069	0.1039	0.0000	.0000E+00	.0000E+00
223		0.59	0.000	0.000	0.1254	0.0000	.0000E+00	.0000E+00
224		0.02	0.000	0.192	0.1245	0.0000	.0000E+00	.0000E+00
225		0.00	0.000	0.212	0.1169	0.0000	.0000E+00	.0000E+00
226		0.13	0.000	0.171	0.1155	0.0000	.0000E+00	.1072E-05
227	*	0.00	0.000	0.133	0.1107	0.0000	.0000E+00	.0000E+00

228	*	0.00	0.000	0.122	0.1064	0.0000	.0000E+00	.1048E-05
229	*	0.00	0.000	0.113	0.1023	0.0000	.0000E+00	.0000E+00
230		0.00	0.000	0.054	0.1004	0.0000	.0000E+00	.0000E+00
231		0.00	0.000	0.010	0.1000	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.002	0.1000	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
234		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
235		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
236		0.21	0.000	0.013	0.1070	0.0000	.0000E+00	.0000E+00
237		0.27	0.000	0.113	0.1126	0.0000	.0000E+00	.0000E+00
238		0.67	0.000	0.161	0.1307	0.0000	.0000E+00	.0000E+00
239		0.19	0.000	0.159	0.1319	0.0000	.0000E+00	.0000E+00
240		0.00	0.000	0.220	0.1240	0.0000	.0000E+00	.1107E-05
241		0.00	0.000	0.261	0.1147	0.0000	.0000E+00	.0000E+00
242		0.00	0.000	0.272	0.1050	0.0000	.0000E+00	.0000E+00
243		0.10	0.000	0.158	0.1029	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.049	0.1011	0.0000	.0000E+00	.0000E+00
245		0.00	0.000	0.027	0.1002	0.0000	.0000E+00	.0000E+00
246		0.00	0.000	0.004	0.1000	0.0000	.0000E+00	.0000E+00
247		0.06	0.000	0.019	0.1015	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.008	0.1012	0.0000	.0000E+00	.0000E+00
249		0.00	0.000	0.015	0.1007	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.013	0.1002	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.005	0.1000	0.0000	.0000E+00	.0000E+00
252		0.00	0.000	0.002	0.1000	0.0000	.0000E+00	.0000E+00
253		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.1078E-05
254		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.1081E-05
255		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
256		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
257		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
258		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
261		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
262		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
263		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
264		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
266		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
267		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
268		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
269		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
270		0.12	0.000	0.010	0.1039	0.0000	.0000E+00	.0000E+00
271		0.06	0.000	0.032	0.1049	0.0000	.0000E+00	.0000E+00
272		0.00	0.000	0.050	0.1031	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.054	0.1012	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.015	0.1006	0.0000	.0000E+00	.0000E+00
275		0.00	0.000	0.011	0.1003	0.0000	.0000E+00	.0000E+00
276		0.00	0.000	0.007	0.1000	0.0000	.0000E+00	.0000E+00
277		0.30	0.000	0.011	0.1103	0.0000	.0000E+00	.0000E+00
278		0.25	0.000	0.094	0.1159	0.0000	.0000E+00	.0000E+00
279		0.00	0.000	0.112	0.1119	0.0000	.0000E+00	.0000E+00
280		0.00	0.000	0.143	0.1068	0.0000	.0000E+00	.0000E+00
281		0.00	0.000	0.123	0.1024	0.0000	.0000E+00	.0000E+00
282		0.00	0.000	0.054	0.1004	0.0000	.0000E+00	.0000E+00
283		0.00	0.000	0.012	0.1000	0.0000	.0000E+00	.0000E+00
284		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
285		0.10	0.000	0.014	0.1030	0.0000	.0000E+00	.0000E+00
286		0.11	0.000	0.013	0.1065	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.071	0.1040	0.0000	.0000E+00	.0000E+00
288		0.00	0.000	0.056	0.1020	0.0000	.0000E+00	.0000E+00
289		0.08	0.000	0.033	0.1037	0.0000	.0000E+00	.0000E+00
290		0.00	0.000	0.011	0.1033	0.0000	.0000E+00	.0000E+00

291		0.00	0.000	0.019	0.1026	0.0000	.0000E+00	.0000E+00
292		0.12	0.000	0.016	0.1063	0.0000	.0000E+00	.0000E+00
293		0.00	0.000	0.076	0.1036	0.0000	.0000E+00	.0000E+00
294		0.04	0.000	0.033	0.1038	0.0000	.0000E+00	.0000E+00
295		0.14	0.000	0.021	0.1081	0.0000	.0000E+00	.0000E+00
296		0.06	0.000	0.068	0.1078	0.0000	.0000E+00	.0000E+00
297		0.27	0.000	0.086	0.1144	0.0000	.0000E+00	.0000E+00
298		0.45	0.000	0.072	0.1279	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.051	0.1260	0.0000	.0000E+00	.0000E+00
300		0.11	0.000	0.079	0.1272	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.120	0.1229	0.0000	.0000E+00	.0000E+00
302		0.00	0.000	0.095	0.1195	0.0000	.0000E+00	.0000E+00
303		0.00	0.000	0.103	0.1158	0.0000	.0000E+00	.0000E+00
304		0.00	0.000	0.099	0.1123	0.0000	.0000E+00	.0000E+00
305		0.00	0.000	0.104	0.1085	0.0000	.0000E+00	.0000E+00
306		0.00	0.000	0.091	0.1053	0.0000	.0000E+00	.0000E+00
307		0.00	0.000	0.104	0.1015	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.036	0.1003	0.0000	.0000E+00	.0000E+00
309		0.00	0.000	0.004	0.1001	0.0000	.0000E+00	.0000E+00
310		0.00	0.000	0.001	0.1001	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.001	0.1001	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.001	0.1001	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
315	*	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
317		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
322		0.33	0.000	0.009	0.1115	0.0000	.0000E+00	.0000E+00
323		0.06	0.000	0.056	0.1117	0.0000	.0000E+00	.0000E+00
324		0.04	0.000	0.055	0.1111	0.0000	.0000E+00	.0000E+00
325		0.07	0.000	0.056	0.1116	0.0000	.0000E+00	.0000E+00
326		0.00	0.000	0.055	0.1097	0.0000	.0000E+00	.0000E+00
327		0.00	0.000	0.064	0.1074	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.073	0.1048	0.0000	.0000E+00	.0000E+00
329		0.61	0.000	0.068	0.1241	0.0000	.0000E+00	.0000E+00
330		0.02	0.000	0.060	0.1227	0.0000	.0000E+00	.0000E+00
331		0.00	0.000	0.074	0.1201	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.067	0.1177	0.0000	.0000E+00	.0000E+00
333		0.00	0.000	0.062	0.1154	0.0000	.0000E+00	.0000E+00
334		0.00	0.000	0.078	0.1127	0.0000	.0000E+00	.0000E+00
335		0.00	0.000	0.071	0.1101	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.080	0.1073	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.071	0.1048	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.086	0.1017	0.0000	.0000E+00	.0000E+00
339		0.51	0.000	0.082	0.1170	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.056	0.1150	0.0000	.0000E+00	.0000E+00
341		0.00	0.000	0.058	0.1129	0.0000	.0000E+00	.0000E+00
342		0.00	0.000	0.068	0.1105	0.0000	.0000E+00	.0000E+00
343		0.03	0.000	0.086	0.1085	0.0000	.0000E+00	.0000E+00
344		0.00	0.000	0.087	0.1054	0.0000	.0000E+00	.0000E+00
345		0.00	0.000	0.085	0.1023	0.0000	.0000E+00	.0000E+00
346		0.00	0.000	0.047	0.1007	0.0000	.0000E+00	.0000E+00
347		0.26	0.000	0.027	0.1090	0.0000	.0000E+00	.0000E+00
348		0.60	0.000	0.052	0.1286	0.0000	.0000E+00	.0000E+00
349		0.60	0.000	0.060	0.1478	0.0000	.0000E+00	.0000E+00
350		0.28	0.000	0.084	0.1548	0.0000	.0000E+00	.0000E+00
351		0.00	0.000	0.073	0.1522	0.0000	.0000E+00	.0000E+00
352		0.00	0.000	0.074	0.1496	0.0000	.0000E+00	.0000E+00
353		0.00	0.000	0.078	0.1468	0.0000	.0000E+00	.0000E+00

354	0.08	0.000	0.088	0.1465	0.0000	.0000E+00	.0000E+00
355	0.00	0.000	0.085	0.1435	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.085	0.1404	0.0000	.0000E+00	.0000E+00
357	0.00	0.000	0.079	0.1376	0.0000	.0000E+00	.0000E+00
358	0.00	0.000	0.078	0.1348	0.0000	.0000E+00	.0000E+00
359	0.00	0.000	0.084	0.1318	0.0000	.0000E+00	.0000E+00
360	0.00	0.000	0.089	0.1286	0.0000	.0000E+00	.0000E+00
361	0.00	0.000	0.091	0.1254	0.0000	.0000E+00	.0000E+00
362	0.00	0.000	0.078	0.1226	0.0000	.0000E+00	.0000E+00
363	0.41	0.000	0.116	0.1331	0.0000	.0000E+00	.0000E+00
364	0.00	0.000	0.101	0.1295	0.0000	.0000E+00	.0000E+00
365	0.00	0.000	0.097	0.1261	0.0000	.0000E+00	.0000E+00
366	0.00	0.000	0.083	0.1231	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.31	0.00	0.32	0.00	0.86	3.82
	1.58	2.94	0.24	2.03	1.13	2.77
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.009
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.973	0.001	0.232	0.140	0.948	3.810
	1.510	2.976	0.254	1.809	1.085	2.407
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 1984

	INCHES	CU. FEET	PERCENT
PRECIPITATION	16.00	2323200.500	100.00
RUNOFF	0.009	1318.595	0.06
EVAPOTRANSPIRATION	16.146	2344375.000	100.91
PERC./LEAKAGE THROUGH LAYER 2	0.000008	1.097	0.00
CHANGE IN WATER STORAGE	-0.155	-22494.676	-0.97
SOIL WATER AT START OF YEAR	4.673	678486.687	
SOIL WATER AT END OF YEAR	4.518	655992.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.445	0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1985

DAY	AIR	SOIL	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.098	0.1196	0.0000	.0000E+00	.0000E+00
2	*		0.00	0.000	0.067	0.1172	0.0000	.0000E+00	.0000E+00
3	*		0.00	0.000	0.067	0.1148	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.086	0.1118	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.091	0.1085	0.0000	.0000E+00	.0000E+00
6			0.00	0.000	0.080	0.1057	0.0000	.0000E+00	.0000E+00
7			0.00	0.000	0.062	0.1035	0.0000	.0000E+00	.0000E+00
8			0.00	0.000	0.052	0.1016	0.0000	.0000E+00	.0000E+00
9			0.00	0.000	0.024	0.1007	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.003	0.1006	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.002	0.1006	0.0000	.0000E+00	.0000E+00
12			0.03	0.000	0.011	0.1012	0.0000	.0000E+00	.0000E+00
13	*		0.36	0.000	0.059	0.1019	0.0000	.0000E+00	.0000E+00
14	*		0.04	0.000	0.048	0.1026	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.084	0.1034	0.0000	.0000E+00	.0000E+00
16			0.28	0.000	0.030	0.1176	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.048	0.1159	0.0000	.0000E+00	.0000E+00
18			0.00	0.000	0.070	0.1134	0.0000	.0000E+00	.0000E+00
19			0.00	0.000	0.092	0.1101	0.0000	.0000E+00	.0000E+00
20			0.00	0.000	0.087	0.1070	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.060	0.1049	0.0000	.0000E+00	.0000E+00
22	*		0.00	0.000	0.050	0.1031	0.0000	.0000E+00	.0000E+00
23			0.00	0.000	0.044	0.1015	0.0000	.0000E+00	.0000E+00
24			0.09	0.000	0.038	0.1034	0.0000	.0000E+00	.0000E+00
25			0.02	0.000	0.014	0.1036	0.0000	.0000E+00	.0000E+00
26			0.17	0.000	0.010	0.1093	0.0000	.0000E+00	.0000E+00
27			0.27	0.000	0.025	0.1180	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.074	0.1154	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.088	0.1122	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.102	0.1086	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.065	0.1063	0.0000	.0000E+00	.0000E+00
32	*		0.01	0.000	0.010	0.1063	0.0000	.0000E+00	.0000E+00
33	*		0.00	0.000	0.050	0.1045	0.0000	.0000E+00	.0000E+00
34	*		0.00	0.000	0.040	0.1031	0.0000	.0000E+00	.0000E+00
35			0.17	0.000	0.046	0.1075	0.0000	.0000E+00	.0000E+00
36			0.00	0.000	0.039	0.1061	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.038	0.1048	0.0000	.0000E+00	.0000E+00
38			0.00	0.000	0.035	0.1035	0.0000	.0000E+00	.0000E+00

39	0.00	0.000	0.027	0.1026	0.0000	.0000E+00	.0000E+00
40	0.00	0.000	0.010	0.1022	0.0000	.0000E+00	.0000E+00
41	0.00	0.000	0.010	0.1019	0.0000	.0000E+00	.0000E+00
42	0.00	0.000	0.007	0.1016	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.007	0.1013	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.006	0.1011	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.006	0.1009	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.006	0.1007	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.006	0.1005	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.004	0.1003	0.0000	.0000E+00	.0000E+00
49	0.00	0.000	0.000	0.1003	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.000	0.1003	0.0000	.0000E+00	.0000E+00
51	0.00	0.000	0.000	0.1003	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.000	0.1003	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.000	0.1003	0.0000	.0000E+00	.0000E+00
54	0.21	0.000	0.008	0.1075	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.011	0.1072	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.010	0.1068	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.011	0.1064	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.013	0.1059	0.0000	.0000E+00	.0000E+00
59	0.03	0.000	0.019	0.1063	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.014	0.1058	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.012	0.1053	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.013	0.1049	0.0000	.0000E+00	.0000E+00
63	0.00	0.000	0.013	0.1044	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.013	0.1039	0.0000	.0000E+00	.0000E+00
65	0.00	0.000	0.013	0.1035	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.013	0.1030	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.013	0.1025	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.013	0.1021	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.011	0.1017	0.0000	.0000E+00	.0000E+00
70	0.00	0.000	0.004	0.1015	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.004	0.1013	0.0000	.0000E+00	.0000E+00
72	0.00	0.000	0.004	0.1012	0.0000	.0000E+00	.0000E+00
73	0.00	0.000	0.004	0.1011	0.0000	.0000E+00	.0000E+00
74	0.16	0.000	0.009	0.1065	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.008	0.1062	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.008	0.1059	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.008	0.1056	0.0000	.0000E+00	.0000E+00
78	0.08	0.000	0.015	0.1079	0.0000	.0000E+00	.0000E+00
79	0.10	0.000	0.016	0.1109	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.009	0.1106	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.008	0.1103	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.008	0.1100	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.009	0.1097	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.010	0.1094	0.0000	.0000E+00	.0000E+00
85	0.00	0.000	0.011	0.1090	0.0000	.0000E+00	.0000E+00
86	0.00	0.000	0.011	0.1086	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.011	0.1082	0.0000	.0000E+00	.0000E+00
88	0.00	0.000	0.011	0.1078	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.011	0.1074	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.011	0.1070	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.011	0.1066	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.011	0.1062	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.011	0.1058	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.011	0.1054	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.011	0.1050	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.011	0.1046	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.011	0.1042	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.011	0.1038	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.011	0.1034	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.011	0.1030	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.012	0.1026	0.0000	.0000E+00	.0000E+00

102	0.00	0.000	0.012	0.1022	0.0000	.0000E+00	.0000E+00
103	0.00	0.000	0.011	0.1018	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.011	0.1014	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.011	0.1010	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.010	0.1006	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.012	0.1002	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.006	0.1000	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
117	0.22	0.000	0.007	0.1075	0.0000	.0000E+00	.0000E+00
118	0.60	0.000	0.013	0.1285	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.128	0.1239	0.0000	.0000E+00	.0000E+00
120	0.00	0.000	0.235	0.1155	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.215	0.1078	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.173	0.1016	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.042	0.1002	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.005	0.1000	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
137	0.45	0.000	0.022	0.1152	0.0000	.0000E+00	.0000E+00
138	0.05	0.000	0.172	0.1109	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.023	0.1100	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.027	0.1091	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.027	0.1081	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.024	0.1073	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.023	0.1065	0.0000	.0000E+00	.0000E+00
144	0.00	0.000	0.022	0.1057	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.023	0.1049	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.022	0.1041	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.022	0.1033	0.0000	.0000E+00	.0000E+00
148	0.00	0.000	0.026	0.1023	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.022	0.1015	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.026	0.1006	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.012	0.1002	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.005	0.1000	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
156	0.38	0.000	0.021	0.1127	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.168	0.1068	0.0000	.0000E+00	.0000E+00
158	0.00	0.000	0.022	0.1060	0.0000	.0000E+00	.0000E+00
159	0.00	0.000	0.023	0.1051	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.023	0.1043	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.023	0.1035	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.024	0.1026	0.0000	.0000E+00	.0000E+00
163	0.00	0.000	0.028	0.1017	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.028	0.1006	0.0000	.0000E+00	.0000E+00

165		0.00	0.000	0.016	0.1001	0.0000	.0000E+00	.0000E+00
166		0.00	0.000	0.003	0.1000	0.0000	.0000E+00	.0000E+00
167		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
168		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
169		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
170		0.14	0.000	0.011	0.1045	0.0000	.0000E+00	.0000E+00
171		0.00	0.000	0.003	0.1044	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.015	0.1039	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.020	0.1032	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.022	0.1024	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.009	0.1021	0.0000	.0000E+00	.0000E+00
176		0.33	0.000	0.024	0.1130	0.0000	.0000E+00	.0000E+00
177		0.00	0.000	0.158	0.1073	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.180	0.1009	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.021	0.1002	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.005	0.1000	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
183		0.22	0.000	0.012	0.1074	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.137	0.1025	0.0000	.0000E+00	.0000E+00
185		0.03	0.000	0.034	0.1023	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.021	0.1016	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.010	0.1012	0.0000	.0000E+00	.0000E+00
188	*	0.00	0.000	0.006	0.1010	0.0000	.0000E+00	.0000E+00
189	*	0.00	0.000	0.005	0.1008	0.0000	.0000E+00	.0000E+00
190	*	0.00	0.000	0.005	0.1006	0.0000	.0000E+00	.0000E+00
191	*	0.00	0.000	0.005	0.1005	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.006	0.1003	0.0000	.0000E+00	.1090E-05
193		0.00	0.000	0.007	0.1000	0.0000	.0000E+00	.1901E-05
194		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
195	*	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
196		0.23	0.000	0.011	0.1077	0.0000	.0000E+00	.0000E+00
197	*	0.00	0.000	0.079	0.1049	0.0000	.0000E+00	.0000E+00
198	*	0.00	0.000	0.097	0.1015	0.0000	.0000E+00	.0000E+00
199		0.13	0.000	0.026	0.1052	0.0000	.0000E+00	.0000E+00
200		0.05	0.000	0.056	0.1049	0.0000	.0000E+00	.0000E+00
201		0.00	0.000	0.080	0.1021	0.0000	.0000E+00	.0000E+00
202	*	0.00	0.000	0.015	0.1015	0.0000	.0000E+00	.0000E+00
203		0.45	0.000	0.032	0.1164	0.0000	.0000E+00	.0000E+00
204		0.02	0.000	0.159	0.1115	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.237	0.1030	0.0000	.0000E+00	.0000E+00
206		0.00	0.000	0.069	0.1005	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.015	0.1000	0.0000	.0000E+00	.1076E-05
208		0.25	0.000	0.023	0.1081	0.0000	.0000E+00	.0000E+00
209		0.00	0.000	0.119	0.1039	0.0000	.0000E+00	.0000E+00
210		0.08	0.000	0.110	0.1028	0.0000	.0000E+00	.0000E+00
211		0.31	0.000	0.045	0.1123	0.0000	.0000E+00	.1091E-05
212		0.05	0.000	0.167	0.1081	0.0000	.0000E+00	.1956E-05
213		0.00	0.000	0.110	0.1042	0.0000	.0000E+00	.0000E+00
214		0.31	0.000	0.081	0.1123	0.0000	.0000E+00	.0000E+00
215		0.50	0.000	0.173	0.1240	0.0000	.0000E+00	.0000E+00
216		0.03	0.000	0.184	0.1185	0.0000	.0000E+00	.0000E+00
217	*	0.00	0.000	0.122	0.1142	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.114	0.1101	0.0000	.0000E+00	.0000E+00
219		0.00	0.000	0.124	0.1057	0.0000	.0000E+00	.0000E+00
220	*	0.00	0.000	0.105	0.1020	0.0000	.0000E+00	.0000E+00
221		0.30	0.000	0.085	0.1096	0.0000	.0000E+00	.0000E+00
222		0.00	0.000	0.079	0.1068	0.0000	.0000E+00	.0000E+00
223		0.31	0.000	0.152	0.1125	0.0000	.0000E+00	.0000E+00
224		0.00	0.000	0.083	0.1095	0.0000	.0000E+00	.0000E+00
225	*	0.00	0.000	0.110	0.1056	0.0000	.0000E+00	.0000E+00
226	*	0.00	0.000	0.114	0.1015	0.0000	.0000E+00	.0000E+00
227		0.00	0.000	0.034	0.1003	0.0000	.0000E+00	.0000E+00

228		0.00	0.000	0.008	0.1000	0.0000	.0000E+00	.3374E-05
229		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
230	*	1.24	0.000	0.068	0.1006	0.0000	.0000E+00	.0000E+00
231		0.00	0.000	0.097	0.1383	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.155	0.1328	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.246	0.1240	0.0000	.0000E+00	.0000E+00
234		0.00	0.000	0.272	0.1143	0.0000	.0000E+00	.0000E+00
235		0.00	0.000	0.295	0.1038	0.0000	.0000E+00	.0000E+00
236		0.00	0.000	0.096	0.1003	0.0000	.0000E+00	.0000E+00
237		0.00	0.000	0.009	0.1000	0.0000	.0000E+00	.0000E+00
238		0.00	0.000	0.003	0.0999	0.0000	.0000E+00	.0000E+00
239		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
240		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
241		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
242		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
243		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
245		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
246		0.16	0.000	0.045	0.1040	0.0000	.0000E+00	.0000E+00
247		0.00	0.000	0.031	0.1029	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.069	0.1005	0.0000	.0000E+00	.0000E+00
249	*	0.00	0.000	0.011	0.1001	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.004	0.1000	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
252		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
253		0.11	0.000	0.037	0.1025	0.0000	.0000E+00	.0000E+00
254		0.00	0.000	0.030	0.1015	0.0000	.0000E+00	.0000E+00
255		0.00	0.000	0.030	0.1004	0.0000	.0000E+00	.0000E+00
256		0.00	0.000	0.008	0.1001	0.0000	.0000E+00	.0000E+00
257		0.04	0.000	0.034	0.1003	0.0000	.0000E+00	.1115E-05
258		0.03	0.000	0.031	0.1002	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.005	0.1001	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.003	0.1000	0.0000	.0000E+00	.0000E+00
261		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
262		0.42	0.000	0.092	0.1116	0.0000	.0000E+00	.0000E+00
263		0.50	0.000	0.117	0.1253	0.0000	.0000E+00	.0000E+00
264		0.00	0.000	0.117	0.1211	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.154	0.1156	0.0000	.0000E+00	.0000E+00
266	*	0.00	0.000	0.075	0.1129	0.0000	.0000E+00	.0000E+00
267		0.00	0.000	0.161	0.1072	0.0000	.0000E+00	.0000E+00
268		0.00	0.000	0.174	0.1010	0.0000	.0000E+00	.0000E+00
269	*	0.00	0.000	0.000	0.1010	0.0000	.0000E+00	.0000E+00
270		0.00	0.000	0.026	0.1000	0.0000	.0000E+00	.0000E+00
271		0.16	0.000	0.038	0.1044	0.0000	.0000E+00	.0000E+00
272		0.00	0.000	0.022	0.1036	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.051	0.1018	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.031	0.1007	0.0000	.0000E+00	.0000E+00
275		0.00	0.000	0.015	0.1001	0.0000	.0000E+00	.1121E-05
276		0.00	0.000	0.003	0.1000	0.0000	.0000E+00	.0000E+00
277		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
278		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.1074E-05
279		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
280	*	1.01	0.000	0.057	0.1006	0.0000	.0000E+00	.0000E+00
281		0.00	0.000	0.088	0.1308	0.0000	.0000E+00	.0000E+00
282		0.07	0.000	0.092	0.1300	0.0000	.0000E+00	.0000E+00
283		0.00	0.000	0.152	0.1246	0.0000	.0000E+00	.0000E+00
284		1.06	0.000	0.142	0.1573	0.0000	.0000E+00	.0000E+00
285		0.00	0.000	0.146	0.1521	0.0000	.0000E+00	.0000E+00
286		0.00	0.000	0.158	0.1465	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.152	0.1411	0.0000	.0000E+00	.0000E+00
288		0.07	0.000	0.130	0.1389	0.0000	.0000E+00	.0000E+00
289		0.12	0.000	0.151	0.1378	0.0000	.0000E+00	.0000E+00
290		1.77	0.036	0.165	0.1938	0.0000	.0000E+00	.0000E+00

291		0.00	0.000	0.159	0.1882	0.0000	.0000E+00	.0000E+00
292		0.00	0.000	0.116	0.1840	0.0000	.0000E+00	.0000E+00
293		0.00	0.000	0.129	0.1794	0.0000	.0000E+00	.0000E+00
294		0.00	0.000	0.130	0.1748	0.0000	.0000E+00	.0000E+00
295		0.00	0.000	0.121	0.1704	0.0000	.0000E+00	.0000E+00
296		0.00	0.000	0.150	0.1651	0.0000	.0000E+00	.0000E+00
297		0.00	0.000	0.134	0.1603	0.0000	.0000E+00	.0000E+00
298		0.00	0.000	0.136	0.1554	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.124	0.1510	0.0000	.0000E+00	.0000E+00
300		0.00	0.000	0.129	0.1464	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.080	0.1435	0.0000	.0000E+00	.0000E+00
302		0.03	0.000	0.072	0.1420	0.0000	.0000E+00	.0000E+00
303		0.00	0.000	0.052	0.1402	0.0000	.0000E+00	.0000E+00
304		0.00	0.000	0.046	0.1385	0.0000	.0000E+00	.0000E+00
305		0.00	0.000	0.042	0.1371	0.0000	.0000E+00	.0000E+00
306		0.00	0.000	0.038	0.1357	0.0000	.0000E+00	.0000E+00
307		0.00	0.000	0.036	0.1344	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.034	0.1332	0.0000	.0000E+00	.0000E+00
309		0.00	0.000	0.032	0.1321	0.0000	.0000E+00	.0000E+00
310		0.00	0.000	0.031	0.1310	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.029	0.1299	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.028	0.1289	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.027	0.1279	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.027	0.1270	0.0000	.0000E+00	.0000E+00
315		0.00	0.000	0.026	0.1261	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.024	0.1252	0.0000	.0000E+00	.0000E+00
317		0.00	0.000	0.023	0.1244	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.023	0.1236	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.022	0.1228	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.021	0.1220	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.021	0.1213	0.0000	.0000E+00	.0000E+00
322		0.00	0.000	0.020	0.1206	0.0000	.0000E+00	.0000E+00
323		0.00	0.000	0.020	0.1199	0.0000	.0000E+00	.0000E+00
324		0.00	0.000	0.020	0.1192	0.0000	.0000E+00	.0000E+00
325		0.00	0.000	0.019	0.1185	0.0000	.0000E+00	.0000E+00
326		0.00	0.000	0.019	0.1178	0.0000	.0000E+00	.0000E+00
327		0.00	0.000	0.018	0.1171	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.018	0.1165	0.0000	.0000E+00	.0000E+00
329		0.00	0.000	0.018	0.1159	0.0000	.0000E+00	.0000E+00
330		0.00	0.000	0.018	0.1152	0.0000	.0000E+00	.0000E+00
331		0.00	0.000	0.017	0.1146	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.017	0.1140	0.0000	.0000E+00	.0000E+00
333		0.00	0.000	0.017	0.1134	0.0000	.0000E+00	.0000E+00
334		0.05	0.000	0.026	0.1143	0.0000	.0000E+00	.0000E+00
335		0.00	0.000	0.016	0.1137	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.016	0.1131	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.016	0.1126	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.016	0.1120	0.0000	.0000E+00	.0000E+00
339		0.00	0.000	0.015	0.1114	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.015	0.1109	0.0000	.0000E+00	.0000E+00
341		0.00	0.000	0.015	0.1104	0.0000	.0000E+00	.0000E+00
342		0.00	0.000	0.015	0.1098	0.0000	.0000E+00	.0000E+00
343		0.00	0.000	0.015	0.1093	0.0000	.0000E+00	.0000E+00
344		0.00	0.000	0.015	0.1088	0.0000	.0000E+00	.0000E+00
345		0.00	0.000	0.014	0.1083	0.0000	.0000E+00	.0000E+00
346		0.05	0.000	0.023	0.1092	0.0000	.0000E+00	.0000E+00
347		0.00	0.000	0.014	0.1087	0.0000	.0000E+00	.0000E+00
348	*	0.00	0.000	0.014	0.1082	0.0000	.0000E+00	.0000E+00
349		0.00	0.000	0.014	0.1078	0.0000	.0000E+00	.0000E+00
350		0.00	0.000	0.014	0.1073	0.0000	.0000E+00	.0000E+00
351		0.00	0.000	0.013	0.1068	0.0000	.0000E+00	.0000E+00
352		0.00	0.000	0.013	0.1063	0.0000	.0000E+00	.0000E+00
353		0.00	0.000	0.013	0.1058	0.0000	.0000E+00	.0000E+00

354	0.00	0.000	0.013	0.1054	0.0000	.0000E+00	.0000E+00
355	0.00	0.000	0.013	0.1049	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.013	0.1044	0.0000	.0000E+00	.0000E+00
357	0.00	0.000	0.013	0.1040	0.0000	.0000E+00	.0000E+00
358	0.00	0.000	0.012	0.1035	0.0000	.0000E+00	.0000E+00
359	0.00	0.000	0.010	0.1032	0.0000	.0000E+00	.0000E+00
360	0.00	0.000	0.006	0.1030	0.0000	.0000E+00	.0000E+00
361	0.00	0.000	0.005	0.1028	0.0000	.0000E+00	.0000E+00
362	0.00	0.000	0.004	0.1027	0.0000	.0000E+00	.0000E+00
363	0.00	0.000	0.003	0.1026	0.0000	.0000E+00	.0000E+00
364	0.00	0.000	0.002	0.1025	0.0000	.0000E+00	.0000E+00
365	0.00	0.000	0.002	0.1024	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1985

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.26	0.42	0.34	0.82	0.50	0.85
	1.82	2.69	1.42	4.13	0.05	0.05
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.036	0.000	0.000
EVAPOTRANSPIRATION	1.730	0.421	0.319	0.582	0.929	0.857
	1.592	2.919	1.368	3.065	0.729	0.382
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 1985

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.35	2083619.870	100.00
RUNOFF	0.036	5263.866	0.25
EVAPOTRANSPIRATION	14.893	2162405.750	103.78
PERC./LEAKAGE THROUGH LAYER 2	0.000014	2.003	0.00
CHANGE IN WATER STORAGE	-0.579	-84051.344	-4.03
SOIL WATER AT START OF YEAR	4.518	655992.000	
SOIL WATER AT END OF YEAR	3.939	571940.687	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.276	0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1986

DAY	AIR -	SOIL -	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.01	0.000	0.009	0.1025	0.0000	.0000E+00	.0000E+00
2			0.00	0.000	0.003	0.1024	0.0000	.0000E+00	.0000E+00
3			0.00	0.000	0.002	0.1023	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.001	0.1023	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.001	0.1022	0.0000	.0000E+00	.0000E+00
6			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
7			0.01	0.000	0.008	0.1023	0.0000	.0000E+00	.0000E+00
8	*		0.00	0.000	0.002	0.1023	0.0000	.0000E+00	.0000E+00
9	*		0.00	0.000	0.002	0.1022	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
12			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
18			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
19			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
20			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
21			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
22			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
23			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
25			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.000	0.1022	0.0000	.0000E+00	.0000E+00
33			0.02	0.000	0.008	0.1026	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.001	0.1026	0.0000	.0000E+00	.0000E+00
35			0.16	0.000	0.010	0.1079	0.0000	.0000E+00	.0000E+00
36			0.04	0.000	0.012	0.1089	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.005	0.1087	0.0000	.0000E+00	.0000E+00
38			0.05	0.000	0.012	0.1101	0.0000	.0000E+00	.0000E+00
39			0.01	0.000	0.012	0.1100	0.0000	.0000E+00	.0000E+00

40	0.05	0.000	0.013	0.1114	0.0000	.0000E+00	.1990E-05
41	0.24	0.000	0.013	0.1195	0.0000	.0000E+00	.1028E-05
42	0.00	0.000	0.005	0.1193	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.005	0.1191	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.006	0.1189	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.007	0.1186	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.007	0.1184	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.007	0.1181	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.007	0.1178	0.0000	.0000E+00	.0000E+00
49	0.00	0.000	0.007	0.1176	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.007	0.1173	0.0000	.0000E+00	.0000E+00
51	0.00	0.000	0.007	0.1171	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.007	0.1168	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.007	0.1165	0.0000	.0000E+00	.0000E+00
54	0.00	0.000	0.007	0.1163	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.007	0.1160	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.007	0.1158	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.007	0.1155	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.007	0.1153	0.0000	.0000E+00	.0000E+00
59	0.00	0.000	0.007	0.1150	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.007	0.1148	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.007	0.1145	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.007	0.1143	0.0000	.0000E+00	.0000E+00
63	0.00	0.000	0.007	0.1140	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.007	0.1138	0.0000	.0000E+00	.0000E+00
65	0.00	0.000	0.007	0.1136	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.007	0.1133	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.007	0.1131	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.007	0.1128	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.007	0.1126	0.0000	.0000E+00	.0000E+00
70	0.07	0.000	0.013	0.1146	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.007	0.1144	0.0000	.0000E+00	.0000E+00
72	0.11	0.000	0.014	0.1178	0.0000	.0000E+00	.0000E+00
73	0.13	0.000	0.014	0.1220	0.0000	.0000E+00	.0000E+00
74	0.00	0.000	0.008	0.1217	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.008	0.1214	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.008	0.1211	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.008	0.1208	0.0000	.0000E+00	.0000E+00
78	0.04	0.000	0.013	0.1217	0.0000	.0000E+00	.0000E+00
79	0.00	0.000	0.007	0.1215	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.008	0.1212	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.008	0.1209	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.008	0.1207	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.007	0.1204	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.007	0.1202	0.0000	.0000E+00	.0000E+00
85	0.00	0.000	0.007	0.1199	0.0000	.0000E+00	.0000E+00
86	0.00	0.000	0.007	0.1196	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.007	0.1194	0.0000	.0000E+00	.0000E+00
88	0.00	0.000	0.007	0.1191	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.007	0.1189	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.007	0.1186	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.007	0.1183	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.008	0.1181	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.008	0.1178	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.008	0.1175	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.008	0.1172	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.008	0.1170	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.008	0.1167	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.008	0.1164	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.009	0.1161	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.009	0.1157	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.009	0.1154	0.0000	.0000E+00	.0000E+00
102	0.00	0.000	0.009	0.1151	0.0000	.0000E+00	.0000E+00

103	0.00	0.000	0.009	0.1148	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.009	0.1144	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.010	0.1141	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.010	0.1137	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.010	0.1134	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.010	0.1130	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.010	0.1127	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.010	0.1123	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.011	0.1119	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.011	0.1115	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.012	0.1111	0.0000	.0000E+00	.0000E+00
114	0.01	0.000	0.017	0.1109	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.012	0.1104	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.013	0.1100	0.0000	.0000E+00	.0000E+00
117	0.00	0.000	0.013	0.1095	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.013	0.1091	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.014	0.1086	0.0000	.0000E+00	.0000E+00
120	0.00	0.000	0.015	0.1080	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.015	0.1075	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.016	0.1069	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.016	0.1063	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.017	0.1057	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.017	0.1051	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.016	0.1045	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.013	0.1041	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.017	0.1035	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.016	0.1029	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.017	0.1023	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.018	0.1017	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.019	0.1010	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.020	0.1003	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.008	0.1000	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
137	0.03	0.000	0.010	0.1007	0.0000	.0000E+00	.0000E+00
138	0.00	0.000	0.002	0.1006	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.004	0.1004	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.005	0.1003	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.005	0.1001	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.004	0.1000	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
144	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
147	0.05	0.000	0.010	0.1014	0.0000	.0000E+00	.0000E+00
148	0.02	0.000	0.009	0.1017	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.002	0.1017	0.0000	.0000E+00	.0000E+00
150	0.27	0.000	0.013	0.1108	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.012	0.1104	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.012	0.1100	0.0000	.0000E+00	.1119E-05
153	0.00	0.000	0.015	0.1095	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.018	0.1088	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.020	0.1081	0.0000	.0000E+00	.0000E+00
156	0.00	0.000	0.021	0.1074	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.022	0.1066	0.0000	.0000E+00	.0000E+00
158	0.00	0.000	0.024	0.1057	0.0000	.0000E+00	.0000E+00
159	0.00	0.000	0.024	0.1049	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.025	0.1040	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.024	0.1031	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.024	0.1023	0.0000	.0000E+00	.0000E+00
163	0.00	0.000	0.026	0.1013	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.028	0.1003	0.0000	.0000E+00	.0000E+00
165	0.00	0.000	0.009	0.1000	0.0000	.0000E+00	.0000E+00

166		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
167		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
168		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
169		0.12	0.000	0.013	0.1038	0.0000	.0000E+00	.0000E+00
170		0.08	0.000	0.013	0.1062	0.0000	.0000E+00	.0000E+00
171		0.00	0.000	0.018	0.1055	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.019	0.1048	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.026	0.1039	0.0000	.0000E+00	.0000E+00
174		0.02	0.000	0.035	0.1034	0.0000	.0000E+00	.0000E+00
175		0.46	0.000	0.033	0.1186	0.0000	.0000E+00	.0000E+00
176		0.48	0.000	0.032	0.1346	0.0000	.0000E+00	.0000E+00
177		0.32	0.000	0.220	0.1382	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.259	0.1289	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.272	0.1192	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.214	0.1115	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.113	0.1075	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.099	0.1040	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.090	0.1007	0.0000	.0000E+00	.0000E+00
184		0.06	0.000	0.038	0.1015	0.0000	.0000E+00	.0000E+00
185		0.00	0.000	0.013	0.1010	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.017	0.1004	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.011	0.1000	0.0000	.0000E+00	.0000E+00
188		0.02	0.000	0.018	0.1001	0.0000	.0000E+00	.0000E+00
189		0.00	0.000	0.003	0.1000	0.0000	.0000E+00	.0000E+00
190		0.03	0.000	0.019	0.1004	0.0000	.0000E+00	.0000E+00
191		0.16	0.000	0.019	0.1054	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.034	0.1042	0.0000	.0000E+00	.1122E-05
193		0.00	0.000	0.041	0.1027	0.0000	.0000E+00	.0000E+00
194		0.00	0.000	0.018	0.1021	0.0000	.0000E+00	.0000E+00
195		0.00	0.000	0.016	0.1015	0.0000	.0000E+00	.0000E+00
196		0.00	0.000	0.009	0.1012	0.0000	.0000E+00	.0000E+00
197	*	0.00	0.000	0.011	0.1008	0.0000	.0000E+00	.0000E+00
198	*	0.27	0.000	0.080	0.1015	0.0000	.0000E+00	.0000E+00
199		0.02	0.000	0.202	0.1011	0.0000	.0000E+00	.0000E+00
200		0.00	0.000	0.014	0.1006	0.0000	.0000E+00	.1079E-05
201		0.00	0.000	0.013	0.1001	0.0000	.0000E+00	.1116E-05
202		0.23	0.000	0.022	0.1075	0.0000	.0000E+00	.0000E+00
203		0.26	0.000	0.042	0.1153	0.0000	.0000E+00	.0000E+00
204		0.00	0.000	0.033	0.1141	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.041	0.1126	0.0000	.0000E+00	.0000E+00
206		0.00	0.000	0.051	0.1108	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.053	0.1089	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.055	0.1070	0.0000	.0000E+00	.0000E+00
209		0.00	0.000	0.052	0.1051	0.0000	.0000E+00	.0000E+00
210		0.00	0.000	0.050	0.1033	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.055	0.1014	0.0000	.0000E+00	.0000E+00
212		0.00	0.000	0.031	0.1003	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.008	0.1000	0.0000	.0000E+00	.0000E+00
214		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
215		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
216		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
217		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
219		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
220		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
221		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
222		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
223		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
224		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
225		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
226		0.85	0.000	0.043	0.1288	0.0000	.0000E+00	.0000E+00
227		0.05	0.000	0.115	0.1264	0.0000	.0000E+00	.0000E+00
228		0.00	0.000	0.238	0.1179	0.0000	.0000E+00	.0000E+00

229		0.00	0.000	0.232	0.1096	0.0000	.0000E+00	.0000E+00
230		0.00	0.000	0.188	0.1029	0.0000	.0000E+00	.0000E+00
231		0.00	0.000	0.063	0.1007	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.016	0.1001	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.004	0.1000	0.0000	.0000E+00	.0000E+00
234		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
235		0.37	0.000	0.026	0.1122	0.0000	.0000E+00	.0000E+00
236		0.00	0.000	0.143	0.1071	0.0000	.0000E+00	.0000E+00
237		0.00	0.000	0.162	0.1013	0.0000	.0000E+00	.0000E+00
238		0.00	0.000	0.032	0.1002	0.0000	.0000E+00	.0000E+00
239		0.01	0.000	0.015	0.1000	0.0000	.0000E+00	.0000E+00
240	*	0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
241		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
242	*	0.46	0.000	0.072	0.1006	0.0000	.0000E+00	.0000E+00
243	*	0.00	0.000	0.068	0.1013	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.107	0.1040	0.0000	.0000E+00	.0000E+00
245	*	0.00	0.000	0.099	0.1040	0.0000	.0000E+00	.0000E+00
246		0.00	0.000	0.028	0.1030	0.0000	.0000E+00	.0000E+00
247		0.06	0.000	0.030	0.1041	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.008	0.1038	0.0000	.0000E+00	.0000E+00
249		0.11	0.000	0.039	0.1063	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.080	0.1035	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.026	0.1025	0.0000	.0000E+00	.0000E+00
252		0.00	0.000	0.028	0.1015	0.0000	.0000E+00	.0000E+00
253		0.00	0.000	0.012	0.1011	0.0000	.0000E+00	.0000E+00
254		0.00	0.000	0.009	0.1008	0.0000	.0000E+00	.1069E-05
255		0.12	0.000	0.022	0.1043	0.0000	.0000E+00	.0000E+00
256		0.00	0.000	0.028	0.1032	0.0000	.0000E+00	.0000E+00
257		0.00	0.000	0.017	0.1026	0.0000	.0000E+00	.1122E-05
258		0.50	0.000	0.039	0.1191	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.095	0.1157	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.162	0.1099	0.0000	.0000E+00	.0000E+00
261		0.00	0.000	0.159	0.1043	0.0000	.0000E+00	.0000E+00
262		0.00	0.000	0.089	0.1011	0.0000	.0000E+00	.0000E+00
263	*	0.00	0.000	0.024	0.1002	0.0000	.0000E+00	.0000E+00
264	*	0.00	0.000	0.006	0.1000	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
266		0.21	0.000	0.023	0.1066	0.0000	.0000E+00	.0000E+00
267		0.80	0.000	0.096	0.1318	0.0000	.0000E+00	.0000E+00
268		0.00	0.000	0.085	0.1287	0.0000	.0000E+00	.0000E+00
269		0.00	0.000	0.147	0.1235	0.0000	.0000E+00	.0000E+00
270		0.00	0.000	0.145	0.1183	0.0000	.0000E+00	.0000E+00
271		0.00	0.000	0.133	0.1135	0.0000	.0000E+00	.0000E+00
272		0.00	0.000	0.130	0.1089	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.138	0.1040	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.100	0.1004	0.0000	.0000E+00	.0000E+00
275		0.24	0.000	0.035	0.1077	0.0000	.0000E+00	.0000E+00
276		0.26	0.000	0.116	0.1129	0.0000	.0000E+00	.0000E+00
277		0.00	0.000	0.084	0.1099	0.0000	.0000E+00	.0000E+00
278		0.00	0.000	0.128	0.1053	0.0000	.0000E+00	.0000E+00
279		0.10	0.000	0.120	0.1046	0.0000	.0000E+00	.0000E+00
280		0.00	0.000	0.050	0.1028	0.0000	.0000E+00	.0000E+00
281		0.00	0.000	0.034	0.1016	0.0000	.0000E+00	.0000E+00
282		0.00	0.000	0.013	0.1011	0.0000	.0000E+00	.0000E+00
283		0.10	0.000	0.030	0.1036	0.0000	.0000E+00	.0000E+00
284		0.05	0.000	0.023	0.1046	0.0000	.0000E+00	.0000E+00
285		0.14	0.000	0.036	0.1083	0.0000	.0000E+00	.0000E+00
286		0.00	0.000	0.075	0.1056	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.088	0.1025	0.0000	.0000E+00	.0000E+00
288		0.00	0.000	0.029	0.1014	0.0000	.0000E+00	.0000E+00
289		0.05	0.000	0.028	0.1022	0.0000	.0000E+00	.0000E+00
290		0.00	0.000	0.005	0.1021	0.0000	.0000E+00	.0000E+00
291	*	0.00	0.000	0.000	0.1021	0.0000	.0000E+00	.0000E+00

292		0.03	0.000	0.022	0.1024	0.0000	.0000E+00	.0000E+00
293		0.00	0.000	0.005	0.1022	0.0000	.0000E+00	.0000E+00
294		0.00	0.000	0.009	0.1019	0.0000	.0000E+00	.0000E+00
295		0.00	0.000	0.008	0.1016	0.0000	.0000E+00	.0000E+00
296		0.00	0.000	0.008	0.1013	0.0000	.0000E+00	.0000E+00
297		0.00	0.000	0.006	0.1011	0.0000	.0000E+00	.3386E-05
298		0.00	0.000	0.006	0.1009	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.006	0.1007	0.0000	.0000E+00	.1159E-05
300		0.00	0.000	0.006	0.1004	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.006	0.1002	0.0000	.0000E+00	.1830E-05
302		0.00	0.000	0.006	0.1000	0.0000	.0000E+00	.1123E-05
303		0.00	0.000	0.002	0.1000	0.0000	.0000E+00	.2014E-05
304		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
305		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
306		1.13	0.000	0.028	0.1393	0.0000	.0000E+00	.0000E+00
307		1.31	0.007	0.084	0.1828	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.090	0.1796	0.0000	.0000E+00	.0000E+00
309		0.00	0.000	0.077	0.1769	0.0000	.0000E+00	.0000E+00
310		0.00	0.000	0.080	0.1740	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.095	0.1706	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.097	0.1672	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.086	0.1641	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.089	0.1609	0.0000	.0000E+00	.0000E+00
315		0.00	0.000	0.081	0.1580	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.089	0.1548	0.0000	.0000E+00	.0000E+00
317		0.24	0.000	0.101	0.1598	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.096	0.1564	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.101	0.1528	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.101	0.1492	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.114	0.1451	0.0000	.0000E+00	.0000E+00
322		0.00	0.000	0.097	0.1416	0.0000	.0000E+00	.0000E+00
323		0.34	0.000	0.108	0.1499	0.0000	.0000E+00	.0000E+00
324		0.00	0.000	0.111	0.1460	0.0000	.0000E+00	.0000E+00
325		0.00	0.000	0.097	0.1425	0.0000	.0000E+00	.0000E+00
326		0.00	0.000	0.097	0.1390	0.0000	.0000E+00	.0000E+00
327		0.00	0.000	0.085	0.1360	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.071	0.1335	0.0000	.0000E+00	.0000E+00
329		0.00	0.000	0.061	0.1313	0.0000	.0000E+00	.0000E+00
330		0.00	0.000	0.052	0.1294	0.0000	.0000E+00	.0000E+00
331		0.00	0.000	0.046	0.1278	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.041	0.1263	0.0000	.0000E+00	.0000E+00
333		0.00	0.000	0.038	0.1250	0.0000	.0000E+00	.0000E+00
334		0.00	0.000	0.035	0.1237	0.0000	.0000E+00	.0000E+00
335		0.00	0.000	0.033	0.1225	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.031	0.1214	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.030	0.1203	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.029	0.1193	0.0000	.0000E+00	.0000E+00
339		0.00	0.000	0.027	0.1183	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.026	0.1174	0.0000	.0000E+00	.0000E+00
341		0.11	0.000	0.038	0.1200	0.0000	.0000E+00	.0000E+00
342		0.52	0.000	0.037	0.1372	0.0000	.0000E+00	.0000E+00
343		0.00	0.000	0.024	0.1364	0.0000	.0000E+00	.0000E+00
344		0.15	0.000	0.035	0.1404	0.0000	.0000E+00	.0000E+00
345	*	0.00	0.000	0.059	0.1383	0.0000	.0000E+00	.0000E+00
346	*	0.00	0.000	0.023	0.1375	0.0000	.0000E+00	.0000E+00
347		0.00	0.000	0.022	0.1367	0.0000	.0000E+00	.0000E+00
348		0.00	0.000	0.021	0.1360	0.0000	.0000E+00	.0000E+00
349		0.00	0.000	0.021	0.1352	0.0000	.0000E+00	.0000E+00
350		0.22	0.000	0.033	0.1419	0.0000	.0000E+00	.0000E+00
351		0.50	0.000	0.096	0.1563	0.0000	.0000E+00	.0000E+00
352		0.00	0.000	0.096	0.1529	0.0000	.0000E+00	.0000E+00
353		0.00	0.000	0.064	0.1506	0.0000	.0000E+00	.0000E+00
354		0.00	0.000	0.063	0.1484	0.0000	.0000E+00	.0000E+00

355	0.00	0.000	0.083	0.1454	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.086	0.1424	0.0000	.0000E+00	.0000E+00
357	0.09	0.000	0.085	0.1425	0.0000	.0000E+00	.0000E+00
358	0.00	0.000	0.062	0.1403	0.0000	.0000E+00	.0000E+00
359	0.00	0.000	0.067	0.1379	0.0000	.0000E+00	.0000E+00
360	0.00	0.000	0.065	0.1356	0.0000	.0000E+00	.0000E+00
361	0.00	0.000	0.068	0.1332	0.0000	.0000E+00	.0000E+00
362	0.00	0.000	0.062	0.1310	0.0000	.0000E+00	.0000E+00
363	0.00	0.000	0.052	0.1291	0.0000	.0000E+00	.0000E+00
364	0.00	0.000	0.046	0.1275	0.0000	.0000E+00	.0000E+00
365	0.00	0.000	0.041	0.1260	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1986

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.02	0.57	0.35	0.01	0.37	1.48
	1.05	1.74	1.80	0.97	3.02	1.59
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.007	0.000
EVAPOTRANSPIRATION	0.027	0.210	0.250	0.307	0.303	1.562
	1.253	1.430	2.006	1.083	2.348	1.525
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 1986

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.97	1883244.000	100.00
RUNOFF	0.007	1013.441	0.05
EVAPOTRANSPIRATION	12.302	1786204.370	94.85
PERC./LEAKAGE THROUGH LAYER 2	0.000019	2.781	0.00
CHANGE IN WATER STORAGE	0.661	96023.211	5.10
SOIL WATER AT START OF YEAR	3.939	571940.687	
SOIL WATER AT END OF YEAR	4.600	667963.875	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 0.174 0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1987

DAY	AIR	SOIL	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.034	0.1248	0.0000	.0000E+00	.0000E+00
2			0.00	0.000	0.035	0.1235	0.0000	.0000E+00	.0000E+00
3			0.00	0.000	0.033	0.1223	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.031	0.1212	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.030	0.1202	0.0000	.0000E+00	.0000E+00
6			0.00	0.000	0.029	0.1191	0.0000	.0000E+00	.0000E+00
7			0.00	0.000	0.027	0.1182	0.0000	.0000E+00	.0000E+00
8			0.00	0.000	0.026	0.1172	0.0000	.0000E+00	.0000E+00
9			0.00	0.000	0.025	0.1163	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.025	0.1154	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.024	0.1146	0.0000	.0000E+00	.0000E+00
12			0.00	0.000	0.023	0.1138	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.023	0.1129	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.022	0.1122	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.021	0.1114	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.021	0.1107	0.0000	.0000E+00	.0000E+00
17	*		0.21	0.000	0.077	0.1114	0.0000	.0000E+00	.0000E+00
18	*		0.00	0.000	0.057	0.1121	0.0000	.0000E+00	.0000E+00
19	*		0.00	0.000	0.037	0.1121	0.0000	.0000E+00	.0000E+00
20	*		0.00	0.000	0.020	0.1113	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.020	0.1106	0.0000	.0000E+00	.0000E+00
22	*		0.00	0.000	0.020	0.1099	0.0000	.0000E+00	.0000E+00
23	*		0.00	0.000	0.019	0.1092	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.019	0.1086	0.0000	.0000E+00	.0000E+00
25			0.00	0.000	0.018	0.1079	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.018	0.1073	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.018	0.1066	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.017	0.1060	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.017	0.1054	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.017	0.1048	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.017	0.1042	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.016	0.1036	0.0000	.0000E+00	.0000E+00
33			0.00	0.000	0.016	0.1030	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.012	0.1026	0.0000	.0000E+00	.0000E+00
35			0.00	0.000	0.008	0.1023	0.0000	.0000E+00	.0000E+00
36			0.00	0.000	0.006	0.1021	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.005	0.1019	0.0000	.0000E+00	.0000E+00
38			0.00	0.000	0.004	0.1018	0.0000	.0000E+00	.0000E+00
39			0.00	0.000	0.003	0.1017	0.0000	.0000E+00	.0000E+00
40			0.00	0.000	0.002	0.1016	0.0000	.0000E+00	.0000E+00

41		0.00	0.000	0.002	0.1015	0.0000	.0000E+00	.0000E+00
42		0.00	0.000	0.002	0.1015	0.0000	.0000E+00	.0000E+00
43		0.00	0.000	0.001	0.1014	0.0000	.0000E+00	.0000E+00
44		0.00	0.000	0.001	0.1014	0.0000	.0000E+00	.0000E+00
45		0.00	0.000	0.001	0.1014	0.0000	.0000E+00	.0000E+00
46		0.00	0.000	0.001	0.1014	0.0000	.0000E+00	.0000E+00
47		0.00	0.000	0.000	0.1013	0.0000	.0000E+00	.0000E+00
48		0.00	0.000	0.000	0.1013	0.0000	.0000E+00	.0000E+00
49		0.28	0.000	0.014	0.1108	0.0000	.0000E+00	.0000E+00
50		0.00	0.000	0.008	0.1106	0.0000	.0000E+00	.0000E+00
51		0.07	0.000	0.019	0.1124	0.0000	.0000E+00	.0000E+00
52		0.38	0.000	0.020	0.1252	0.0000	.0000E+00	.0000E+00
53	*	0.00	0.000	0.008	0.1250	0.0000	.0000E+00	.0000E+00
54		0.00	0.000	0.011	0.1246	0.0000	.0000E+00	.0000E+00
55		0.00	0.000	0.010	0.1242	0.0000	.0000E+00	.0000E+00
56		0.00	0.000	0.010	0.1238	0.0000	.0000E+00	.0000E+00
57		0.00	0.000	0.010	0.1235	0.0000	.0000E+00	.0000E+00
58		0.00	0.000	0.010	0.1231	0.0000	.0000E+00	.0000E+00
59		0.00	0.000	0.010	0.1227	0.0000	.0000E+00	.0000E+00
60		0.00	0.000	0.010	0.1224	0.0000	.0000E+00	.0000E+00
61		0.00	0.000	0.010	0.1220	0.0000	.0000E+00	.0000E+00
62		0.00	0.000	0.010	0.1217	0.0000	.0000E+00	.0000E+00
63		0.00	0.000	0.010	0.1214	0.0000	.0000E+00	.0000E+00
64		0.00	0.000	0.010	0.1210	0.0000	.0000E+00	.0000E+00
65		0.00	0.000	0.009	0.1207	0.0000	.0000E+00	.0000E+00
66		0.00	0.000	0.009	0.1203	0.0000	.0000E+00	.0000E+00
67		0.00	0.000	0.009	0.1200	0.0000	.0000E+00	.0000E+00
68		0.00	0.000	0.009	0.1197	0.0000	.0000E+00	.0000E+00
69		0.04	0.000	0.020	0.1204	0.0000	.0000E+00	.0000E+00
70		0.05	0.000	0.020	0.1215	0.0000	.0000E+00	.0000E+00
71		0.00	0.000	0.011	0.1211	0.0000	.0000E+00	.0000E+00
72		0.00	0.000	0.011	0.1207	0.0000	.0000E+00	.0000E+00
73		0.00	0.000	0.011	0.1203	0.0000	.0000E+00	.0000E+00
74		0.00	0.000	0.011	0.1199	0.0000	.0000E+00	.0000E+00
75		0.00	0.000	0.011	0.1195	0.0000	.0000E+00	.0000E+00
76		0.00	0.000	0.011	0.1191	0.0000	.0000E+00	.0000E+00
77		0.00	0.000	0.009	0.1188	0.0000	.0000E+00	.0000E+00
78		0.00	0.000	0.009	0.1185	0.0000	.0000E+00	.0000E+00
79		0.00	0.000	0.009	0.1181	0.0000	.0000E+00	.0000E+00
80		0.00	0.000	0.009	0.1178	0.0000	.0000E+00	.0000E+00
81		0.00	0.000	0.009	0.1175	0.0000	.0000E+00	.0000E+00
82		0.00	0.000	0.009	0.1172	0.0000	.0000E+00	.0000E+00
83		0.00	0.000	0.009	0.1168	0.0000	.0000E+00	.0000E+00
84		0.00	0.000	0.009	0.1165	0.0000	.0000E+00	.0000E+00
85		0.00	0.000	0.009	0.1162	0.0000	.0000E+00	.0000E+00
86		0.00	0.000	0.009	0.1159	0.0000	.0000E+00	.0000E+00
87		0.00	0.000	0.009	0.1156	0.0000	.0000E+00	.0000E+00
88		0.51	0.000	0.019	0.1331	0.0000	.0000E+00	.0000E+00
89		0.00	0.000	0.010	0.1327	0.0000	.0000E+00	.0000E+00
90		0.00	0.000	0.009	0.1324	0.0000	.0000E+00	.0000E+00
91		0.00	0.000	0.009	0.1321	0.0000	.0000E+00	.0000E+00
92		0.00	0.000	0.009	0.1318	0.0000	.0000E+00	.0000E+00
93		0.00	0.000	0.009	0.1314	0.0000	.0000E+00	.0000E+00
94		0.03	0.000	0.018	0.1318	0.0000	.0000E+00	.0000E+00
95		0.00	0.000	0.009	0.1315	0.0000	.0000E+00	.0000E+00
96		0.00	0.000	0.010	0.1312	0.0000	.0000E+00	.0000E+00
97		0.00	0.000	0.009	0.1309	0.0000	.0000E+00	.0000E+00
98		0.00	0.000	0.009	0.1305	0.0000	.0000E+00	.0000E+00
99		0.00	0.000	0.009	0.1302	0.0000	.0000E+00	.0000E+00
100		0.00	0.000	0.009	0.1299	0.0000	.0000E+00	.0000E+00
101		0.00	0.000	0.009	0.1296	0.0000	.0000E+00	.0000E+00
102		0.00	0.000	0.010	0.1292	0.0000	.0000E+00	.0000E+00
103		0.00	0.000	0.009	0.1289	0.0000	.0000E+00	.0000E+00

104	0.00	0.000	0.009	0.1285	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.010	0.1282	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.010	0.1279	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.010	0.1275	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.010	0.1271	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.010	0.1268	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.010	0.1264	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.011	0.1260	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.011	0.1256	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.011	0.1253	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.011	0.1249	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.011	0.1245	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.011	0.1241	0.0000	.0000E+00	.0000E+00
117	0.00	0.000	0.012	0.1236	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.012	0.1232	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.012	0.1228	0.0000	.0000E+00	.0000E+00
120	0.06	0.000	0.022	0.1241	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.014	0.1236	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.015	0.1231	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.015	0.1226	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.015	0.1220	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.016	0.1215	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.016	0.1209	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.016	0.1203	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.015	0.1198	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.013	0.1193	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.014	0.1188	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.014	0.1183	0.0000	.0000E+00	.1072E-05
132	0.10	0.000	0.026	0.1210	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.018	0.1203	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.018	0.1197	0.0000	.0000E+00	.0000E+00
135	0.03	0.000	0.029	0.1197	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.019	0.1190	0.0000	.0000E+00	.0000E+00
137	0.00	0.000	0.020	0.1183	0.0000	.0000E+00	.0000E+00
138	0.00	0.000	0.021	0.1176	0.0000	.0000E+00	.0000E+00
139	0.13	0.000	0.034	0.1210	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.020	0.1203	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.021	0.1195	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.022	0.1187	0.0000	.0000E+00	.0000E+00
143	0.30	0.000	0.036	0.1281	0.0000	.0000E+00	.0000E+00
144	0.15	0.000	0.036	0.1322	0.0000	.0000E+00	.0000E+00
145	0.10	0.000	0.261	0.1265	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.027	0.1255	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.026	0.1246	0.0000	.0000E+00	.0000E+00
148	0.00	0.000	0.026	0.1237	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.024	0.1228	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.024	0.1220	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.024	0.1211	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.025	0.1202	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.028	0.1192	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.026	0.1183	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.027	0.1173	0.0000	.0000E+00	.0000E+00
156	0.00	0.000	0.028	0.1163	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.030	0.1152	0.0000	.0000E+00	.0000E+00
158	0.35	0.000	0.045	0.1261	0.0000	.0000E+00	.0000E+00
159	0.03	0.000	0.208	0.1198	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.200	0.1126	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.148	0.1074	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.109	0.1035	0.0000	.0000E+00	.0000E+00
163	0.00	0.000	0.082	0.1005	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.015	0.1000	0.0000	.0000E+00	.0000E+00
165	0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
166	0.04	0.000	0.023	0.1005	0.0000	.0000E+00	.0000E+00

167		0.00	0.000	0.009	0.1002	0.0000	.0000E+00	.0000E+00
168		0.00	0.000	0.007	0.1000	0.0000	.0000E+00	.0000E+00
169		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
170		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.1120E-05
171		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
176		0.13	0.000	0.023	0.1038	0.0000	.0000E+00	.0000E+00
177		0.00	0.000	0.007	0.1035	0.0000	.0000E+00	.0000E+00
178		1.40	0.000	0.043	0.1520	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.253	0.1429	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.265	0.1334	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.304	0.1226	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.317	0.1113	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.262	0.1019	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.043	0.1004	0.0000	.0000E+00	.0000E+00
185		0.00	0.000	0.011	0.1000	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
188		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
189		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
190		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
191		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
193		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
194		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
195		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
196	*	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
197	*	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
198		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
199	*	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
200		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
201		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
202		0.22	0.000	0.024	0.1069	0.0000	.0000E+00	.0000E+00
203		0.00	0.000	0.036	0.1056	0.0000	.0000E+00	.0000E+00
204		0.04	0.000	0.045	0.1055	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.034	0.1042	0.0000	.0000E+00	.0000E+00
206		0.03	0.000	0.043	0.1038	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.019	0.1031	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.023	0.1023	0.0000	.0000E+00	.1094E-05
209		0.00	0.000	0.015	0.1018	0.0000	.0000E+00	.1093E-05
210		0.29	0.000	0.032	0.1110	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.168	0.1049	0.0000	.0000E+00	.1104E-05
212		0.00	0.000	0.098	0.1014	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.031	0.1003	0.0000	.0000E+00	.0000E+00
214	*	0.00	0.000	0.009	0.1000	0.0000	.0000E+00	.0000E+00
215		0.04	0.000	0.022	0.1007	0.0000	.0000E+00	.0000E+00
216		0.63	0.000	0.037	0.1219	0.0000	.0000E+00	.0000E+00
217		0.00	0.000	0.080	0.1190	0.0000	.0000E+00	.0000E+00
218	*	0.00	0.000	0.111	0.1151	0.0000	.0000E+00	.0000E+00
219		0.00	0.000	0.112	0.1111	0.0000	.0000E+00	.0000E+00
220	*	0.00	0.000	0.110	0.1071	0.0000	.0000E+00	.0000E+00
221		0.60	0.000	0.100	0.1250	0.0000	.0000E+00	.0000E+00
222		0.00	0.000	0.229	0.1168	0.0000	.0000E+00	.0000E+00
223		0.30	0.000	0.265	0.1181	0.0000	.0000E+00	.0000E+00
224		0.00	0.000	0.111	0.1141	0.0000	.0000E+00	.1107E-05
225	*	0.00	0.000	0.110	0.1101	0.0000	.0000E+00	.1083E-05
226		0.00	0.000	0.196	0.1031	0.0000	.0000E+00	.0000E+00
227		0.00	0.000	0.070	0.1006	0.0000	.0000E+00	.0000E+00
228		0.00	0.000	0.015	0.1001	0.0000	.0000E+00	.0000E+00
229		0.00	0.000	0.004	0.1000	0.0000	.0000E+00	.0000E+00

230		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
231		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
234		0.01	0.000	0.010	0.0999	0.0000	.0000E+00	.0000E+00
235		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
236		1.90	0.036	0.059	0.1644	0.0000	.0000E+00	.0000E+00
237		0.00	0.000	0.226	0.1563	0.0000	.0000E+00	.0000E+00
238		0.15	0.000	0.261	0.1524	0.0000	.0000E+00	.0000E+00
239		0.00	0.000	0.239	0.1438	0.0000	.0000E+00	.0000E+00
240		0.00	0.000	0.238	0.1353	0.0000	.0000E+00	.0000E+00
241		0.00	0.000	0.206	0.1280	0.0000	.0000E+00	.0000E+00
242		0.00	0.000	0.181	0.1215	0.0000	.0000E+00	.0000E+00
243		0.00	0.000	0.224	0.1135	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.257	0.1043	0.0000	.0000E+00	.0000E+00
245	*	0.00	0.000	0.088	0.1012	0.0000	.0000E+00	.0000E+00
246	*	0.00	0.000	0.007	0.1010	0.0000	.0000E+00	.0000E+00
247		0.05	0.000	0.054	0.1008	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.017	0.1002	0.0000	.0000E+00	.0000E+00
249		0.00	0.000	0.006	0.1000	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.1129E-05
252		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
253		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
254		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
255		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
256		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
257		0.22	0.000	0.028	0.1068	0.0000	.0000E+00	.0000E+00
258		0.00	0.000	0.034	0.1056	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.039	0.1042	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.047	0.1025	0.0000	.0000E+00	.0000E+00
261		0.02	0.000	0.035	0.1020	0.0000	.0000E+00	.0000E+00
262	*	0.00	0.000	0.000	0.1020	0.0000	.0000E+00	.0000E+00
263		0.00	0.000	0.010	0.1016	0.0000	.0000E+00	.0000E+00
264		0.00	0.000	0.012	0.1012	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.010	0.1008	0.0000	.0000E+00	.0000E+00
266		0.00	0.000	0.010	0.1004	0.0000	.0000E+00	.0000E+00
267		0.00	0.000	0.010	0.1001	0.0000	.0000E+00	.1136E-05
268		0.15	0.000	0.029	0.1044	0.0000	.0000E+00	.0000E+00
269		0.00	0.000	0.005	0.1043	0.0000	.0000E+00	.1561E-05
270		0.00	0.000	0.021	0.1035	0.0000	.0000E+00	.0000E+00
271		0.00	0.000	0.027	0.1025	0.0000	.0000E+00	.0000E+00
272		0.12	0.000	0.031	0.1057	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.062	0.1035	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.025	0.1026	0.0000	.0000E+00	.0000E+00
275		0.00	0.000	0.014	0.1021	0.0000	.0000E+00	.0000E+00
276		0.00	0.000	0.010	0.1017	0.0000	.0000E+00	.1091E-05
277		0.00	0.000	0.007	0.1015	0.0000	.0000E+00	.0000E+00
278		0.00	0.000	0.007	0.1013	0.0000	.0000E+00	.0000E+00
279		0.00	0.000	0.006	0.1010	0.0000	.0000E+00	.0000E+00
280		0.00	0.000	0.006	0.1008	0.0000	.0000E+00	.1092E-05
281		0.00	0.000	0.006	0.1006	0.0000	.0000E+00	.1136E-05
282		0.00	0.000	0.006	0.1004	0.0000	.0000E+00	.1124E-05
283		0.00	0.000	0.006	0.1002	0.0000	.0000E+00	.1977E-05
284		0.00	0.000	0.006	0.1000	0.0000	.0000E+00	.0000E+00
285		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
286		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
288		0.09	0.000	0.024	0.1023	0.0000	.0000E+00	.0000E+00
289		0.00	0.000	0.002	0.1022	0.0000	.0000E+00	.0000E+00
290		0.00	0.000	0.005	0.1020	0.0000	.0000E+00	.0000E+00
291	*	0.00	0.000	0.000	0.1020	0.0000	.0000E+00	.0000E+00
292		0.00	0.000	0.005	0.1018	0.0000	.0000E+00	.0000E+00

293		0.00	0.000	0.004	0.1017	0.0000	.0000E+00	.0000E+00
294		0.00	0.000	0.004	0.1015	0.0000	.0000E+00	.0000E+00
295		0.00	0.000	0.004	0.1014	0.0000	.0000E+00	.0000E+00
296		0.17	0.000	0.026	0.1065	0.0000	.0000E+00	.0000E+00
297		0.00	0.000	0.060	0.1044	0.0000	.0000E+00	.1531E-05
298		0.00	0.000	0.072	0.1018	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.014	0.1013	0.0000	.0000E+00	.0000E+00
300		0.00	0.000	0.006	0.1011	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.004	0.1010	0.0000	.0000E+00	.0000E+00
302		0.00	0.000	0.004	0.1008	0.0000	.0000E+00	.0000E+00
303		0.00	0.000	0.003	0.1007	0.0000	.0000E+00	.1136E-05
304		0.00	0.000	0.003	0.1006	0.0000	.0000E+00	.1110E-05
305		0.35	0.000	0.025	0.1122	0.0000	.0000E+00	.2110E-05
306		0.00	0.000	0.055	0.1102	0.0000	.0000E+00	.0000E+00
307		0.00	0.000	0.065	0.1079	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.073	0.1053	0.0000	.0000E+00	.0000E+00
309		0.11	0.000	0.105	0.1055	0.0000	.0000E+00	.0000E+00
310		0.14	0.000	0.083	0.1075	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.059	0.1054	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.066	0.1030	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.035	0.1018	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.023	0.1009	0.0000	.0000E+00	.0000E+00
315		0.00	0.000	0.015	0.1004	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.009	0.1001	0.0000	.0000E+00	.0000E+00
317		0.00	0.000	0.002	0.1000	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
322		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
323		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
324		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
325		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
326		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
327		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
329		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
330		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
331	*	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
333		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
334		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
335		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
339		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
341		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
342		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
343		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
344		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
345		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
346		0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
347		0.67	0.000	0.027	0.1229	0.0000	.0000E+00	.0000E+00
348	*	0.45	0.000	0.051	0.1236	0.0000	.0000E+00	.0000E+00
349	*	0.00	0.000	0.052	0.1243	0.0000	.0000E+00	.0000E+00
350	*	0.00	0.000	0.043	0.1250	0.0000	.0000E+00	.0000E+00
351		0.00	0.000	0.074	0.1257	0.0000	.0000E+00	.0000E+00
352		0.11	0.000	0.081	0.1322	0.0000	.0000E+00	.0000E+00
353		0.01	0.000	0.058	0.1305	0.0000	.0000E+00	.0000E+00
354		0.00	0.000	0.051	0.1287	0.0000	.0000E+00	.0000E+00
355		0.00	0.000	0.047	0.1270	0.0000	.0000E+00	.0000E+00

356		0.00	0.000	0.050	0.1252	0.0000	.0000E+00	.0000E+00
357		0.00	0.000	0.063	0.1230	0.0000	.0000E+00	.0000E+00
358		0.00	0.000	0.057	0.1209	0.0000	.0000E+00	.0000E+00
359		0.00	0.000	0.055	0.1190	0.0000	.0000E+00	.0000E+00
360	*	0.50	0.000	0.048	0.1197	0.0000	.0000E+00	.0000E+00
361	*	0.02	0.000	0.030	0.1204	0.0000	.0000E+00	.0000E+00
362	*	0.00	0.000	0.035	0.1211	0.0000	.0000E+00	.0000E+00
363	*	0.00	0.000	0.040	0.1218	0.0000	.0000E+00	.0000E+00
364		0.00	0.000	0.056	0.1225	0.0000	.0000E+00	.0000E+00
365		0.00	0.000	0.064	0.1278	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1987

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.21	0.73	0.60	0.09	0.81	1.95
	0.58	3.63	0.56	0.26	0.60	1.76
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.036	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.821	0.210	0.330	0.321	0.895	1.908
	1.172	3.255	0.841	0.341	0.618	0.981
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 1987

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.78	1710456.120	100.00
RUNOFF	0.036	5209.863	0.30
EVAPOTRANSPIRATION	11.695	1698082.500	99.28
PERC./LEAKAGE THROUGH LAYER 2	0.000024	3.457	0.00
CHANGE IN WATER STORAGE	0.049	7160.812	0.42
SOIL WATER AT START OF YEAR	4.600	667963.875	
SOIL WATER AT END OF YEAR	4.650	675124.687	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 -0.554 0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1988

DAY	AIR	SOIL	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.056	0.1258	0.0000	.0000E+00	.0000E+00
2			0.00	0.000	0.062	0.1236	0.0000	.0000E+00	.0000E+00
3			0.00	0.000	0.050	0.1218	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.052	0.1199	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.051	0.1181	0.0000	.0000E+00	.0000E+00
6			0.12	0.000	0.080	0.1195	0.0000	.0000E+00	.0000E+00
7			0.00	0.000	0.065	0.1172	0.0000	.0000E+00	.0000E+00
8			0.00	0.000	0.065	0.1149	0.0000	.0000E+00	.0000E+00
9			0.00	0.000	0.066	0.1125	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.055	0.1106	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.052	0.1087	0.0000	.0000E+00	.0000E+00
12			0.00	0.000	0.071	0.1062	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.063	0.1039	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.070	0.1014	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.030	0.1003	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.002	0.1003	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.001	0.1002	0.0000	.0000E+00	.0000E+00
18			0.08	0.000	0.024	0.1022	0.0000	.0000E+00	.0000E+00
19			0.00	0.000	0.005	0.1020	0.0000	.0000E+00	.0000E+00
20	*		0.02	0.000	0.030	0.1017	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.009	0.1014	0.0000	.0000E+00	.0000E+00
22			0.00	0.000	0.009	0.1010	0.0000	.0000E+00	.0000E+00
23	*		0.00	0.000	0.008	0.1008	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.008	0.1005	0.0000	.0000E+00	.0000E+00
25	*		0.00	0.000	0.007	0.1002	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.003	0.1001	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.001	0.1001	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.001	0.1001	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
33			0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
35			0.02	0.000	0.014	0.1003	0.0000	.0000E+00	.0000E+00
36			1.21	0.000	0.029	0.1425	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.059	0.1404	0.0000	.0000E+00	.0000E+00
38			0.00	0.000	0.074	0.1377	0.0000	.0000E+00	.0000E+00
39			0.00	0.000	0.070	0.1352	0.0000	.0000E+00	.0000E+00
40			0.00	0.000	0.084	0.1323	0.0000	.0000E+00	.0000E+00
41			0.00	0.000	0.081	0.1293	0.0000	.0000E+00	.0000E+00

42	0.00	0.000	0.087	0.1262	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.090	0.1230	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.095	0.1196	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.096	0.1162	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.085	0.1132	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.097	0.1097	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.107	0.1059	0.0000	.0000E+00	.0000E+00
49	0.14	0.000	0.110	0.1069	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.072	0.1044	0.0000	.0000E+00	.0000E+00
51	0.00	0.000	0.045	0.1027	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.018	0.1021	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.021	0.1013	0.0000	.0000E+00	.0000E+00
54	0.00	0.000	0.014	0.1009	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.013	0.1004	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.004	0.1003	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.001	0.1002	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.001	0.1002	0.0000	.0000E+00	.0000E+00
59	0.00	0.000	0.000	0.1002	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.000	0.1002	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.000	0.1002	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.000	0.1002	0.0000	.0000E+00	.0000E+00
63	0.10	0.000	0.021	0.1030	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.003	0.1029	0.0000	.0000E+00	.0000E+00
65	0.00	0.000	0.009	0.1026	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.007	0.1023	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.007	0.1021	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.006	0.1019	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.006	0.1017	0.0000	.0000E+00	.0000E+00
70	0.00	0.000	0.005	0.1015	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.005	0.1013	0.0000	.0000E+00	.0000E+00
72	0.00	0.000	0.005	0.1011	0.0000	.0000E+00	.0000E+00
73	0.00	0.000	0.005	0.1009	0.0000	.0000E+00	.0000E+00
74	0.00	0.000	0.005	0.1007	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.005	0.1006	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.005	0.1004	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.005	0.1002	0.0000	.0000E+00	.0000E+00
78	0.00	0.000	0.002	0.1002	0.0000	.0000E+00	.0000E+00
79	0.00	0.000	0.001	0.1001	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
85	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
86	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
88	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.000	0.1001	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
102	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
103	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00

105	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.000	0.1000	0.0000	.0000E+00	.0000E+00
107	0.04	0.000	0.017	0.1008	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.002	0.1007	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.003	0.1006	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.003	0.1005	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.003	0.1004	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.003	0.1003	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.003	0.1002	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.003	0.1001	0.0000	.0000E+00	.3418E-05
115	0.00	0.000	0.003	0.1000	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.3357E-05
117	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.3364E-05
119	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
120	0.04	0.000	0.017	0.1008	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.001	0.1007	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.003	0.1006	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.003	0.1005	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.003	0.1004	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.003	0.1003	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.003	0.1002	0.0000	.0000E+00	.1094E-05
127	0.00	0.000	0.003	0.1001	0.0000	.0000E+00	.3420E-05
128	0.00	0.000	0.003	0.1000	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.1103E-05
130	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
137	0.13	0.000	0.018	0.1039	0.0000	.0000E+00	.0000E+00
138	0.00	0.000	0.001	0.1039	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.006	0.1037	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.006	0.1034	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.006	0.1032	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.007	0.1030	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.008	0.1027	0.0000	.0000E+00	.0000E+00
144	0.00	0.000	0.008	0.1024	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.009	0.1021	0.0000	.0000E+00	.0000E+00
146	0.05	0.000	0.022	0.1031	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.002	0.1030	0.0000	.0000E+00	.0000E+00
148	0.00	0.000	0.006	0.1028	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.007	0.1025	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.006	0.1023	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.004	0.1022	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.004	0.1020	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.003	0.1019	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.003	0.1018	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.003	0.1017	0.0000	.0000E+00	.0000E+00
156	0.00	0.000	0.003	0.1016	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.003	0.1015	0.0000	.0000E+00	.1589E-05
158	0.00	0.000	0.003	0.1014	0.0000	.0000E+00	.0000E+00
159	0.00	0.000	0.003	0.1013	0.0000	.0000E+00	.2012E-05
160	0.00	0.000	0.003	0.1012	0.0000	.0000E+00	.1128E-05
161	0.00	0.000	0.003	0.1011	0.0000	.0000E+00	.2075E-05
162	0.00	0.000	0.003	0.1010	0.0000	.0000E+00	.0000E+00
163	0.15	0.000	0.020	0.1056	0.0000	.0000E+00	.2150E-05
164	0.00	0.000	0.084	0.1026	0.0000	.0000E+00	.1124E-05
165	0.00	0.000	0.009	0.1023	0.0000	.0000E+00	.2173E-05
166	0.00	0.000	0.010	0.1020	0.0000	.0000E+00	.0000E+00
167	0.76	0.000	0.027	0.1281	0.0000	.0000E+00	.0000E+00

168		0.00	0.000	0.152	0.1227	0.0000	.0000E+00	.0000E+00
169		0.00	0.000	0.218	0.1149	0.0000	.0000E+00	.0000E+00
170		0.00	0.000	0.237	0.1065	0.0000	.0000E+00	.0000E+00
171		0.00	0.000	0.157	0.1009	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.020	0.1002	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.005	0.1000	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
176		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
177		0.33	0.000	0.023	0.1109	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.146	0.1057	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.125	0.1012	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.027	0.1002	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.007	0.1000	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.002	0.0999	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
185		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
186		0.02	0.000	0.016	0.1001	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.002	0.1000	0.0000	.0000E+00	.2277E-05
188		0.51	0.000	0.034	0.1170	0.0000	.0000E+00	.2270E-05
189		0.00	0.000	0.132	0.1123	0.0000	.0000E+00	.0000E+00
190		0.00	0.000	0.189	0.1055	0.0000	.0000E+00	.0000E+00
191	*	0.38	0.000	0.082	0.1062	0.0000	.0000E+00	.0000E+00
192		0.07	0.000	0.281	0.1086	0.0000	.0000E+00	.0000E+00
193		0.00	0.000	0.136	0.1038	0.0000	.0000E+00	.0000E+00
194		0.00	0.000	0.078	0.1010	0.0000	.0000E+00	.0000E+00
195		0.00	0.000	0.024	0.1001	0.0000	.0000E+00	.0000E+00
196		0.00	0.000	0.004	0.1000	0.0000	.0000E+00	.0000E+00
197		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.1127E-05
198		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
199		0.31	0.000	0.024	0.1102	0.0000	.0000E+00	.0000E+00
200		0.00	0.000	0.146	0.1050	0.0000	.0000E+00	.0000E+00
201		0.15	0.000	0.053	0.1084	0.0000	.0000E+00	.0000E+00
202		0.00	0.000	0.167	0.1024	0.0000	.0000E+00	.0000E+00
203		0.00	0.000	0.035	0.1012	0.0000	.0000E+00	.0000E+00
204		0.00	0.000	0.019	0.1005	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.010	0.1001	0.0000	.0000E+00	.0000E+00
206		0.00	0.000	0.004	0.1000	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.001	0.1000	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.001	0.0999	0.0000	.0000E+00	.1102E-05
209		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.1886E-05
210		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
212		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
214		0.00	0.000	0.000	0.0999	0.0000	.0000E+00	.0000E+00
215		0.05	0.000	0.020	0.1010	0.0000	.0000E+00	.0000E+00
216		0.10	0.000	0.022	0.1038	0.0000	.0000E+00	.0000E+00
217		0.98	0.000	0.033	0.1376	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.128	0.1330	0.0000	.0000E+00	.0000E+00
219		0.83	0.000	0.172	0.1565	0.0000	.0000E+00	.0000E+00
220		0.57	0.000	0.243	0.1682	0.0000	.0000E+00	.0000E+00
221		2.25	0.273	0.146	0.2336	0.0000	.0000E+00	.0000E+00
222		0.00	0.000	0.203	0.2264	0.0000	.0000E+00	.0000E+00
223		0.00	0.000	0.232	0.2181	0.0000	.0000E+00	.0000E+00
224		0.35	0.000	0.206	0.2232	0.0000	.0000E+00	.0000E+00
225		0.00	0.000	0.195	0.2163	0.0000	.0000E+00	.0000E+00
226	*	0.00	0.000	0.117	0.2121	0.0000	.0000E+00	.0000E+00
227		0.25	0.000	0.253	0.2120	0.0000	.0000E+00	.0000E+00
228		1.22	0.003	0.262	0.2461	0.0000	.0000E+00	.0000E+00
229	*	1.22	0.000	0.071	0.2468	0.0000	.0000E+00	.0000E+00
230		0.13	0.028	0.100	0.2872	0.0000	.0000E+00	.0000E+00

231		0.00	0.000	0.205	0.2798	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.244	0.2711	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.242	0.2608	0.0000	.0000E+00	.0000E+00
234		0.00	0.000	0.206	0.2496	0.0000	.0000E+00	.0000E+00
235		0.00	0.000	0.221	0.2383	0.0000	.0000E+00	.0000E+00
236	*	0.46	0.000	0.072	0.2355	0.0000	.0000E+00	.0000E+00
237		0.00	0.000	0.073	0.2331	0.0000	.0000E+00	.0000E+00
238		0.00	0.000	0.277	0.2300	0.0000	.0000E+00	.0000E+00
239		0.59	0.000	0.261	0.2393	0.0000	.0000E+00	.0000E+00
240		0.20	0.000	0.215	0.2364	0.0000	.0000E+00	.0000E+00
241		0.20	0.000	0.213	0.2347	0.0000	.0000E+00	.0000E+00
242		0.38	0.000	0.197	0.2400	0.0000	.0000E+00	.0000E+00
243		0.00	0.000	0.206	0.2313	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.221	0.2220	0.0000	.0000E+00	.0000E+00
245		0.00	0.000	0.215	0.2132	0.0000	.0000E+00	.0000E+00
246		0.10	0.000	0.199	0.2085	0.0000	.0000E+00	.0000E+00
247		0.00	0.000	0.185	0.2006	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.085	0.1963	0.0000	.0000E+00	.0000E+00
249		0.00	0.000	0.066	0.1929	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.055	0.1900	0.0000	.0000E+00	.2570E-03
251		0.00	0.000	0.049	0.1874	0.0000	.0000E+00	.4898E-02
252		0.00	0.000	0.045	0.1850	0.0000	.0000E+00	.9901E-02
253		0.00	0.000	0.041	0.1829	0.0000	.0000E+00	.1343E-01
254		0.00	0.000	0.039	0.1809	0.0000	.0000E+00	.1578E-01
255		0.00	0.000	0.036	0.1790	0.0000	.0000E+00	.1719E-01
256		0.00	0.000	0.035	0.1773	0.0000	.0000E+00	.1795E-01
257		0.00	0.000	0.033	0.1756	0.0000	.0000E+00	.1822E-01
258		0.00	0.000	0.031	0.1741	0.0000	.0000E+00	.1818E-01
259		0.00	0.000	0.029	0.1726	0.0000	.0000E+00	.1793E-01
260		0.00	0.000	0.028	0.1712	0.0000	.0000E+00	.1755E-01
261		0.00	0.000	0.027	0.1699	0.0000	.0000E+00	.1708E-01
262		0.00	0.000	0.026	0.1686	0.0000	.0000E+00	.1657E-01
263		0.00	0.000	0.025	0.1673	0.0000	.0000E+00	.1383E-01
264		0.00	0.000	0.024	0.1660	0.0000	.0000E+00	.1366E-01
265		0.77	0.000	0.039	0.1918	0.0000	.0000E+00	.1451E-01
266		0.00	0.000	0.023	0.1906	0.0000	.0000E+00	.1485E-01
267		0.06	0.000	0.037	0.1911	0.0000	.0000E+00	.1486E-01
268		0.00	0.000	0.022	0.1901	0.0000	.0000E+00	.1466E-01
269		0.00	0.000	0.021	0.1891	0.0000	.0000E+00	.1433E-01
270		0.00	0.000	0.021	0.1881	0.0000	.0000E+00	.1392E-01
271		0.00	0.000	0.020	0.1872	0.0000	.0000E+00	.1347E-01
272		0.00	0.000	0.020	0.1863	0.0000	.0000E+00	.1300E-01
273		0.00	0.000	0.019	0.1854	0.0000	.0000E+00	.1253E-01
274		0.00	0.000	0.019	0.1846	0.0000	.0000E+00	.1207E-01
275		0.00	0.000	0.018	0.1837	0.0000	.0000E+00	.1163E-01
276		0.00	0.000	0.018	0.1829	0.0000	.0000E+00	.1119E-01
277		0.00	0.000	0.018	0.1821	0.0000	.0000E+00	.1078E-01
278		0.00	0.000	0.017	0.1815	0.0000	.0000E+00	.1381E-01
279		0.00	0.000	0.017	0.1809	0.0000	.0000E+00	.1293E-01
280		0.00	0.000	0.017	0.1803	0.0000	.0000E+00	.1195E-01
281		0.00	0.000	0.017	0.1797	0.0000	.0000E+00	.1110E-01
282		0.00	0.000	0.016	0.1791	0.0000	.0000E+00	.1036E-01
283		0.05	0.000	0.029	0.1799	0.0000	.0000E+00	.9704E-02
284		0.06	0.000	0.029	0.1810	0.0000	.0000E+00	.9126E-02
285		0.00	0.000	0.016	0.1804	0.0000	.0000E+00	.8609E-02
286		0.00	0.000	0.015	0.1799	0.0000	.0000E+00	.8146E-02
287		0.00	0.000	0.015	0.1793	0.0000	.0000E+00	.6762E-02
288		0.00	0.000	0.015	0.1787	0.0000	.0000E+00	.6271E-02
289		0.00	0.000	0.015	0.1782	0.0000	.0000E+00	.6413E-02
290		0.00	0.000	0.015	0.1775	0.0000	.0000E+00	.3696E-02
291		0.00	0.000	0.015	0.1769	0.0000	.0000E+00	.5316E-02
292		0.00	0.000	0.014	0.1764	0.0000	.0000E+00	.6769E-02
293		0.00	0.000	0.014	0.1759	0.0000	.0000E+00	.6473E-02

294	0.00	0.000	0.014	0.1754	0.0000	.0000E+00	.6201E-02
295	0.12	0.000	0.026	0.1788	0.0000	.0000E+00	.5950E-02
296	0.00	0.000	0.014	0.1783	0.0000	.0000E+00	.5717E-02
297	0.00	0.000	0.014	0.1778	0.0000	.0000E+00	.5502E-02
298	0.00	0.000	0.014	0.1773	0.0000	.0000E+00	.5301E-02
299	0.00	0.000	0.014	0.1767	0.0000	.0000E+00	.3415E-02
300	0.00	0.000	0.014	0.1762	0.0000	.0000E+00	.3899E-02
301	0.00	0.000	0.013	0.1757	0.0000	.0000E+00	.3167E-02
302	0.00	0.000	0.013	0.1751	0.0000	.0000E+00	.2247E-02
303	0.00	0.000	0.013	0.1746	0.0000	.0000E+00	.4938E-02
304	0.00	0.000	0.013	0.1741	0.0000	.0000E+00	.4774E-02
305	0.00	0.000	0.013	0.1737	0.0000	.0000E+00	.4620E-02
306	0.00	0.000	0.013	0.1732	0.0000	.0000E+00	.4476E-02
307	0.00	0.000	0.013	0.1727	0.0000	.0000E+00	.4339E-02
308	0.00	0.000	0.013	0.1723	0.0000	.0000E+00	.4211E-02
309	0.00	0.000	0.013	0.1718	0.0000	.0000E+00	.2744E-02
310	0.00	0.000	0.013	0.1714	0.0000	.0000E+00	.0000E+00
311	0.00	0.000	0.013	0.1709	0.0000	.0000E+00	.0000E+00
312	0.00	0.000	0.013	0.1705	0.0000	.0000E+00	.0000E+00
313	0.00	0.000	0.013	0.1700	0.0000	.0000E+00	.0000E+00
314	0.00	0.000	0.013	0.1695	0.0000	.0000E+00	.0000E+00
315	0.00	0.000	0.012	0.1691	0.0000	.0000E+00	.0000E+00
316	0.00	0.000	0.012	0.1687	0.0000	.0000E+00	.0000E+00
317	0.00	0.000	0.012	0.1683	0.0000	.0000E+00	.0000E+00
318	0.00	0.000	0.011	0.1679	0.0000	.0000E+00	.0000E+00
319	0.00	0.000	0.011	0.1675	0.0000	.0000E+00	.0000E+00
320	0.00	0.000	0.011	0.1670	0.0000	.0000E+00	.0000E+00
321	0.00	0.000	0.011	0.1666	0.0000	.0000E+00	.0000E+00
322	0.00	0.000	0.011	0.1662	0.0000	.0000E+00	.0000E+00
323	0.00	0.000	0.011	0.1659	0.0000	.0000E+00	.0000E+00
324	0.00	0.000	0.011	0.1655	0.0000	.0000E+00	.0000E+00
325	0.00	0.000	0.011	0.1651	0.0000	.0000E+00	.0000E+00
326	0.00	0.000	0.011	0.1647	0.0000	.0000E+00	.0000E+00
327	0.00	0.000	0.011	0.1643	0.0000	.0000E+00	.0000E+00
328	0.00	0.000	0.010	0.1639	0.0000	.0000E+00	.0000E+00
329	0.00	0.000	0.011	0.1635	0.0000	.0000E+00	.0000E+00
330	0.00	0.000	0.011	0.1632	0.0000	.0000E+00	.0000E+00
331	0.00	0.000	0.011	0.1628	0.0000	.0000E+00	.0000E+00
332	0.00	0.000	0.010	0.1624	0.0000	.0000E+00	.0000E+00
333	0.00	0.000	0.010	0.1620	0.0000	.0000E+00	.0000E+00
334	0.00	0.000	0.010	0.1617	0.0000	.0000E+00	.0000E+00
335	0.00	0.000	0.010	0.1613	0.0000	.0000E+00	.0000E+00
336	0.00	0.000	0.010	0.1609	0.0000	.0000E+00	.0000E+00
337	0.00	0.000	0.010	0.1606	0.0000	.0000E+00	.0000E+00
338	0.00	0.000	0.010	0.1602	0.0000	.0000E+00	.0000E+00
339	0.00	0.000	0.010	0.1599	0.0000	.0000E+00	.0000E+00
340	0.00	0.000	0.010	0.1595	0.0000	.0000E+00	.0000E+00
341	0.00	0.000	0.010	0.1591	0.0000	.0000E+00	.0000E+00
342	0.00	0.000	0.010	0.1588	0.0000	.0000E+00	.0000E+00
343	0.00	0.000	0.010	0.1584	0.0000	.0000E+00	.0000E+00
344	0.68	0.000	0.016	0.1822	0.0000	.0000E+00	.0000E+00
345	0.00	0.000	0.010	0.1818	0.0000	.0000E+00	.0000E+00
346	0.00	0.000	0.010	0.1815	0.0000	.0000E+00	.0000E+00
347	0.00	0.000	0.010	0.1811	0.0000	.0000E+00	.0000E+00
348	0.00	0.000	0.010	0.1808	0.0000	.0000E+00	.0000E+00
349	0.00	0.000	0.010	0.1804	0.0000	.0000E+00	.0000E+00
350	0.00	0.000	0.010	0.1801	0.0000	.0000E+00	.0000E+00
351	0.00	0.000	0.009	0.1798	0.0000	.0000E+00	.0000E+00
352	0.00	0.000	0.009	0.1794	0.0000	.0000E+00	.0000E+00
353	0.00	0.000	0.009	0.1791	0.0000	.0000E+00	.0000E+00
354	0.54	0.000	0.015	0.1978	0.0000	.0000E+00	.0000E+00
355	0.00	0.000	0.082	0.1949	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.087	0.1918	0.0000	.0000E+00	.0000E+00

357		0.00	0.000	0.085	0.1888	0.0000	.0000E+00	.0000E+00
358		0.00	0.000	0.080	0.1859	0.0000	.0000E+00	.0000E+00
359		0.00	0.000	0.062	0.1837	0.0000	.0000E+00	.0000E+00
360		0.00	0.000	0.052	0.1818	0.0000	.0000E+00	.0000E+00
361		0.00	0.000	0.046	0.1802	0.0000	.0000E+00	.0000E+00
362	*	0.00	0.000	0.041	0.1787	0.0000	.0000E+00	.0000E+00
363	*	0.00	0.000	0.038	0.1774	0.0000	.0000E+00	.0000E+00
364	*	0.00	0.000	0.035	0.1761	0.0000	.0000E+00	.0000E+00
365	*	0.00	0.000	0.033	0.1749	0.0000	.0000E+00	.0000E+00
366	*	0.00	0.000	0.031	0.1738	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.22	1.37	0.10	0.08	0.18	1.24
	1.44	9.78	0.93	0.23	0.00	1.22
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.304	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.995	1.367	0.103	0.062	0.142	1.299
	1.441	5.256	1.514	0.505	0.346	0.870
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 2	0.0000	0.0000	0.3506	0.2268	0.0158	0.0000

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ANNUAL TOTALS FOR YEAR 1988

	INCHES	CU. FEET	PERCENT
PRECIPITATION	16.79	2437908.500	100.00
RUNOFF	0.304	44068.602	1.81
EVAPOTRANSPIRATION	13.901	2018386.370	82.79
PERC./LEAKAGE THROUGH LAYER 2	0.593196	86132.078	3.53
CHANGE IN WATER STORAGE	1.993	289321.500	11.87
SOIL WATER AT START OF YEAR	4.650	675124.687	
SOIL WATER AT END OF YEAR	6.642	964446.187	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 -0.208 0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1984 THROUGH 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.40	0.62	0.34	0.20	0.54	1.87
	1.29	4.16	0.99	1.52	0.96	1.48
STD. DEVIATIONS	0.49	0.50	0.18	0.35	0.29	1.16
	0.49	3.22	0.63	1.63	1.24	0.98
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.002
	0.000	0.068	0.000	0.007	0.001	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.004
	0.000	0.133	0.000	0.016	0.003	0.000
EVAPOTRANSPIRATION						
TOTALS	0.909	0.442	0.247	0.282	0.643	1.887
	1.393	3.167	1.197	1.361	1.025	1.233
STD. DEVIATIONS	0.607	0.538	0.091	0.200	0.389	1.141
	0.176	1.368	0.671	1.113	0.786	0.772
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0701	0.0454	0.0032	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.1568	0.1014	0.0071	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1984 THROUGH 1988

	INCHES		CU. FEET	PERCENT
PRECIPITATION	14.38	(2.073)	2087685.7	100.00
RUNOFF	0.078	(0.1267)	11374.87	0.545
EVAPOTRANSPIRATION	13.787	(1.8291)	2001890.75	95.890

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\HELP3\WTSMODEL\WS.D4
TEMPERATURE DATA FILE:      C:\HELP3\WTSMODEL\WS.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\WTSMODEL\WS.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\WTSMODEL\WS.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\WTSMODEL\WS.D10
OUTPUT DATA FILE:           C:\HELP3\WTSMODEL\WSP.OUT


TIME:  16: 4     DATE:  12/18/2008


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     TITLE:  WHITE SANDS MISSILE RANGE PRESCRIPTIVE COVER

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


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   9
          THICKNESS                   =      6.00   INCHES
          POROSITY                    =      0.5010 VOL/VOL
          FIELD CAPACITY              =      0.2840 VOL/VOL
          WILTING POINT               =      0.1350 VOL/VOL
          INITIAL SOIL WATER CONTENT  =      0.1720 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.190000006000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.60
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


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

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            TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER   0
  THICKNESS                    =     18.00   INCHES
  POROSITY                     =      0.4190 VOL/VOL
  FIELD CAPACITY               =      0.3070 VOL/VOL
  WILTING POINT                =      0.1800 VOL/VOL
  INITIAL SOIL WATER CONTENT   =      0.2120 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC
```

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

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE # 9 WITH A
          POOR STAND OF GRASS, A SURFACE SLOPE OF  5.%
          AND A SLOPE LENGTH OF  750. FEET.

SCS RUNOFF CURVE NUMBER             =     87.00
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =     40.000  ACRES
EVAPORATIVE ZONE DEPTH              =     24.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      4.848  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =     10.548  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      4.050  INCHES
INITIAL SNOW WATER                  =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS    =      4.848  INCHES
TOTAL INITIAL WATER                 =      4.848  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR
```

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            EVAPOTRANSPIRATION AND WEATHER DATA
            -----------------------------------

 NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          EL PASO               TEXAS

     STATION LATITUDE                        =  32.22 DEGREES
     MAXIMUM LEAF AREA INDEX                 =   0.80
     START OF GROWING SEASON (JULIAN DATE)   =     66
     END OF GROWING SEASON (JULIAN DATE)     =    315
     EVAPORATIVE ZONE DEPTH                  =  24.0  INCHES
     AVERAGE ANNUAL WIND SPEED               =   9.20 MPH
     AVERAGE 1ST QUARTER RELATIVE HUMIDITY   =  40.00 %
     AVERAGE 2ND QUARTER RELATIVE HUMIDITY   =  27.00 %
     AVERAGE 3RD QUARTER RELATIVE HUMIDITY   =  46.00 %
     AVERAGE 4TH QUARTER RELATIVE HUMIDITY   =  48.00 %


 NOTE:  PRECIPITATION DATA FOR     White Sands Natl MonNew Mexico
          WAS ENTERED FROM A EARTH INFO CLIMATEDATA.


 NOTE:  TEMPERATURE DATA FOR     White Sand Natl     Mon New Mexico
          WAS ENTERED FROM A EARTH INFO CLIMATEDATA.
```

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EL PASO TEXAS
AND STATION LATITUDE = 32.22 DEGREES

LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

****

DAILY OUTPUT FOR YEAR 1984

DAY	AIR -	SOIL -	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.077	0.1988	0.0000	.0000E+00	.0000E+00
2			0.00	0.000	0.079	0.1955	0.0000	.0000E+00	.0000E+00
3			0.02	0.000	0.092	0.1925	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.072	0.1895	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.075	0.1864	0.0000	.0000E+00	.0000E+00
6			0.00	0.000	0.086	0.1828	0.0000	.0000E+00	.0000E+00
7			0.00	0.000	0.086	0.1792	0.0000	.0000E+00	.0000E+00
8			0.29	0.000	0.098	0.1872	0.0000	.0000E+00	.0000E+00
9			0.00	0.000	0.089	0.1835	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.085	0.1800	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.076	0.1766	0.0000	.0000E+00	.6464E-02
12			0.00	0.000	0.076	0.1734	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.063	0.1708	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.022	0.1699	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.012	0.1694	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.008	0.1690	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.005	0.1688	0.0000	.0000E+00	.0000E+00
18			0.00	0.000	0.002	0.1688	0.0000	.0000E+00	.3025E-07
19			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
20			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
22			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
23			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
25			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
33			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
35			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
36			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
38			0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00

39	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
40	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
41	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
42	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
49	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
51	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
54	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
59	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
63	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
65	0.32	0.000	0.013	0.1815	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.006	0.1813	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.006	0.1811	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.005	0.1808	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.006	0.1806	0.0000	.0000E+00	.0000E+00
70	0.00	0.000	0.007	0.1803	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.007	0.1800	0.0000	.0000E+00	.0000E+00
72	0.00	0.000	0.008	0.1797	0.0000	.0000E+00	.0000E+00
73	0.00	0.000	0.008	0.1794	0.0000	.0000E+00	.0000E+00
74	0.00	0.000	0.008	0.1790	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.008	0.1787	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.008	0.1784	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.008	0.1780	0.0000	.0000E+00	.0000E+00
78	0.00	0.000	0.008	0.1777	0.0000	.0000E+00	.0000E+00
79	0.00	0.000	0.008	0.1774	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.008	0.1770	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.008	0.1767	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.008	0.1763	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.008	0.1760	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.008	0.1757	0.0000	.0000E+00	.0000E+00
85	0.00	0.000	0.008	0.1753	0.0000	.0000E+00	.0000E+00
86	0.00	0.000	0.008	0.1750	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.008	0.1747	0.0000	.0000E+00	.2075E-06
88	0.00	0.000	0.008	0.1743	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.008	0.1740	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.008	0.1737	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.008	0.1734	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.008	0.1730	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.008	0.1727	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.008	0.1724	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.008	0.1720	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.008	0.1717	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.008	0.1714	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.008	0.1711	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.008	0.1707	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.008	0.1704	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.008	0.1701	0.0000	.0000E+00	.0000E+00

102	0.00	0.000	0.008	0.1697	0.0000	.0000E+00	.0000E+00
103	0.00	0.000	0.008	0.1694	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.007	0.1691	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.008	0.1688	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
117	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
120	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
136	0.11	0.000	0.013	0.1728	0.0000	.0000E+00	.0000E+00
137	0.72	0.000	0.017	0.2021	0.0000	.0000E+00	.0000E+00
138	0.03	0.000	0.016	0.2027	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.008	0.2023	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.008	0.2020	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.008	0.2017	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.008	0.2014	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.008	0.2010	0.0000	.0000E+00	.0000E+00
144	0.00	0.000	0.008	0.2007	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.008	0.2003	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.008	0.2000	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.008	0.1996	0.0000	.0000E+00	.0000E+00
148	0.00	0.000	0.009	0.1993	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.009	0.1989	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.009	0.1985	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.009	0.1982	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.009	0.1978	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.009	0.1974	0.0000	.0000E+00	.0000E+00
154	1.64	0.176	0.022	0.2575	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.201	0.2491	0.0000	.0000E+00	.2252E-07
156	0.00	0.000	0.211	0.2403	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.170	0.2332	0.0000	.0000E+00	.0000E+00
158	0.00	0.000	0.081	0.2298	0.0000	.0000E+00	.0000E+00
159	0.00	0.000	0.064	0.2272	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.055	0.2249	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.049	0.2228	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.046	0.2209	0.0000	.0000E+00	.0000E+00
163	0.00	0.000	0.044	0.2191	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.038	0.2175	0.0000	.0000E+00	.0000E+00

165		0.08	0.000	0.053	0.2186	0.0000	.0000E+00	.0000E+00
166		0.00	0.000	0.038	0.2170	0.0000	.0000E+00	.0000E+00
167		0.89	0.008	0.050	0.2517	0.0000	.0000E+00	.0000E+00
168		0.30	0.000	0.250	0.2538	0.0000	.0000E+00	.6743E-07
169		0.01	0.000	0.226	0.2448	0.0000	.0000E+00	.0000E+00
170		0.00	0.000	0.202	0.2364	0.0000	.0000E+00	.0000E+00
171		0.82	0.013	0.102	0.2657	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.300	0.2532	0.0000	.0000E+00	.3769E-03
173		0.00	0.000	0.296	0.2408	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.196	0.2327	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.089	0.2289	0.0000	.0000E+00	.0000E+00
176		0.08	0.000	0.086	0.2287	0.0000	.0000E+00	.0000E+00
177		0.00	0.000	0.064	0.2260	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.060	0.2235	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.047	0.2215	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.052	0.2194	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.051	0.2172	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.050	0.2152	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.049	0.2131	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.046	0.2112	0.0000	.0000E+00	.0000E+00
185		0.00	0.000	0.040	0.2095	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.044	0.2077	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.047	0.2057	0.0000	.0000E+00	.0000E+00
188		0.00	0.000	0.046	0.2038	0.0000	.0000E+00	.0000E+00
189		0.00	0.000	0.044	0.2020	0.0000	.0000E+00	.0000E+00
190		0.00	0.000	0.046	0.2000	0.0000	.0000E+00	.0000E+00
191		0.00	0.000	0.050	0.1980	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.035	0.1965	0.0000	.0000E+00	.0000E+00
193		0.68	0.000	0.064	0.2222	0.0000	.0000E+00	.0000E+00
194	*	0.00	0.000	0.033	0.2208	0.0000	.0000E+00	.0000E+00
195		0.00	0.000	0.048	0.2188	0.0000	.0000E+00	.0000E+00
196		0.00	0.000	0.049	0.2168	0.0000	.0000E+00	.0000E+00
197		0.00	0.000	0.050	0.2147	0.0000	.0000E+00	.0000E+00
198		0.00	0.000	0.056	0.2124	0.0000	.0000E+00	.0000E+00
199		0.00	0.000	0.048	0.2104	0.0000	.0000E+00	.0000E+00
200		0.47	0.000	0.063	0.2274	0.0000	.0000E+00	.0000E+00
201		0.00	0.000	0.055	0.2251	0.0000	.0000E+00	.0000E+00
202		0.00	0.000	0.052	0.2229	0.0000	.0000E+00	.0000E+00
203		0.15	0.000	0.072	0.2262	0.0000	.0000E+00	.0000E+00
204		0.00	0.000	0.266	0.2151	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.059	0.2126	0.0000	.0000E+00	.0000E+00
206		0.14	0.000	0.080	0.2151	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.060	0.2126	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.055	0.2103	0.0000	.0000E+00	.0000E+00
209		0.14	0.000	0.074	0.2131	0.0000	.0000E+00	.0000E+00
210		0.00	0.000	0.067	0.2103	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.065	0.2076	0.0000	.0000E+00	.0000E+00
212		0.00	0.000	0.070	0.2047	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.073	0.2016	0.0000	.0000E+00	.0000E+00
214	*	0.00	0.000	0.041	0.1999	0.0000	.0000E+00	.0000E+00
215		0.19	0.000	0.088	0.2042	0.0000	.0000E+00	.0000E+00
216	*	0.13	0.000	0.120	0.2046	0.0000	.0000E+00	.0000E+00
217	*	0.09	0.000	0.113	0.2036	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.234	0.1939	0.0000	.0000E+00	.0000E+00
219		0.00	0.000	0.231	0.1843	0.0000	.0000E+00	.0000E+00
220		0.10	0.000	0.113	0.1837	0.0000	.0000E+00	.0000E+00
221		0.00	0.000	0.094	0.1798	0.0000	.0000E+00	.0000E+00
222	*	0.25	0.000	0.069	0.1806	0.0000	.0000E+00	.0000E+00
223		0.59	0.000	0.000	0.2057	0.0000	.0000E+00	.0000E+00
224		0.02	0.000	0.193	0.2047	0.0000	.0000E+00	.0000E+00
225		0.00	0.000	0.202	0.1963	0.0000	.0000E+00	.0000E+00
226		0.13	0.000	0.151	0.1954	0.0000	.0000E+00	.0000E+00
227	*	0.00	0.000	0.089	0.1917	0.0000	.0000E+00	.0000E+00

228	*	0.00	0.000	0.092	0.1879	0.0000	.0000E+00	.0000E+00
229	*	0.00	0.000	0.067	0.1851	0.0000	.0000E+00	.0000E+00
230		0.00	0.000	0.077	0.1819	0.0000	.0000E+00	.0000E+00
231		0.00	0.000	0.073	0.1789	0.0000	.0000E+00	.3902E-07
232		0.00	0.000	0.067	0.1761	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.059	0.1736	0.0000	.0000E+00	.0000E+00
234		0.00	0.000	0.082	0.1702	0.0000	.0000E+00	.0000E+00
235		0.00	0.000	0.031	0.1689	0.0000	.0000E+00	.0000E+00
236		0.21	0.000	0.033	0.1763	0.0000	.0000E+00	.0000E+00
237		0.27	0.000	0.055	0.1852	0.0000	.0000E+00	.0000E+00
238		0.67	0.000	0.068	0.2103	0.0000	.0000E+00	.0000E+00
239		0.19	0.000	0.158	0.2117	0.0000	.0000E+00	.0000E+00
240		0.00	0.000	0.164	0.2048	0.0000	.0000E+00	.0000E+00
241		0.00	0.000	0.192	0.1968	0.0000	.0000E+00	.0000E+00
242		0.00	0.000	0.199	0.1885	0.0000	.0000E+00	.0000E+00
243		0.10	0.000	0.170	0.1856	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.115	0.1808	0.0000	.0000E+00	.0000E+00
245		0.00	0.000	0.107	0.1764	0.0000	.0000E+00	.0000E+00
246		0.00	0.000	0.083	0.1729	0.0000	.0000E+00	.0000E+00
247		0.06	0.000	0.095	0.1714	0.0000	.0000E+00	.3243E-03
248		0.00	0.000	0.020	0.1706	0.0000	.0000E+00	.1322E-03
249		0.00	0.000	0.017	0.1699	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.013	0.1694	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.011	0.1689	0.0000	.0000E+00	.0000E+00
252		0.00	0.000	0.002	0.1688	0.0000	.0000E+00	.0000E+00
253		0.00	0.000	0.001	0.1688	0.0000	.0000E+00	.0000E+00
254		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
255		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
256		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
257		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
258		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
261		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
262		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
263		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
264		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
266		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
267		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
268		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
269		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
270		0.12	0.000	0.027	0.1726	0.0000	.0000E+00	.0000E+00
271		0.06	0.000	0.025	0.1741	0.0000	.0000E+00	.0000E+00
272		0.00	0.000	0.010	0.1736	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.009	0.1733	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.009	0.1729	0.0000	.0000E+00	.0000E+00
275		0.00	0.000	0.011	0.1724	0.0000	.0000E+00	.0000E+00
276		0.00	0.000	0.012	0.1719	0.0000	.0000E+00	.0000E+00
277		0.30	0.000	0.038	0.1829	0.0000	.0000E+00	.0000E+00
278		0.25	0.000	0.035	0.1918	0.0000	.0000E+00	.0000E+00
279		0.00	0.000	0.010	0.1914	0.0000	.0000E+00	.0000E+00
280		0.00	0.000	0.012	0.1909	0.0000	.0000E+00	.0000E+00
281		0.00	0.000	0.012	0.1904	0.0000	.0000E+00	.0000E+00
282		0.00	0.000	0.011	0.1899	0.0000	.0000E+00	.0000E+00
283		0.00	0.000	0.011	0.1895	0.0000	.0000E+00	.0000E+00
284		0.00	0.000	0.011	0.1890	0.0000	.0000E+00	.0000E+00
285		0.10	0.000	0.036	0.1917	0.0000	.0000E+00	.0000E+00
286		0.11	0.000	0.038	0.1947	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.012	0.1942	0.0000	.0000E+00	.0000E+00
288		0.00	0.000	0.013	0.1937	0.0000	.0000E+00	.0000E+00
289		0.08	0.000	0.035	0.1955	0.0000	.0000E+00	.0000E+00
290		0.00	0.000	0.012	0.1950	0.0000	.0000E+00	.0000E+00

291		0.00	0.000	0.011	0.1946	0.0000	.0000E+00	.0000E+00
292		0.12	0.000	0.035	0.1981	0.0000	.0000E+00	.0000E+00
293		0.00	0.000	0.012	0.1976	0.0000	.0000E+00	.0000E+00
294		0.04	0.000	0.031	0.1980	0.0000	.0000E+00	.0000E+00
295		0.14	0.000	0.035	0.2024	0.0000	.0000E+00	.0000E+00
296		0.06	0.000	0.034	0.2035	0.0000	.0000E+00	.0000E+00
297		0.27	0.000	0.035	0.2133	0.0000	.0000E+00	.0000E+00
298		0.45	0.000	0.037	0.2305	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.036	0.2290	0.0000	.0000E+00	.1376E-04
300		0.11	0.000	0.067	0.2307	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.070	0.2278	0.0000	.0000E+00	.0000E+00
302		0.00	0.000	0.056	0.2255	0.0000	.0000E+00	.0000E+00
303		0.00	0.000	0.066	0.2228	0.0000	.0000E+00	.0000E+00
304		0.00	0.000	0.061	0.2202	0.0000	.0000E+00	.0000E+00
305		0.00	0.000	0.066	0.2174	0.0000	.0000E+00	.0000E+00
306		0.00	0.000	0.068	0.2146	0.0000	.0000E+00	.0000E+00
307		0.00	0.000	0.052	0.2124	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.044	0.2106	0.0000	.0000E+00	.0000E+00
309		0.00	0.000	0.039	0.2090	0.0000	.0000E+00	.2626E-05
310		0.00	0.000	0.035	0.2075	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.032	0.2062	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.030	0.2049	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.030	0.2037	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.030	0.2024	0.0000	.0000E+00	.0000E+00
315	*	0.00	0.000	0.000	0.2024	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.028	0.2012	0.0000	.0000E+00	.0000E+00
317		0.00	0.000	0.027	0.2001	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.026	0.1991	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.025	0.1980	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.024	0.1970	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.023	0.1961	0.0000	.0000E+00	.1141E-04
322		0.33	0.000	0.044	0.2080	0.0000	.0000E+00	.0000E+00
323		0.06	0.000	0.042	0.2088	0.0000	.0000E+00	.0000E+00
324		0.04	0.000	0.039	0.2088	0.0000	.0000E+00	.0000E+00
325		0.07	0.000	0.041	0.2100	0.0000	.0000E+00	.4023E-05
326		0.00	0.000	0.020	0.2092	0.0000	.0000E+00	.1408E-05
327		0.00	0.000	0.020	0.2083	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.019	0.2075	0.0000	.0000E+00	.0000E+00
329		0.61	0.000	0.040	0.2313	0.0000	.0000E+00	.0000E+00
330		0.02	0.000	0.063	0.2295	0.0000	.0000E+00	.0000E+00
331		0.00	0.000	0.053	0.2273	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.052	0.2251	0.0000	.0000E+00	.0000E+00
333		0.00	0.000	0.047	0.2232	0.0000	.0000E+00	.0000E+00
334		0.00	0.000	0.056	0.2208	0.0000	.0000E+00	.3899E-03
335		0.00	0.000	0.047	0.2189	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.044	0.2171	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.039	0.2155	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.035	0.2140	0.0000	.0000E+00	.0000E+00
339		0.51	0.000	0.053	0.2330	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.045	0.2312	0.0000	.0000E+00	.0000E+00
341		0.00	0.000	0.048	0.2292	0.0000	.0000E+00	.0000E+00
342		0.00	0.000	0.051	0.2271	0.0000	.0000E+00	.0000E+00
343		0.03	0.000	0.071	0.2253	0.0000	.0000E+00	.0000E+00
344		0.00	0.000	0.053	0.2231	0.0000	.0000E+00	.2294E-03
345		0.00	0.000	0.044	0.2213	0.0000	.0000E+00	.0000E+00
346		0.00	0.000	0.039	0.2197	0.0000	.0000E+00	.0000E+00
347		0.26	0.000	0.056	0.2282	0.0000	.0000E+00	.0000E+00
348		0.60	0.000	0.053	0.2509	0.0000	.0000E+00	.0000E+00
349		0.60	0.003	0.075	0.2727	0.0000	.0000E+00	.0000E+00
350		0.28	0.000	0.073	0.2813	0.0000	.0000E+00	.0000E+00
351		0.00	0.000	0.053	0.2791	0.0000	.0000E+00	.0000E+00
352		0.00	0.000	0.049	0.2771	0.0000	.0000E+00	.0000E+00
353		0.00	0.000	0.049	0.2750	0.0000	.0000E+00	.0000E+00

354	0.08	0.000	0.072	0.2754	0.0000	.0000E+00	.0000E+00
355	0.00	0.000	0.053	0.2731	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.056	0.2708	0.0000	.0000E+00	.0000E+00
357	0.00	0.000	0.050	0.2688	0.0000	.0000E+00	.0000E+00
358	0.00	0.000	0.049	0.2667	0.0000	.0000E+00	.0000E+00
359	0.00	0.000	0.054	0.2645	0.0000	.0000E+00	.0000E+00
360	0.00	0.000	0.056	0.2621	0.0000	.0000E+00	.0000E+00
361	0.00	0.000	0.060	0.2596	0.0000	.0000E+00	.0000E+00
362	0.00	0.000	0.051	0.2575	0.0000	.0000E+00	.0000E+00
363	0.41	0.000	0.095	0.2706	0.0000	.0000E+00	.0000E+00
364	0.00	0.000	0.067	0.2679	0.0000	.0000E+00	.0000E+00
365	0.00	0.000	0.060	0.2654	0.0000	.0000E+00	.0000E+00
366	0.00	0.000	0.050	0.2633	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.31	0.00	0.32	0.00	0.86	3.82
	1.58	2.94	0.24	2.03	1.13	2.77
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.197
	0.000	0.000	0.000	0.000	0.000	0.003
EVAPOTRANSPIRATION	1.102	0.000	0.210	0.110	0.163	3.205
	1.904	3.439	0.431	0.960	1.095	1.702
PERCOLATION/LEAKAGE THROUGH	0.0065	0.0000	0.0000	0.0000	0.0000	0.0004
LAYER 2	0.0000	0.0000	0.0005	0.0000	0.0004	0.0002

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ANNUAL TOTALS FOR YEAR 1984

	INCHES	CU. FEET	PERCENT
PRECIPITATION	16.00	2323200.500	100.00
RUNOFF	0.200	29062.937	1.25
EVAPOTRANSPIRATION	14.321	2079468.250	89.51
PERC./LEAKAGE THROUGH LAYER 2	0.007950	1154.363	0.05
CHANGE IN WATER STORAGE	1.470	213513.906	9.19
SOIL WATER AT START OF YEAR	4.848	703929.625	
SOIL WATER AT END OF YEAR	6.318	917443.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	1.150	0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1985

DAY	AIR	SOIL	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.059	0.2608	0.0000	.0000E+00	.0000E+00
2	*		0.00	0.000	0.043	0.2590	0.0000	.0000E+00	.0000E+00
3	*		0.00	0.000	0.042	0.2573	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.052	0.2551	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.054	0.2529	0.0000	.0000E+00	.0000E+00
6			0.00	0.000	0.058	0.2504	0.0000	.0000E+00	.0000E+00
7			0.00	0.000	0.058	0.2480	0.0000	.0000E+00	.0000E+00
8			0.00	0.000	0.071	0.2451	0.0000	.0000E+00	.0000E+00
9			0.00	0.000	0.066	0.2423	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.063	0.2397	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.055	0.2374	0.0000	.0000E+00	.0000E+00
12			0.03	0.000	0.070	0.2357	0.0000	.0000E+00	.0000E+00
13	*		0.36	0.000	0.059	0.2366	0.0000	.0000E+00	.0000E+00
14	*		0.04	0.000	0.048	0.2374	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.084	0.2382	0.0000	.0000E+00	.0000E+00
16			0.28	0.000	0.030	0.2548	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.053	0.2526	0.0000	.0000E+00	.0000E+00
18			0.00	0.000	0.065	0.2499	0.0000	.0000E+00	.0000E+00
19			0.00	0.000	0.072	0.2469	0.0000	.0000E+00	.0000E+00
20			0.00	0.000	0.068	0.2441	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.049	0.2421	0.0000	.0000E+00	.2340E-03
22	*		0.00	0.000	0.055	0.2398	0.0000	.0000E+00	.0000E+00
23			0.00	0.000	0.067	0.2370	0.0000	.0000E+00	.0000E+00
24			0.09	0.000	0.084	0.2372	0.0000	.0000E+00	.0000E+00
25			0.02	0.000	0.084	0.2345	0.0000	.0000E+00	.5888E-03
26			0.17	0.000	0.089	0.2379	0.0000	.0000E+00	.0000E+00
27			0.27	0.000	0.088	0.2455	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.082	0.2420	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.074	0.2389	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.078	0.2357	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.063	0.2331	0.0000	.0000E+00	.0000E+00
32	*		0.01	0.000	0.010	0.2331	0.0000	.0000E+00	.0000E+00
33	*		0.00	0.000	0.048	0.2311	0.0000	.0000E+00	.0000E+00
34	*		0.00	0.000	0.058	0.2287	0.0000	.0000E+00	.0000E+00
35			0.17	0.000	0.073	0.2327	0.0000	.0000E+00	.0000E+00
36			0.00	0.000	0.045	0.2309	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.042	0.2291	0.0000	.0000E+00	.0000E+00
38			0.00	0.000	0.039	0.2275	0.0000	.0000E+00	.0000E+00

39	0.00	0.000	0.036	0.2260	0.0000	.0000E+00	.0000E+00
40	0.00	0.000	0.034	0.2245	0.0000	.0000E+00	.0000E+00
41	0.00	0.000	0.032	0.2232	0.0000	.0000E+00	.0000E+00
42	0.00	0.000	0.031	0.2219	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.029	0.2207	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.028	0.2195	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.027	0.2184	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.026	0.2173	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.025	0.2163	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.024	0.2153	0.0000	.0000E+00	.0000E+00
49	0.00	0.000	0.023	0.2143	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.022	0.2134	0.0000	.0000E+00	.0000E+00
51	0.00	0.000	0.022	0.2125	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.021	0.2116	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.018	0.2108	0.0000	.0000E+00	.0000E+00
54	0.21	0.000	0.042	0.2178	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.020	0.2170	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.019	0.2162	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.019	0.2154	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.019	0.2146	0.0000	.0000E+00	.0000E+00
59	0.03	0.000	0.035	0.2144	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.018	0.2137	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.018	0.2130	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.018	0.2122	0.0000	.0000E+00	.0000E+00
63	0.00	0.000	0.018	0.2115	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.017	0.2108	0.0000	.0000E+00	.0000E+00
65	0.00	0.000	0.017	0.2100	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.017	0.2093	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.017	0.2086	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.017	0.2080	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.016	0.2073	0.0000	.0000E+00	.0000E+00
70	0.00	0.000	0.016	0.2066	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.016	0.2059	0.0000	.0000E+00	.0000E+00
72	0.00	0.000	0.016	0.2053	0.0000	.0000E+00	.0000E+00
73	0.00	0.000	0.016	0.2046	0.0000	.0000E+00	.0000E+00
74	0.16	0.000	0.037	0.2098	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.015	0.2091	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.015	0.2085	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.015	0.2079	0.0000	.0000E+00	.0000E+00
78	0.08	0.000	0.036	0.2097	0.0000	.0000E+00	.0000E+00
79	0.10	0.000	0.036	0.2124	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.015	0.2118	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.015	0.2112	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.014	0.2106	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.014	0.2100	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.014	0.2094	0.0000	.0000E+00	.1666E-03
85	0.00	0.000	0.014	0.2088	0.0000	.0000E+00	.4498E-04
86	0.00	0.000	0.014	0.2082	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.014	0.2076	0.0000	.0000E+00	.0000E+00
88	0.00	0.000	0.014	0.2070	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.014	0.2064	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.014	0.2058	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.014	0.2052	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.014	0.2046	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.014	0.2040	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.014	0.2034	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.015	0.2028	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.014	0.2022	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.014	0.2016	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.015	0.2010	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.015	0.2004	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.015	0.1998	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.015	0.1992	0.0000	.0000E+00	.0000E+00

102	0.00	0.000	0.016	0.1985	0.0000	.0000E+00	.0000E+00
103	0.00	0.000	0.015	0.1979	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.016	0.1973	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.016	0.1966	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.016	0.1959	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.016	0.1953	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.017	0.1946	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.017	0.1939	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.017	0.1932	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.017	0.1925	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.017	0.1918	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.017	0.1911	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.016	0.1904	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.019	0.1896	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.019	0.1888	0.0000	.0000E+00	.0000E+00
117	0.22	0.000	0.041	0.1963	0.0000	.0000E+00	.0000E+00
118	0.60	0.000	0.040	0.2196	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.018	0.2189	0.0000	.0000E+00	.0000E+00
120	0.00	0.000	0.020	0.2180	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.020	0.2172	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.022	0.2163	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.021	0.2154	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.022	0.2145	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.024	0.2135	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.024	0.2125	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.025	0.2115	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.025	0.2104	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.026	0.2094	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.029	0.2082	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.025	0.2072	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.027	0.2060	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.028	0.2049	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.024	0.2039	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.025	0.2028	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.032	0.2015	0.0000	.0000E+00	.0000E+00
137	0.45	0.000	0.057	0.2179	0.0000	.0000E+00	.0000E+00
138	0.05	0.000	0.054	0.2177	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.035	0.2162	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.036	0.2147	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.037	0.2132	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.036	0.2117	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.040	0.2100	0.0000	.0000E+00	.0000E+00
144	0.00	0.000	0.043	0.2082	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.047	0.2063	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.047	0.2043	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.050	0.2023	0.0000	.0000E+00	.0000E+00
148	0.00	0.000	0.051	0.2001	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.052	0.1980	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.049	0.1959	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.055	0.1937	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.059	0.1912	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.059	0.1888	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.065	0.1860	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.064	0.1834	0.0000	.0000E+00	.0000E+00
156	0.38	0.000	0.091	0.1954	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.191	0.1875	0.0000	.0000E+00	.0000E+00
158	0.00	0.000	0.056	0.1852	0.0000	.0000E+00	.1975E-07
159	0.00	0.000	0.056	0.1828	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.055	0.1805	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.053	0.1783	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.066	0.1756	0.0000	.0000E+00	.0000E+00
163	0.00	0.000	0.068	0.1727	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.069	0.1699	0.0000	.0000E+00	.0000E+00

165		0.00	0.000	0.022	0.1689	0.0000	.0000E+00	.0000E+00
166		0.00	0.000	0.004	0.1688	0.0000	.0000E+00	.0000E+00
167		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.3299E-07
168		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
169		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
170		0.14	0.000	0.036	0.1731	0.0000	.0000E+00	.0000E+00
171		0.00	0.000	0.007	0.1728	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.026	0.1717	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.015	0.1711	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.017	0.1704	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.015	0.1698	0.0000	.0000E+00	.0000E+00
176		0.33	0.000	0.043	0.1817	0.0000	.0000E+00	.0000E+00
177		0.00	0.000	0.098	0.1777	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.158	0.1711	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.045	0.1692	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.008	0.1689	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.003	0.1688	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
183		0.22	0.000	0.041	0.1762	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.048	0.1742	0.0000	.0000E+00	.0000E+00
185		0.03	0.000	0.075	0.1723	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.026	0.1712	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.020	0.1704	0.0000	.0000E+00	.0000E+00
188	*	0.00	0.000	0.014	0.1698	0.0000	.0000E+00	.0000E+00
189	*	0.00	0.000	0.011	0.1693	0.0000	.0000E+00	.0000E+00
190	*	0.00	0.000	0.011	0.1689	0.0000	.0000E+00	.0000E+00
191	*	0.00	0.000	0.003	0.1688	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
193		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
194		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
195	*	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
196		0.23	0.000	0.036	0.1768	0.0000	.0000E+00	.0000E+00
197	*	0.00	0.000	0.024	0.1759	0.0000	.0000E+00	.0000E+00
198	*	0.00	0.000	0.030	0.1746	0.0000	.0000E+00	.0000E+00
199		0.13	0.000	0.082	0.1766	0.0000	.0000E+00	.0000E+00
200		0.05	0.000	0.084	0.1752	0.0000	.0000E+00	.0000E+00
201		0.00	0.000	0.047	0.1732	0.0000	.0000E+00	.0000E+00
202	*	0.00	0.000	0.035	0.1718	0.0000	.0000E+00	.0000E+00
203		0.45	0.000	0.079	0.1872	0.0000	.0000E+00	.9194E-04
204		0.02	0.000	0.052	0.1859	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.051	0.1838	0.0000	.0000E+00	.0000E+00
206		0.00	0.000	0.061	0.1813	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.064	0.1786	0.0000	.0000E+00	.0000E+00
208		0.25	0.000	0.093	0.1851	0.0000	.0000E+00	.0000E+00
209		0.00	0.000	0.069	0.1822	0.0000	.0000E+00	.3979E-07
210		0.08	0.000	0.080	0.1822	0.0000	.0000E+00	.0000E+00
211		0.31	0.000	0.091	0.1914	0.0000	.0000E+00	.0000E+00
212		0.05	0.000	0.131	0.1880	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.093	0.1841	0.0000	.0000E+00	.0000E+00
214		0.31	0.000	0.092	0.1932	0.0000	.0000E+00	.0000E+00
215		0.50	0.000	0.156	0.2076	0.0000	.0000E+00	.0000E+00
216		0.03	0.000	0.168	0.2018	0.0000	.0000E+00	.0000E+00
217	*	0.00	0.000	0.086	0.1982	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.079	0.1949	0.0000	.0000E+00	.6665E-08
219		0.00	0.000	0.088	0.1913	0.0000	.0000E+00	.0000E+00
220	*	0.00	0.000	0.080	0.1880	0.0000	.0000E+00	.0000E+00
221		0.30	0.000	0.148	0.1943	0.0000	.0000E+00	.0000E+00
222		0.00	0.000	0.085	0.1907	0.0000	.0000E+00	.0000E+00
223		0.31	0.000	0.161	0.1969	0.0000	.0000E+00	.0000E+00
224		0.00	0.000	0.086	0.1934	0.0000	.0000E+00	.0000E+00
225	*	0.00	0.000	0.099	0.1892	0.0000	.0000E+00	.2347E-03
226	*	0.00	0.000	0.082	0.1858	0.0000	.0000E+00	.0000E+00
227		0.00	0.000	0.121	0.1808	0.0000	.0000E+00	.0000E+00

228		0.00	0.000	0.109	0.1762	0.0000	.0000E+00	.0000E+00
229		0.00	0.000	0.077	0.1730	0.0000	.0000E+00	.0000E+00
230	*	1.24	0.000	0.068	0.1738	0.0000	.0000E+00	.0000E+00
231		0.00	0.031	0.097	0.2165	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.162	0.2097	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.169	0.2027	0.0000	.0000E+00	.0000E+00
234		0.00	0.000	0.162	0.1959	0.0000	.0000E+00	.0000E+00
235		0.00	0.000	0.210	0.1872	0.0000	.0000E+00	.0000E+00
236		0.00	0.000	0.203	0.1787	0.0000	.0000E+00	.0000E+00
237		0.00	0.000	0.133	0.1732	0.0000	.0000E+00	.0000E+00
238		0.00	0.000	0.095	0.1692	0.0000	.0000E+00	.0000E+00
239		0.00	0.000	0.009	0.1689	0.0000	.0000E+00	.0000E+00
240		0.00	0.000	0.003	0.1688	0.0000	.0000E+00	.0000E+00
241		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
242		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
243		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
245		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
246		0.16	0.000	0.045	0.1736	0.0000	.0000E+00	.0000E+00
247		0.00	0.000	0.007	0.1733	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.031	0.1720	0.0000	.0000E+00	.0000E+00
249	*	0.00	0.000	0.013	0.1714	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.014	0.1709	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.013	0.1703	0.0000	.0000E+00	.0000E+00
252		0.00	0.000	0.011	0.1699	0.0000	.0000E+00	.0000E+00
253		0.11	0.000	0.043	0.1726	0.0000	.0000E+00	.0000E+00
254		0.00	0.000	0.008	0.1723	0.0000	.0000E+00	.0000E+00
255		0.00	0.000	0.016	0.1717	0.0000	.0000E+00	.0000E+00
256		0.00	0.000	0.011	0.1712	0.0000	.0000E+00	.0000E+00
257		0.04	0.000	0.031	0.1716	0.0000	.0000E+00	.0000E+00
258		0.03	0.000	0.027	0.1717	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.003	0.1716	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.009	0.1712	0.0000	.0000E+00	.0000E+00
261		0.00	0.000	0.008	0.1709	0.0000	.0000E+00	.0000E+00
262		0.42	0.000	0.053	0.1862	0.0000	.0000E+00	.0000E+00
263		0.50	0.000	0.052	0.2048	0.0000	.0000E+00	.0000E+00
264		0.00	0.000	0.014	0.2043	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.020	0.2034	0.0000	.0000E+00	.0000E+00
266	*	0.00	0.000	0.016	0.2028	0.0000	.0000E+00	.0000E+00
267		0.00	0.000	0.019	0.2020	0.0000	.0000E+00	.0000E+00
268		0.00	0.000	0.018	0.2012	0.0000	.0000E+00	.0000E+00
269	*	0.00	0.000	0.000	0.2012	0.0000	.0000E+00	.0000E+00
270		0.00	0.000	0.017	0.2005	0.0000	.0000E+00	.0000E+00
271		0.16	0.000	0.055	0.2049	0.0000	.0000E+00	.0000E+00
272		0.00	0.000	0.019	0.2041	0.0000	.0000E+00	.4394E-07
273		0.00	0.000	0.017	0.2033	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.015	0.2027	0.0000	.0000E+00	.0000E+00
275		0.00	0.000	0.014	0.2021	0.0000	.0000E+00	.0000E+00
276		0.00	0.000	0.014	0.2016	0.0000	.0000E+00	.0000E+00
277		0.00	0.000	0.013	0.2010	0.0000	.0000E+00	.0000E+00
278		0.00	0.000	0.013	0.2005	0.0000	.0000E+00	.0000E+00
279		0.00	0.000	0.012	0.2000	0.0000	.0000E+00	.0000E+00
280	*	1.01	0.000	0.057	0.2008	0.0000	.0000E+00	.0000E+00
281		0.00	0.010	0.088	0.2356	0.0000	.0000E+00	.0000E+00
282		0.07	0.000	0.077	0.2353	0.0000	.0000E+00	.0000E+00
283		0.00	0.000	0.080	0.2319	0.0000	.0000E+00	.4886E-07
284		1.06	0.059	0.106	0.2692	0.0000	.0000E+00	.0000E+00
285		0.00	0.000	0.068	0.2664	0.0000	.0000E+00	.1759E-07
286		0.00	0.000	0.078	0.2631	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.075	0.2600	0.0000	.0000E+00	.0000E+00
288		0.07	0.000	0.084	0.2594	0.0000	.0000E+00	.0000E+00
289		0.12	0.000	0.098	0.2603	0.0000	.0000E+00	.0000E+00
290		1.77	0.373	0.112	0.3139	0.0000	.0000E+00	.0000E+00

291		0.00	0.000	0.075	0.3107	0.0000	.0000E+00	.0000E+00
292		0.00	0.000	0.057	0.3084	0.0000	.0000E+00	.0000E+00
293		0.00	0.000	0.058	0.3060	0.0000	.0000E+00	.0000E+00
294		0.00	0.000	0.054	0.3037	0.0000	.0000E+00	.0000E+00
295		0.00	0.000	0.049	0.3017	0.0000	.0000E+00	.0000E+00
296		0.00	0.000	0.069	0.2988	0.0000	.0000E+00	.0000E+00
297		0.00	0.000	0.064	0.2961	0.0000	.0000E+00	.0000E+00
298		0.00	0.000	0.064	0.2935	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.054	0.2912	0.0000	.0000E+00	.0000E+00
300		0.00	0.000	0.058	0.2888	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.063	0.2862	0.0000	.0000E+00	.0000E+00
302		0.03	0.000	0.074	0.2843	0.0000	.0000E+00	.0000E+00
303		0.00	0.000	0.055	0.2820	0.0000	.0000E+00	.0000E+00
304		0.00	0.000	0.062	0.2794	0.0000	.0000E+00	.0000E+00
305		0.00	0.000	0.057	0.2771	0.0000	.0000E+00	.0000E+00
306		0.00	0.000	0.051	0.2749	0.0000	.0000E+00	.0000E+00
307		0.00	0.000	0.056	0.2726	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.049	0.2706	0.0000	.0000E+00	.0000E+00
309		0.00	0.000	0.051	0.2684	0.0000	.0000E+00	.0000E+00
310		0.00	0.000	0.070	0.2655	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.069	0.2626	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.050	0.2605	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.057	0.2581	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.065	0.2554	0.0000	.0000E+00	.0000E+00
315		0.00	0.000	0.056	0.2531	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.047	0.2511	0.0000	.0000E+00	.0000E+00
317		0.00	0.000	0.042	0.2494	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.039	0.2477	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.036	0.2462	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.034	0.2448	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.032	0.2435	0.0000	.0000E+00	.0000E+00
322		0.00	0.000	0.031	0.2422	0.0000	.0000E+00	.0000E+00
323		0.00	0.000	0.029	0.2410	0.0000	.0000E+00	.0000E+00
324		0.00	0.000	0.028	0.2398	0.0000	.0000E+00	.0000E+00
325		0.00	0.000	0.027	0.2387	0.0000	.0000E+00	.0000E+00
326		0.00	0.000	0.026	0.2376	0.0000	.0000E+00	.0000E+00
327		0.00	0.000	0.025	0.2366	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.024	0.2355	0.0000	.0000E+00	.0000E+00
329		0.00	0.000	0.024	0.2345	0.0000	.0000E+00	.0000E+00
330		0.00	0.000	0.023	0.2336	0.0000	.0000E+00	.0000E+00
331		0.00	0.000	0.022	0.2326	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.022	0.2317	0.0000	.0000E+00	.0000E+00
333		0.00	0.000	0.021	0.2308	0.0000	.0000E+00	.0000E+00
334		0.05	0.000	0.039	0.2313	0.0000	.0000E+00	.0000E+00
335		0.00	0.000	0.020	0.2305	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.020	0.2296	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.020	0.2288	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.019	0.2280	0.0000	.0000E+00	.0000E+00
339		0.00	0.000	0.019	0.2272	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.019	0.2264	0.0000	.0000E+00	.0000E+00
341		0.00	0.000	0.018	0.2257	0.0000	.0000E+00	.0000E+00
342		0.00	0.000	0.018	0.2249	0.0000	.0000E+00	.0000E+00
343		0.00	0.000	0.018	0.2242	0.0000	.0000E+00	.0000E+00
344		0.00	0.000	0.017	0.2235	0.0000	.0000E+00	.0000E+00
345		0.00	0.000	0.017	0.2228	0.0000	.0000E+00	.0000E+00
346		0.05	0.000	0.032	0.2235	0.0000	.0000E+00	.0000E+00
347		0.00	0.000	0.017	0.2228	0.0000	.0000E+00	.0000E+00
348	*	0.00	0.000	0.016	0.2221	0.0000	.0000E+00	.0000E+00
349		0.00	0.000	0.016	0.2215	0.0000	.0000E+00	.0000E+00
350		0.00	0.000	0.016	0.2208	0.0000	.0000E+00	.0000E+00
351		0.00	0.000	0.016	0.2201	0.0000	.0000E+00	.0000E+00
352		0.00	0.000	0.016	0.2195	0.0000	.0000E+00	.0000E+00
353		0.00	0.000	0.015	0.2189	0.0000	.0000E+00	.0000E+00

354	0.00	0.000	0.015	0.2182	0.0000	.0000E+00	.0000E+00
355	0.00	0.000	0.015	0.2176	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.015	0.2170	0.0000	.0000E+00	.0000E+00
357	0.00	0.000	0.015	0.2164	0.0000	.0000E+00	.0000E+00
358	0.00	0.000	0.015	0.2158	0.0000	.0000E+00	.0000E+00
359	0.00	0.000	0.014	0.2152	0.0000	.0000E+00	.0000E+00
360	0.00	0.000	0.014	0.2146	0.0000	.0000E+00	.0000E+00
361	0.00	0.000	0.014	0.2140	0.0000	.0000E+00	.0000E+00
362	0.00	0.000	0.014	0.2134	0.0000	.0000E+00	.0000E+00
363	0.00	0.000	0.014	0.2128	0.0000	.0000E+00	.0000E+00
364	0.00	0.000	0.014	0.2123	0.0000	.0000E+00	.0000E+00
365	0.00	0.000	0.014	0.2117	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1985

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.26	0.42	0.34	0.82	0.50	0.85
	1.82	2.69	1.42	4.13	0.05	0.05
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.031	0.000	0.442	0.000	0.000
EVAPOTRANSPIRATION	1.984	0.867	0.547	0.527	1.085	1.448
	1.358	3.121	0.590	1.862	1.205	0.521
PERCOLATION/LEAKAGE THROUGH	0.0008	0.0000	0.0002	0.0000	0.0000	0.0000
LAYER 2	0.0001	0.0002	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 1985

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.35	2083619.870	100.00
RUNOFF	0.473	68680.883	3.30
EVAPOTRANSPIRATION	15.113	2194475.500	105.32
PERC./LEAKAGE THROUGH LAYER 2	0.001361	197.637	0.01
CHANGE IN WATER STORAGE	-1.238	-179733.844	-8.63
SOIL WATER AT START OF YEAR	6.318	917443.500	
SOIL WATER AT END OF YEAR	5.081	737709.687	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.343	0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1986

DAY	AIR -	SOIL -	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.01	0.000	0.020	0.2113	0.0000	.0000E+00	.0000E+00
2			0.00	0.000	0.013	0.2107	0.0000	.0000E+00	.0000E+00
3			0.00	0.000	0.013	0.2102	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.013	0.2096	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.013	0.2091	0.0000	.0000E+00	.0000E+00
6			0.00	0.000	0.013	0.2086	0.0000	.0000E+00	.0000E+00
7			0.01	0.000	0.019	0.2082	0.0000	.0000E+00	.0000E+00
8	*		0.00	0.000	0.013	0.2076	0.0000	.0000E+00	.0000E+00
9	*		0.00	0.000	0.012	0.2071	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.012	0.2066	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.012	0.2061	0.0000	.0000E+00	.0000E+00
12			0.00	0.000	0.012	0.2056	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.012	0.2051	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.012	0.2046	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.012	0.2041	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.012	0.2036	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.012	0.2031	0.0000	.0000E+00	.0000E+00
18			0.00	0.000	0.012	0.2026	0.0000	.0000E+00	.0000E+00
19			0.00	0.000	0.012	0.2021	0.0000	.0000E+00	.0000E+00
20			0.00	0.000	0.012	0.2016	0.0000	.0000E+00	.0000E+00
21			0.00	0.000	0.011	0.2012	0.0000	.0000E+00	.0000E+00
22			0.00	0.000	0.011	0.2007	0.0000	.0000E+00	.0000E+00
23			0.00	0.000	0.011	0.2002	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.011	0.1997	0.0000	.0000E+00	.0000E+00
25			0.00	0.000	0.011	0.1993	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.011	0.1988	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.011	0.1983	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.011	0.1979	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.011	0.1974	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.011	0.1970	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.011	0.1965	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.011	0.1961	0.0000	.0000E+00	.0000E+00
33			0.02	0.000	0.019	0.1961	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.011	0.1957	0.0000	.0000E+00	.0000E+00
35			0.16	0.000	0.019	0.2016	0.0000	.0000E+00	.0000E+00
36			0.04	0.000	0.019	0.2024	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.010	0.2020	0.0000	.0000E+00	.0000E+00
38			0.05	0.000	0.019	0.2033	0.0000	.0000E+00	.0000E+00
39			0.01	0.000	0.016	0.2030	0.0000	.0000E+00	.0000E+00

40	0.05	0.000	0.019	0.2043	0.0000	.0000E+00	.0000E+00
41	0.24	0.000	0.019	0.2136	0.0000	.0000E+00	.0000E+00
42	0.00	0.000	0.010	0.2131	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.010	0.2127	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.010	0.2123	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.010	0.2119	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.010	0.2115	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.010	0.2111	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.010	0.2107	0.0000	.0000E+00	.0000E+00
49	0.00	0.000	0.010	0.2102	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.010	0.2098	0.0000	.0000E+00	.0000E+00
51	0.00	0.000	0.010	0.2094	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.010	0.2090	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.010	0.2086	0.0000	.0000E+00	.0000E+00
54	0.00	0.000	0.010	0.2082	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.010	0.2078	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.009	0.2074	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.009	0.2070	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.009	0.2067	0.0000	.0000E+00	.0000E+00
59	0.00	0.000	0.009	0.2063	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.009	0.2059	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.009	0.2055	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.009	0.2051	0.0000	.0000E+00	.0000E+00
63	0.00	0.000	0.009	0.2047	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.009	0.2043	0.0000	.0000E+00	.0000E+00
65	0.00	0.000	0.009	0.2040	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.009	0.2036	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.009	0.2032	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.009	0.2028	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.009	0.2024	0.0000	.0000E+00	.0000E+00
70	0.07	0.000	0.016	0.2047	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.009	0.2043	0.0000	.0000E+00	.0000E+00
72	0.11	0.000	0.016	0.2082	0.0000	.0000E+00	.0000E+00
73	0.13	0.000	0.016	0.2130	0.0000	.0000E+00	.0000E+00
74	0.00	0.000	0.009	0.2126	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.009	0.2122	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.009	0.2119	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.009	0.2115	0.0000	.0000E+00	.0000E+00
78	0.04	0.000	0.016	0.2125	0.0000	.0000E+00	.0000E+00
79	0.00	0.000	0.009	0.2121	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.009	0.2118	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.009	0.2114	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.009	0.2110	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.009	0.2106	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.009	0.2103	0.0000	.0000E+00	.0000E+00
85	0.00	0.000	0.009	0.2099	0.0000	.0000E+00	.0000E+00
86	0.00	0.000	0.009	0.2095	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.009	0.2091	0.0000	.0000E+00	.0000E+00
88	0.00	0.000	0.009	0.2087	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.009	0.2083	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.009	0.2079	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.010	0.2075	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.010	0.2071	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.010	0.2067	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.010	0.2063	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.010	0.2059	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.010	0.2054	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.011	0.2050	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.011	0.2045	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.011	0.2041	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.011	0.2036	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.011	0.2032	0.0000	.0000E+00	.0000E+00
102	0.00	0.000	0.012	0.2027	0.0000	.0000E+00	.0000E+00

103	0.00	0.000	0.012	0.2022	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.012	0.2017	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.013	0.2012	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.013	0.2006	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.013	0.2001	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.012	0.1996	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.013	0.1991	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.013	0.1985	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.014	0.1980	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.014	0.1974	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.015	0.1968	0.0000	.0000E+00	.0000E+00
114	0.01	0.000	0.020	0.1963	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.015	0.1957	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.016	0.1950	0.0000	.0000E+00	.0000E+00
117	0.00	0.000	0.016	0.1944	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.016	0.1937	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.017	0.1929	0.0000	.0000E+00	.0000E+00
120	0.00	0.000	0.019	0.1921	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.019	0.1913	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.020	0.1905	0.0000	.0000E+00	.1671E-02
123	0.00	0.000	0.021	0.1896	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.021	0.1887	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.021	0.1878	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.022	0.1869	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.024	0.1859	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.023	0.1849	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.022	0.1840	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.023	0.1831	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.024	0.1820	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.025	0.1810	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.026	0.1799	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.024	0.1789	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.030	0.1777	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.032	0.1763	0.0000	.0000E+00	.0000E+00
137	0.03	0.000	0.041	0.1759	0.0000	.0000E+00	.0000E+00
138	0.00	0.000	0.030	0.1746	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.035	0.1731	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.037	0.1716	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.041	0.1699	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.027	0.1688	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.2956E-07
144	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
147	0.05	0.000	0.013	0.1703	0.0000	.0000E+00	.0000E+00
148	0.02	0.000	0.012	0.1707	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.004	0.1705	0.0000	.0000E+00	.0000E+00
150	0.27	0.000	0.017	0.1811	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.019	0.1803	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.017	0.1795	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.024	0.1786	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.029	0.1774	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.032	0.1760	0.0000	.0000E+00	.0000E+00
156	0.00	0.000	0.033	0.1747	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.035	0.1732	0.0000	.0000E+00	.0000E+00
158	0.00	0.000	0.037	0.1716	0.0000	.0000E+00	.0000E+00
159	0.00	0.000	0.037	0.1701	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.025	0.1690	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.005	0.1688	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.001	0.1688	0.0000	.0000E+00	.0000E+00
163	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
165	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00

166		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
167		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
168		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
169		0.12	0.000	0.016	0.1731	0.0000	.0000E+00	.0000E+00
170		0.08	0.000	0.016	0.1758	0.0000	.0000E+00	.0000E+00
171		0.00	0.000	0.024	0.1748	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.027	0.1737	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.038	0.1721	0.0000	.0000E+00	.0000E+00
174		0.02	0.000	0.030	0.1717	0.0000	.0000E+00	.0000E+00
175		0.46	0.000	0.035	0.1894	0.0000	.0000E+00	.0000E+00
176		0.48	0.000	0.038	0.2078	0.0000	.0000E+00	.0000E+00
177		0.32	0.000	0.049	0.2191	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.041	0.2174	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.043	0.2155	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.043	0.2138	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.057	0.2114	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.052	0.2092	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.052	0.2070	0.0000	.0000E+00	.0000E+00
184		0.06	0.000	0.065	0.2068	0.0000	.0000E+00	.0000E+00
185		0.00	0.000	0.058	0.2044	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.057	0.2020	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.068	0.1992	0.0000	.0000E+00	.0000E+00
188		0.02	0.000	0.072	0.1970	0.0000	.0000E+00	.0000E+00
189		0.00	0.000	0.064	0.1944	0.0000	.0000E+00	.0000E+00
190		0.03	0.000	0.078	0.1924	0.0000	.0000E+00	.1901E-03
191		0.16	0.000	0.079	0.1958	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.070	0.1928	0.0000	.0000E+00	.2031E-03
193		0.00	0.000	0.072	0.1898	0.0000	.0000E+00	.0000E+00
194		0.00	0.000	0.073	0.1868	0.0000	.0000E+00	.8946E-07
195		0.00	0.000	0.033	0.1854	0.0000	.0000E+00	.0000E+00
196		0.00	0.000	0.032	0.1841	0.0000	.0000E+00	.0000E+00
197	*	0.00	0.000	0.029	0.1829	0.0000	.0000E+00	.0000E+00
198	*	0.27	0.000	0.080	0.1837	0.0000	.0000E+00	.0000E+00
199		0.02	0.000	0.245	0.1814	0.0000	.0000E+00	.0000E+00
200		0.00	0.000	0.055	0.1791	0.0000	.0000E+00	.0000E+00
201		0.00	0.000	0.054	0.1769	0.0000	.0000E+00	.0000E+00
202		0.23	0.000	0.086	0.1829	0.0000	.0000E+00	.0000E+00
203		0.26	0.000	0.248	0.1834	0.0000	.0000E+00	.1407E-05
204		0.00	0.000	0.191	0.1754	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.124	0.1702	0.0000	.0000E+00	.0000E+00
206		0.00	0.000	0.027	0.1691	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.007	0.1688	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.002	0.1688	0.0000	.0000E+00	.0000E+00
209		0.00	0.000	0.001	0.1688	0.0000	.0000E+00	.0000E+00
210		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
212		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
214		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
215		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
216		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
217		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
219		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
220		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
221		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
222		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
223		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
224		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
225		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
226		0.85	0.002	0.054	0.2018	0.0000	.0000E+00	.0000E+00
227		0.05	0.000	0.047	0.2020	0.0000	.0000E+00	.0000E+00
228		0.00	0.000	0.061	0.1994	0.0000	.0000E+00	.0000E+00

229		0.00	0.000	0.058	0.1970	0.0000	.0000E+00	.0000E+00
230		0.00	0.000	0.059	0.1945	0.0000	.0000E+00	.0000E+00
231		0.00	0.000	0.056	0.1922	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.056	0.1899	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.050	0.1878	0.0000	.0000E+00	.0000E+00
234		0.00	0.000	0.049	0.1857	0.0000	.0000E+00	.0000E+00
235		0.37	0.000	0.063	0.1986	0.0000	.0000E+00	.0000E+00
236		0.00	0.000	0.049	0.1965	0.0000	.0000E+00	.0000E+00
237		0.00	0.000	0.044	0.1947	0.0000	.0000E+00	.0000E+00
238		0.00	0.000	0.022	0.1938	0.0000	.0000E+00	.0000E+00
239		0.01	0.000	0.032	0.1928	0.0000	.0000E+00	.0000E+00
240	*	0.00	0.000	0.023	0.1919	0.0000	.0000E+00	.0000E+00
241		0.00	0.000	0.022	0.1910	0.0000	.0000E+00	.0000E+00
242	*	0.46	0.000	0.072	0.1918	0.0000	.0000E+00	.0000E+00
243	*	0.00	0.000	0.068	0.1926	0.0000	.0000E+00	.0000E+00
244		0.00	0.000	0.107	0.1958	0.0000	.0000E+00	.0000E+00
245	*	0.00	0.000	0.102	0.1956	0.0000	.0000E+00	.0000E+00
246		0.00	0.000	0.159	0.1890	0.0000	.0000E+00	.0000E+00
247		0.06	0.000	0.121	0.1865	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.079	0.1832	0.0000	.0000E+00	.0000E+00
249		0.11	0.000	0.085	0.1842	0.0000	.0000E+00	.1199E-04
250		0.00	0.000	0.066	0.1815	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.055	0.1792	0.0000	.0000E+00	.0000E+00
252		0.00	0.000	0.057	0.1768	0.0000	.0000E+00	.0000E+00
253		0.00	0.000	0.044	0.1749	0.0000	.0000E+00	.0000E+00
254		0.00	0.000	0.035	0.1735	0.0000	.0000E+00	.0000E+00
255		0.12	0.000	0.062	0.1759	0.0000	.0000E+00	.1477E-07
256		0.00	0.000	0.040	0.1743	0.0000	.0000E+00	.0000E+00
257		0.00	0.000	0.024	0.1733	0.0000	.0000E+00	.0000E+00
258		0.50	0.000	0.045	0.1922	0.0000	.0000E+00	.1378E-04
259		0.00	0.000	0.016	0.1916	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.024	0.1906	0.0000	.0000E+00	.0000E+00
261		0.00	0.000	0.023	0.1896	0.0000	.0000E+00	.0000E+00
262		0.00	0.000	0.022	0.1887	0.0000	.0000E+00	.0000E+00
263	*	0.00	0.000	0.019	0.1879	0.0000	.0000E+00	.0000E+00
264	*	0.00	0.000	0.018	0.1872	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.020	0.1863	0.0000	.0000E+00	.0000E+00
266		0.21	0.000	0.041	0.1934	0.0000	.0000E+00	.0000E+00
267		0.80	0.003	0.043	0.2248	0.0000	.0000E+00	.4943E-07
268		0.00	0.000	0.095	0.2209	0.0000	.0000E+00	.0000E+00
269		0.00	0.000	0.109	0.2163	0.0000	.0000E+00	.0000E+00
270		0.00	0.000	0.131	0.2108	0.0000	.0000E+00	.0000E+00
271		0.00	0.000	0.119	0.2059	0.0000	.0000E+00	.0000E+00
272		0.00	0.000	0.099	0.2018	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.107	0.1973	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.069	0.1944	0.0000	.0000E+00	.0000E+00
275		0.24	0.000	0.078	0.2011	0.0000	.0000E+00	.1038E-03
276		0.26	0.000	0.069	0.2091	0.0000	.0000E+00	.0000E+00
277		0.00	0.000	0.113	0.2044	0.0000	.0000E+00	.1058E-03
278		0.00	0.000	0.043	0.2026	0.0000	.0000E+00	.0000E+00
279		0.10	0.000	0.061	0.2042	0.0000	.0000E+00	.0000E+00
280		0.00	0.000	0.038	0.2027	0.0000	.0000E+00	.0000E+00
281		0.00	0.000	0.035	0.2012	0.0000	.0000E+00	.0000E+00
282		0.00	0.000	0.032	0.1999	0.0000	.0000E+00	.0000E+00
283		0.10	0.000	0.051	0.2019	0.0000	.0000E+00	.0000E+00
284		0.05	0.000	0.049	0.2020	0.0000	.0000E+00	.0000E+00
285		0.14	0.000	0.050	0.2057	0.0000	.0000E+00	.0000E+00
286		0.00	0.000	0.028	0.2045	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.026	0.2034	0.0000	.0000E+00	.0000E+00
288		0.00	0.000	0.024	0.2025	0.0000	.0000E+00	.0000E+00
289		0.05	0.000	0.043	0.2027	0.0000	.0000E+00	.0000E+00
290		0.00	0.000	0.024	0.2017	0.0000	.0000E+00	.0000E+00
291	*	0.00	0.000	0.000	0.2017	0.0000	.0000E+00	.0000E+00

292		0.03	0.000	0.039	0.2014	0.0000	.0000E+00	.0000E+00
293		0.00	0.000	0.018	0.2006	0.0000	.0000E+00	.0000E+00
294		0.00	0.000	0.018	0.1999	0.0000	.0000E+00	.4712E-04
295		0.00	0.000	0.016	0.1992	0.0000	.0000E+00	.0000E+00
296		0.00	0.000	0.015	0.1986	0.0000	.0000E+00	.0000E+00
297		0.00	0.000	0.015	0.1980	0.0000	.0000E+00	.0000E+00
298		0.00	0.000	0.015	0.1974	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.014	0.1968	0.0000	.0000E+00	.0000E+00
300		0.00	0.000	0.014	0.1962	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.014	0.1956	0.0000	.0000E+00	.0000E+00
302		0.00	0.000	0.014	0.1950	0.0000	.0000E+00	.0000E+00
303		0.00	0.000	0.014	0.1944	0.0000	.0000E+00	.0000E+00
304		0.00	0.000	0.014	0.1938	0.0000	.0000E+00	.0000E+00
305		0.00	0.000	0.014	0.1932	0.0000	.0000E+00	.0000E+00
306		1.13	0.031	0.037	0.2375	0.0000	.0000E+00	.0000E+00
307		1.31	0.178	0.074	0.2816	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.072	0.2786	0.0000	.0000E+00	.2352E-07
309		0.00	0.000	0.064	0.2759	0.0000	.0000E+00	.0000E+00
310		0.00	0.000	0.066	0.2732	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.074	0.2701	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.076	0.2669	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.071	0.2639	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.074	0.2609	0.0000	.0000E+00	.0000E+00
315		0.00	0.000	0.067	0.2581	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.073	0.2550	0.0000	.0000E+00	.0000E+00
317		0.24	0.000	0.094	0.2611	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.084	0.2576	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.088	0.2540	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.088	0.2503	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.105	0.2459	0.0000	.0000E+00	.0000E+00
322		0.00	0.000	0.088	0.2423	0.0000	.0000E+00	.6325E-03
323		0.34	0.000	0.102	0.2522	0.0000	.0000E+00	.0000E+00
324		0.00	0.000	0.097	0.2482	0.0000	.0000E+00	.0000E+00
325		0.00	0.000	0.084	0.2447	0.0000	.0000E+00	.0000E+00
326		0.00	0.000	0.085	0.2411	0.0000	.0000E+00	.0000E+00
327		0.00	0.000	0.075	0.2380	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.066	0.2353	0.0000	.0000E+00	.0000E+00
329		0.00	0.000	0.067	0.2325	0.0000	.0000E+00	.0000E+00
330		0.00	0.000	0.078	0.2292	0.0000	.0000E+00	.0000E+00
331		0.00	0.000	0.077	0.2260	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.063	0.2233	0.0000	.0000E+00	.4493E-03
333		0.00	0.000	0.052	0.2212	0.0000	.0000E+00	.0000E+00
334		0.00	0.000	0.047	0.2192	0.0000	.0000E+00	.0000E+00
335		0.00	0.000	0.042	0.2174	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.039	0.2158	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.036	0.2143	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.034	0.2129	0.0000	.0000E+00	.0000E+00
339		0.00	0.000	0.032	0.2116	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.030	0.2103	0.0000	.0000E+00	.0000E+00
341		0.11	0.000	0.045	0.2131	0.0000	.0000E+00	.0000E+00
342		0.52	0.000	0.043	0.2329	0.0000	.0000E+00	.0000E+00
343		0.00	0.000	0.068	0.2301	0.0000	.0000E+00	.0000E+00
344		0.15	0.000	0.042	0.2346	0.0000	.0000E+00	.0000E+00
345	*	0.00	0.000	0.051	0.2324	0.0000	.0000E+00	.0000E+00
346	*	0.00	0.000	0.025	0.2314	0.0000	.0000E+00	.0000E+00
347		0.00	0.000	0.024	0.2304	0.0000	.0000E+00	.0000E+00
348		0.00	0.000	0.024	0.2294	0.0000	.0000E+00	.0000E+00
349		0.00	0.000	0.023	0.2284	0.0000	.0000E+00	.0000E+00
350		0.22	0.000	0.039	0.2360	0.0000	.0000E+00	.0000E+00
351		0.50	0.000	0.089	0.2531	0.0000	.0000E+00	.0000E+00
352		0.00	0.000	0.082	0.2497	0.0000	.0000E+00	.0000E+00
353		0.00	0.000	0.055	0.2474	0.0000	.0000E+00	.0000E+00
354		0.00	0.000	0.055	0.2451	0.0000	.0000E+00	.0000E+00

355	0.00	0.000	0.071	0.2421	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.074	0.2391	0.0000	.0000E+00	.0000E+00
357	0.09	0.000	0.079	0.2395	0.0000	.0000E+00	.0000E+00
358	0.00	0.000	0.055	0.2372	0.0000	.0000E+00	.0000E+00
359	0.00	0.000	0.058	0.2348	0.0000	.0000E+00	.0000E+00
360	0.00	0.000	0.058	0.2324	0.0000	.0000E+00	.0000E+00
361	0.00	0.000	0.060	0.2299	0.0000	.0000E+00	.0000E+00
362	0.00	0.000	0.068	0.2271	0.0000	.0000E+00	.0000E+00
363	0.00	0.000	0.063	0.2245	0.0000	.0000E+00	.0000E+00
364	0.00	0.000	0.053	0.2222	0.0000	.0000E+00	.0000E+00
365	0.00	0.000	0.047	0.2203	0.0000	.0000E+00	.4264E-04

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1986

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.02	0.57	0.35	0.01	0.37	1.48
	1.05	1.74	1.80	0.97	3.02	1.59
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.002	0.003	0.000	0.210	0.000
EVAPOTRANSPIRATION	0.384	0.336	0.310	0.389	0.653	0.734
	2.072	0.885	1.966	1.053	2.200	1.564
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0017	0.0000
LAYER 2	0.0004	0.0000	0.0000	0.0003	0.0011	0.0000

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ANNUAL TOTALS FOR YEAR 1986

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.97	1883244.000	100.00
RUNOFF	0.214	31045.662	1.65
EVAPOTRANSPIRATION	12.546	1821722.370	96.73
PERC./LEAKAGE THROUGH LAYER 2	0.003473	504.209	0.03
CHANGE IN WATER STORAGE	0.206	29972.107	1.59
SOIL WATER AT START OF YEAR	5.081	737709.687	
SOIL WATER AT END OF YEAR	5.287	767681.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 -0.273 0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1987

DAY	AIR	SOIL	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.042	0.2185	0.0000	.0000E+00	.1150E-03
2			0.00	0.000	0.039	0.2169	0.0000	.0000E+00	.2702E-03
3			0.00	0.000	0.036	0.2154	0.0000	.0000E+00	.4775E-03
4			0.00	0.000	0.034	0.2139	0.0000	.0000E+00	.6190E-03
5			0.00	0.000	0.032	0.2125	0.0000	.0000E+00	.7154E-03
6			0.00	0.000	0.031	0.2112	0.0000	.0000E+00	.5327E-03
7			0.00	0.000	0.029	0.2100	0.0000	.0000E+00	.5696E-03
8			0.00	0.000	0.028	0.2088	0.0000	.0000E+00	.5930E-03
9			0.00	0.000	0.026	0.2077	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.025	0.2067	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.024	0.2057	0.0000	.0000E+00	.0000E+00
12			0.00	0.000	0.024	0.2047	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.023	0.2037	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.022	0.2028	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.022	0.2019	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.022	0.2009	0.0000	.0000E+00	.0000E+00
17	*		0.21	0.000	0.077	0.2018	0.0000	.0000E+00	.0000E+00
18	*		0.00	0.000	0.057	0.2026	0.0000	.0000E+00	.0000E+00
19	*		0.00	0.000	0.037	0.2026	0.0000	.0000E+00	.0000E+00
20	*		0.00	0.000	0.021	0.2017	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.020	0.2009	0.0000	.0000E+00	.0000E+00
22	*		0.00	0.000	0.020	0.2000	0.0000	.0000E+00	.0000E+00
23	*		0.00	0.000	0.020	0.1992	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.020	0.1984	0.0000	.0000E+00	.0000E+00
25			0.00	0.000	0.019	0.1976	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.019	0.1968	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.019	0.1960	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.018	0.1953	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.018	0.1945	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.018	0.1938	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.017	0.1931	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.017	0.1924	0.0000	.0000E+00	.0000E+00
33			0.00	0.000	0.017	0.1917	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.017	0.1910	0.0000	.0000E+00	.0000E+00
35			0.00	0.000	0.016	0.1903	0.0000	.0000E+00	.0000E+00
36			0.00	0.000	0.016	0.1896	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.016	0.1889	0.0000	.0000E+00	.0000E+00
38			0.00	0.000	0.016	0.1883	0.0000	.0000E+00	.0000E+00
39			0.00	0.000	0.015	0.1876	0.0000	.0000E+00	.0000E+00
40			0.00	0.000	0.015	0.1870	0.0000	.0000E+00	.0000E+00

41		0.00	0.000	0.015	0.1864	0.0000	.0000E+00	.0000E+00
42		0.00	0.000	0.015	0.1858	0.0000	.0000E+00	.0000E+00
43		0.00	0.000	0.014	0.1852	0.0000	.0000E+00	.0000E+00
44		0.00	0.000	0.014	0.1846	0.0000	.0000E+00	.0000E+00
45		0.00	0.000	0.014	0.1840	0.0000	.0000E+00	.0000E+00
46		0.00	0.000	0.014	0.1834	0.0000	.0000E+00	.0000E+00
47		0.00	0.000	0.014	0.1829	0.0000	.0000E+00	.0000E+00
48		0.00	0.000	0.014	0.1823	0.0000	.0000E+00	.0000E+00
49		0.28	0.000	0.030	0.1927	0.0000	.0000E+00	.0000E+00
50		0.00	0.000	0.013	0.1922	0.0000	.0000E+00	.0000E+00
51		0.07	0.000	0.029	0.1939	0.0000	.0000E+00	.0000E+00
52		0.38	0.000	0.029	0.2085	0.0000	.0000E+00	.0000E+00
53	*	0.00	0.000	0.013	0.2079	0.0000	.0000E+00	.0000E+00
54		0.00	0.000	0.013	0.2074	0.0000	.0000E+00	.0000E+00
55		0.00	0.000	0.013	0.2068	0.0000	.0000E+00	.0000E+00
56		0.00	0.000	0.013	0.2063	0.0000	.0000E+00	.0000E+00
57		0.00	0.000	0.013	0.2057	0.0000	.0000E+00	.0000E+00
58		0.00	0.000	0.013	0.2052	0.0000	.0000E+00	.0000E+00
59		0.00	0.000	0.013	0.2047	0.0000	.0000E+00	.0000E+00
60		0.00	0.000	0.013	0.2041	0.0000	.0000E+00	.0000E+00
61		0.00	0.000	0.013	0.2036	0.0000	.0000E+00	.0000E+00
62		0.00	0.000	0.012	0.2031	0.0000	.0000E+00	.0000E+00
63		0.00	0.000	0.012	0.2026	0.0000	.0000E+00	.0000E+00
64		0.00	0.000	0.012	0.2021	0.0000	.0000E+00	.0000E+00
65		0.00	0.000	0.012	0.2016	0.0000	.0000E+00	.0000E+00
66		0.00	0.000	0.012	0.2011	0.0000	.0000E+00	.0000E+00
67		0.00	0.000	0.012	0.2006	0.0000	.0000E+00	.0000E+00
68		0.00	0.000	0.012	0.2001	0.0000	.0000E+00	.0000E+00
69		0.04	0.000	0.027	0.2006	0.0000	.0000E+00	.0000E+00
70		0.05	0.000	0.027	0.2016	0.0000	.0000E+00	.0000E+00
71		0.00	0.000	0.012	0.2011	0.0000	.0000E+00	.0000E+00
72		0.00	0.000	0.012	0.2006	0.0000	.0000E+00	.0000E+00
73		0.00	0.000	0.012	0.2001	0.0000	.0000E+00	.8499E-04
74		0.00	0.000	0.012	0.1996	0.0000	.0000E+00	.6282E-05
75		0.00	0.000	0.012	0.1991	0.0000	.0000E+00	.0000E+00
76		0.00	0.000	0.012	0.1986	0.0000	.0000E+00	.0000E+00
77		0.00	0.000	0.012	0.1981	0.0000	.0000E+00	.0000E+00
78		0.00	0.000	0.012	0.1976	0.0000	.0000E+00	.0000E+00
79		0.00	0.000	0.012	0.1972	0.0000	.0000E+00	.0000E+00
80		0.00	0.000	0.012	0.1967	0.0000	.0000E+00	.0000E+00
81		0.00	0.000	0.012	0.1962	0.0000	.0000E+00	.0000E+00
82		0.00	0.000	0.011	0.1957	0.0000	.0000E+00	.0000E+00
83		0.00	0.000	0.011	0.1952	0.0000	.0000E+00	.0000E+00
84		0.00	0.000	0.011	0.1948	0.0000	.0000E+00	.0000E+00
85		0.00	0.000	0.011	0.1943	0.0000	.0000E+00	.0000E+00
86		0.00	0.000	0.011	0.1938	0.0000	.0000E+00	.0000E+00
87		0.00	0.000	0.011	0.1934	0.0000	.0000E+00	.0000E+00
88		0.51	0.000	0.027	0.2135	0.0000	.0000E+00	.0000E+00
89		0.00	0.000	0.011	0.2130	0.0000	.0000E+00	.0000E+00
90		0.00	0.000	0.011	0.2126	0.0000	.0000E+00	.0000E+00
91		0.00	0.000	0.011	0.2121	0.0000	.0000E+00	.0000E+00
92		0.00	0.000	0.011	0.2116	0.0000	.0000E+00	.0000E+00
93		0.00	0.000	0.011	0.2112	0.0000	.0000E+00	.0000E+00
94		0.03	0.000	0.025	0.2114	0.0000	.0000E+00	.0000E+00
95		0.00	0.000	0.011	0.2109	0.0000	.0000E+00	.0000E+00
96		0.00	0.000	0.011	0.2105	0.0000	.0000E+00	.0000E+00
97		0.00	0.000	0.011	0.2100	0.0000	.0000E+00	.0000E+00
98		0.00	0.000	0.011	0.2095	0.0000	.0000E+00	.0000E+00
99		0.00	0.000	0.011	0.2091	0.0000	.0000E+00	.0000E+00
100		0.00	0.000	0.011	0.2086	0.0000	.0000E+00	.0000E+00
101		0.00	0.000	0.011	0.2081	0.0000	.0000E+00	.0000E+00
102		0.00	0.000	0.012	0.2076	0.0000	.0000E+00	.0000E+00
103		0.00	0.000	0.012	0.2071	0.0000	.0000E+00	.0000E+00

104	0.00	0.000	0.012	0.2066	0.0000	.0000E+00	.0000E+00
105	0.00	0.000	0.012	0.2062	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.012	0.2057	0.0000	.0000E+00	.0000E+00
107	0.00	0.000	0.012	0.2052	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.013	0.2046	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.013	0.2041	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.013	0.2036	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.013	0.2030	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.013	0.2025	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.013	0.2019	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.014	0.2014	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.013	0.2008	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.014	0.2002	0.0000	.0000E+00	.0000E+00
117	0.00	0.000	0.015	0.1996	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.015	0.1990	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.015	0.1984	0.0000	.0000E+00	.0000E+00
120	0.06	0.000	0.030	0.1996	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.016	0.1990	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.016	0.1983	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.016	0.1976	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.017	0.1969	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.017	0.1962	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.017	0.1955	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.018	0.1947	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.019	0.1939	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.019	0.1931	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.020	0.1923	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.021	0.1914	0.0000	.0000E+00	.0000E+00
132	0.10	0.000	0.039	0.1939	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.024	0.1930	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.024	0.1920	0.0000	.0000E+00	.0000E+00
135	0.03	0.000	0.037	0.1917	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.021	0.1908	0.0000	.0000E+00	.4012E-07
137	0.00	0.000	0.022	0.1899	0.0000	.0000E+00	.0000E+00
138	0.00	0.000	0.024	0.1889	0.0000	.0000E+00	.0000E+00
139	0.13	0.000	0.042	0.1926	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.023	0.1916	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.024	0.1906	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.025	0.1896	0.0000	.0000E+00	.0000E+00
143	0.30	0.000	0.045	0.2002	0.0000	.0000E+00	.0000E+00
144	0.15	0.000	0.045	0.2046	0.0000	.0000E+00	.0000E+00
145	0.10	0.000	0.048	0.2068	0.0000	.0000E+00	.0000E+00
146	0.00	0.000	0.033	0.2054	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.029	0.2042	0.0000	.0000E+00	.1699E-04
148	0.00	0.000	0.025	0.2032	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.025	0.2021	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.026	0.2010	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.027	0.1999	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.027	0.1988	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.031	0.1975	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.029	0.1963	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.030	0.1951	0.0000	.0000E+00	.0000E+00
156	0.00	0.000	0.031	0.1938	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.032	0.1924	0.0000	.0000E+00	.0000E+00
158	0.35	0.000	0.054	0.2048	0.0000	.0000E+00	.0000E+00
159	0.03	0.000	0.050	0.2039	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.037	0.2024	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.038	0.2008	0.0000	.0000E+00	.9369E-07
162	0.00	0.000	0.038	0.1992	0.0000	.0000E+00	.7242E-07
163	0.00	0.000	0.038	0.1976	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.040	0.1959	0.0000	.0000E+00	.0000E+00
165	0.00	0.000	0.042	0.1942	0.0000	.0000E+00	.0000E+00
166	0.04	0.000	0.057	0.1935	0.0000	.0000E+00	.0000E+00

167		0.00	0.000	0.055	0.1912	0.0000	.0000E+00	.0000E+00
168		0.00	0.000	0.050	0.1891	0.0000	.0000E+00	.0000E+00
169		0.00	0.000	0.048	0.1871	0.0000	.0000E+00	.0000E+00
170		0.00	0.000	0.048	0.1851	0.0000	.0000E+00	.0000E+00
171		0.00	0.000	0.045	0.1832	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.048	0.1812	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.049	0.1792	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.063	0.1765	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.061	0.1740	0.0000	.0000E+00	.0000E+00
176		0.13	0.000	0.096	0.1754	0.0000	.0000E+00	.0000E+00
177		0.00	0.000	0.057	0.1730	0.0000	.0000E+00	.0000E+00
178		1.40	0.092	0.058	0.2251	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.204	0.2167	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.211	0.2078	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.254	0.1972	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.264	0.1863	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.234	0.1765	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.171	0.1694	0.0000	.0000E+00	.1060E-06
185		0.00	0.000	0.011	0.1689	0.0000	.0000E+00	.0000E+00
186		0.00	0.000	0.004	0.1688	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
188		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
189		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
190		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
191		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
192		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
193		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
194		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
195		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
196	*	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
197	*	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
198		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
199	*	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
200		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
201		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
202		0.22	0.000	0.035	0.1765	0.0000	.0000E+00	.0000E+00
203		0.00	0.000	0.043	0.1747	0.0000	.0000E+00	.0000E+00
204		0.04	0.000	0.056	0.1740	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.038	0.1725	0.0000	.0000E+00	.0000E+00
206		0.03	0.000	0.040	0.1720	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.009	0.1717	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.019	0.1709	0.0000	.0000E+00	.0000E+00
209		0.00	0.000	0.017	0.1701	0.0000	.0000E+00	.0000E+00
210		0.29	0.000	0.042	0.1805	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.045	0.1786	0.0000	.0000E+00	.1642E-13
212		0.00	0.000	0.049	0.1766	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.037	0.1750	0.0000	.0000E+00	.0000E+00
214	*	0.00	0.000	0.038	0.1734	0.0000	.0000E+00	.0000E+00
215		0.04	0.000	0.054	0.1729	0.0000	.0000E+00	.1886E-05
216		0.63	0.000	0.057	0.1967	0.0000	.0000E+00	.0000E+00
217		0.00	0.000	0.033	0.1953	0.0000	.0000E+00	.0000E+00
218	*	0.00	0.000	0.036	0.1938	0.0000	.0000E+00	.0000E+00
219		0.00	0.000	0.036	0.1924	0.0000	.0000E+00	.0000E+00
220	*	0.00	0.000	0.035	0.1909	0.0000	.0000E+00	.0000E+00
221		0.60	0.000	0.056	0.2136	0.0000	.0000E+00	.0000E+00
222		0.00	0.000	0.193	0.2055	0.0000	.0000E+00	.0000E+00
223		0.30	0.000	0.221	0.2088	0.0000	.0000E+00	.0000E+00
224		0.00	0.000	0.113	0.2041	0.0000	.0000E+00	.0000E+00
225	*	0.00	0.000	0.109	0.1995	0.0000	.0000E+00	.3257E-04
226		0.00	0.000	0.135	0.1939	0.0000	.0000E+00	.0000E+00
227		0.00	0.000	0.108	0.1894	0.0000	.0000E+00	.0000E+00
228		0.00	0.000	0.091	0.1856	0.0000	.0000E+00	.0000E+00
229		0.00	0.000	0.082	0.1822	0.0000	.0000E+00	.0000E+00

230		0.00	0.000	0.077	0.1790	0.0000	.0000E+00	.0000E+00
231		0.00	0.000	0.098	0.1749	0.0000	.0000E+00	.0000E+00
232		0.00	0.000	0.106	0.1704	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.035	0.1690	0.0000	.0000E+00	.0000E+00
234		0.01	0.000	0.015	0.1688	0.0000	.0000E+00	.0000E+00
235		0.00	0.000	0.001	0.1688	0.0000	.0000E+00	.0000E+00
236		1.90	0.256	0.070	0.2344	0.0000	.0000E+00	.0000E+00
237		0.00	0.000	0.177	0.2270	0.0000	.0000E+00	.0000E+00
238		0.15	0.000	0.228	0.2237	0.0000	.0000E+00	.0000E+00
239		0.00	0.000	0.195	0.2156	0.0000	.0000E+00	.0000E+00
240		0.00	0.000	0.199	0.2073	0.0000	.0000E+00	.0000E+00
241		0.00	0.000	0.175	0.2000	0.0000	.0000E+00	.0000E+00
242		0.00	0.000	0.153	0.1936	0.0000	.0000E+00	.0000E+00
243		0.00	0.000	0.169	0.1865	0.0000	.0000E+00	.3234E-03
244		0.00	0.000	0.132	0.1810	0.0000	.0000E+00	.0000E+00
245	*	0.00	0.000	0.069	0.1782	0.0000	.0000E+00	.0000E+00
246	*	0.00	0.000	0.049	0.1761	0.0000	.0000E+00	.0000E+00
247		0.05	0.000	0.126	0.1730	0.0000	.0000E+00	.0000E+00
248		0.00	0.000	0.083	0.1695	0.0000	.0000E+00	.0000E+00
249		0.00	0.000	0.012	0.1690	0.0000	.0000E+00	.0000E+00
250		0.00	0.000	0.006	0.1688	0.0000	.0000E+00	.0000E+00
251		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
252		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
253		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
254		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
255		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
256		0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
257		0.22	0.000	0.039	0.1763	0.0000	.0000E+00	.0000E+00
258		0.00	0.000	0.034	0.1749	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.045	0.1730	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.044	0.1712	0.0000	.0000E+00	.0000E+00
261		0.02	0.000	0.033	0.1706	0.0000	.0000E+00	.0000E+00
262	*	0.00	0.000	0.000	0.1706	0.0000	.0000E+00	.0000E+00
263		0.00	0.000	0.007	0.1703	0.0000	.0000E+00	.0000E+00
264		0.00	0.000	0.010	0.1699	0.0000	.0000E+00	.0000E+00
265		0.00	0.000	0.010	0.1695	0.0000	.0000E+00	.0000E+00
266		0.00	0.000	0.009	0.1691	0.0000	.0000E+00	.0000E+00
267		0.00	0.000	0.007	0.1688	0.0000	.0000E+00	.0000E+00
268		0.15	0.000	0.038	0.1735	0.0000	.0000E+00	.0000E+00
269		0.00	0.000	0.004	0.1733	0.0000	.0000E+00	.0000E+00
270		0.00	0.000	0.020	0.1725	0.0000	.0000E+00	.0000E+00
271		0.00	0.000	0.021	0.1716	0.0000	.0000E+00	.0000E+00
272		0.12	0.000	0.040	0.1749	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.017	0.1742	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.016	0.1735	0.0000	.0000E+00	.0000E+00
275		0.00	0.000	0.019	0.1728	0.0000	.0000E+00	.0000E+00
276		0.00	0.000	0.020	0.1719	0.0000	.0000E+00	.0000E+00
277		0.00	0.000	0.018	0.1711	0.0000	.0000E+00	.0000E+00
278		0.00	0.000	0.006	0.1709	0.0000	.0000E+00	.0000E+00
279		0.00	0.000	0.006	0.1706	0.0000	.0000E+00	.0000E+00
280		0.00	0.000	0.005	0.1704	0.0000	.0000E+00	.0000E+00
281		0.00	0.000	0.005	0.1702	0.0000	.0000E+00	.0000E+00
282		0.00	0.000	0.005	0.1700	0.0000	.0000E+00	.0000E+00
283		0.00	0.000	0.005	0.1698	0.0000	.0000E+00	.0000E+00
284		0.00	0.000	0.005	0.1696	0.0000	.0000E+00	.0000E+00
285		0.00	0.000	0.005	0.1694	0.0000	.0000E+00	.0000E+00
286		0.00	0.000	0.004	0.1692	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.004	0.1690	0.0000	.0000E+00	.0000E+00
288		0.09	0.000	0.034	0.1714	0.0000	.0000E+00	.0000E+00
289		0.00	0.000	0.003	0.1713	0.0000	.0000E+00	.0000E+00
290		0.00	0.000	0.004	0.1711	0.0000	.0000E+00	.0000E+00
291	*	0.00	0.000	0.000	0.1711	0.0000	.0000E+00	.0000E+00
292		0.00	0.000	0.004	0.1709	0.0000	.0000E+00	.0000E+00

293		0.00	0.000	0.004	0.1707	0.0000	.0000E+00	.0000E+00
294		0.00	0.000	0.003	0.1706	0.0000	.0000E+00	.0000E+00
295		0.00	0.000	0.003	0.1705	0.0000	.0000E+00	.0000E+00
296		0.17	0.000	0.036	0.1760	0.0000	.0000E+00	.0000E+00
297		0.00	0.000	0.008	0.1757	0.0000	.0000E+00	.0000E+00
298		0.00	0.000	0.007	0.1754	0.0000	.0000E+00	.0000E+00
299		0.00	0.000	0.008	0.1751	0.0000	.0000E+00	.0000E+00
300		0.00	0.000	0.009	0.1747	0.0000	.0000E+00	.0000E+00
301		0.00	0.000	0.009	0.1743	0.0000	.0000E+00	.0000E+00
302		0.00	0.000	0.009	0.1740	0.0000	.0000E+00	.0000E+00
303		0.00	0.000	0.009	0.1736	0.0000	.0000E+00	.0000E+00
304		0.00	0.000	0.009	0.1732	0.0000	.0000E+00	.0000E+00
305		0.35	0.000	0.042	0.1860	0.0000	.0000E+00	.0000E+00
306		0.00	0.000	0.007	0.1858	0.0000	.0000E+00	.0000E+00
307		0.00	0.000	0.005	0.1855	0.0000	.0000E+00	.0000E+00
308		0.00	0.000	0.005	0.1853	0.0000	.0000E+00	.0000E+00
309		0.11	0.000	0.039	0.1883	0.0000	.0000E+00	.0000E+00
310		0.14	0.000	0.041	0.1924	0.0000	.0000E+00	.0000E+00
311		0.00	0.000	0.005	0.1922	0.0000	.0000E+00	.0000E+00
312		0.00	0.000	0.008	0.1918	0.0000	.0000E+00	.0000E+00
313		0.00	0.000	0.008	0.1915	0.0000	.0000E+00	.0000E+00
314		0.00	0.000	0.008	0.1912	0.0000	.0000E+00	.0000E+00
315		0.00	0.000	0.008	0.1908	0.0000	.0000E+00	.0000E+00
316		0.00	0.000	0.008	0.1905	0.0000	.0000E+00	.0000E+00
317		0.00	0.000	0.008	0.1902	0.0000	.0000E+00	.0000E+00
318		0.00	0.000	0.008	0.1898	0.0000	.0000E+00	.0000E+00
319		0.00	0.000	0.008	0.1895	0.0000	.0000E+00	.0000E+00
320		0.00	0.000	0.008	0.1892	0.0000	.0000E+00	.0000E+00
321		0.00	0.000	0.008	0.1889	0.0000	.0000E+00	.0000E+00
322		0.00	0.000	0.008	0.1886	0.0000	.0000E+00	.0000E+00
323		0.00	0.000	0.008	0.1882	0.0000	.0000E+00	.0000E+00
324		0.00	0.000	0.008	0.1879	0.0000	.0000E+00	.0000E+00
325		0.00	0.000	0.007	0.1876	0.0000	.0000E+00	.0000E+00
326		0.00	0.000	0.007	0.1873	0.0000	.0000E+00	.0000E+00
327		0.00	0.000	0.007	0.1870	0.0000	.0000E+00	.0000E+00
328		0.00	0.000	0.007	0.1867	0.0000	.0000E+00	.0000E+00
329		0.00	0.000	0.007	0.1864	0.0000	.0000E+00	.0000E+00
330		0.00	0.000	0.007	0.1861	0.0000	.0000E+00	.0000E+00
331	*	0.00	0.000	0.007	0.1858	0.0000	.0000E+00	.0000E+00
332		0.00	0.000	0.007	0.1855	0.0000	.0000E+00	.0000E+00
333		0.00	0.000	0.007	0.1852	0.0000	.0000E+00	.0000E+00
334		0.00	0.000	0.007	0.1849	0.0000	.0000E+00	.0000E+00
335		0.00	0.000	0.007	0.1846	0.0000	.0000E+00	.0000E+00
336		0.00	0.000	0.007	0.1843	0.0000	.0000E+00	.0000E+00
337		0.00	0.000	0.007	0.1840	0.0000	.0000E+00	.0000E+00
338		0.00	0.000	0.007	0.1837	0.0000	.0000E+00	.0000E+00
339		0.00	0.000	0.007	0.1834	0.0000	.0000E+00	.0000E+00
340		0.00	0.000	0.007	0.1832	0.0000	.0000E+00	.0000E+00
341		0.00	0.000	0.007	0.1829	0.0000	.0000E+00	.0000E+00
342		0.00	0.000	0.007	0.1826	0.0000	.0000E+00	.0000E+00
343		0.00	0.000	0.007	0.1823	0.0000	.0000E+00	.0000E+00
344		0.00	0.000	0.007	0.1820	0.0000	.0000E+00	.0000E+00
345		0.00	0.000	0.007	0.1818	0.0000	.0000E+00	.0000E+00
346		0.00	0.000	0.007	0.1815	0.0000	.0000E+00	.0000E+00
347		0.67	0.000	0.034	0.2080	0.0000	.0000E+00	.0000E+00
348	*	0.45	0.000	0.051	0.2088	0.0000	.0000E+00	.0000E+00
349	*	0.00	0.000	0.052	0.2096	0.0000	.0000E+00	.0000E+00
350	*	0.00	0.000	0.043	0.2104	0.0000	.0000E+00	.0000E+00
351		0.00	0.000	0.074	0.2113	0.0000	.0000E+00	.0000E+00
352		0.11	0.000	0.081	0.2188	0.0000	.0000E+00	.0000E+00
353		0.01	0.000	0.041	0.2175	0.0000	.0000E+00	.5096E-07
354		0.00	0.000	0.032	0.2162	0.0000	.0000E+00	.0000E+00
355		0.00	0.000	0.029	0.2150	0.0000	.0000E+00	.0000E+00

356		0.00	0.000	0.038	0.2134	0.0000	.0000E+00	.0000E+00
357		0.00	0.000	0.047	0.2114	0.0000	.0000E+00	.0000E+00
358		0.00	0.000	0.043	0.2096	0.0000	.0000E+00	.0000E+00
359		0.00	0.000	0.039	0.2080	0.0000	.0000E+00	.0000E+00
360	*	0.50	0.000	0.048	0.2089	0.0000	.0000E+00	.0000E+00
361	*	0.02	0.000	0.030	0.2097	0.0000	.0000E+00	.0000E+00
362	*	0.00	0.000	0.035	0.2105	0.0000	.0000E+00	.0000E+00
363	*	0.00	0.000	0.040	0.2113	0.0000	.0000E+00	.0000E+00
364		0.00	0.000	0.056	0.2121	0.0000	.0000E+00	.0000E+00
365		0.00	0.000	0.064	0.2183	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1987

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.21	0.73	0.60	0.09	0.81	1.95
	0.58	3.63	0.56	0.26	0.60	1.76
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.092
	0.000	0.256	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.860	0.452	0.411	0.400	0.803	1.923
	1.077	3.134	0.856	0.283	0.320	0.958
PERCOLATION/LEAKAGE THROUGH	0.0039	0.0000	0.0001	0.0000	0.0000	0.0000
LAYER 2	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 1987

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.78	1710456.120	100.00
RUNOFF	0.347	50409.484	2.95
EVAPOTRANSPIRATION	11.476	1666360.120	97.42
PERC./LEAKAGE THROUGH LAYER 2	0.004359	632.910	0.04
CHANGE IN WATER STORAGE	-0.048	-6945.831	-0.41
SOIL WATER AT START OF YEAR	5.287	767681.750	
SOIL WATER AT END OF YEAR	5.239	760735.937	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 -0.645 0.00

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LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

****

DAILY OUTPUT FOR YEAR 1988

DAY	AIR	SOIL	RAIN IN.	RUNOFF IN.	ET IN.	E. ZONE WATER IN./IN.	HEAD #1 IN.	DRAIN #1 IN.	LEAK #1 IN.
1			0.00	0.000	0.035	0.2169	0.0000	.0000E+00	.2252E-07
2			0.00	0.000	0.036	0.2154	0.0000	.0000E+00	.0000E+00
3			0.00	0.000	0.033	0.2140	0.0000	.0000E+00	.0000E+00
4			0.00	0.000	0.031	0.2127	0.0000	.0000E+00	.0000E+00
5			0.00	0.000	0.031	0.2114	0.0000	.0000E+00	.0000E+00
6			0.12	0.000	0.054	0.2141	0.0000	.0000E+00	.5145E-04
7			0.00	0.000	0.024	0.2131	0.0000	.0000E+00	.0000E+00
8			0.00	0.000	0.023	0.2122	0.0000	.0000E+00	.0000E+00
9			0.00	0.000	0.025	0.2111	0.0000	.0000E+00	.0000E+00
10			0.00	0.000	0.024	0.2101	0.0000	.0000E+00	.0000E+00
11			0.00	0.000	0.022	0.2092	0.0000	.0000E+00	.0000E+00
12			0.00	0.000	0.021	0.2083	0.0000	.0000E+00	.0000E+00
13			0.00	0.000	0.020	0.2075	0.0000	.0000E+00	.0000E+00
14			0.00	0.000	0.019	0.2067	0.0000	.0000E+00	.0000E+00
15			0.00	0.000	0.018	0.2060	0.0000	.0000E+00	.0000E+00
16			0.00	0.000	0.018	0.2052	0.0000	.0000E+00	.0000E+00
17			0.00	0.000	0.018	0.2045	0.0000	.0000E+00	.0000E+00
18			0.08	0.000	0.043	0.2060	0.0000	.0000E+00	.0000E+00
19			0.00	0.000	0.017	0.2053	0.0000	.0000E+00	.0000E+00
20	*		0.02	0.000	0.036	0.2046	0.0000	.0000E+00	.0000E+00
21	*		0.00	0.000	0.016	0.2040	0.0000	.0000E+00	.0000E+00
22			0.00	0.000	0.016	0.2033	0.0000	.0000E+00	.0000E+00
23	*		0.00	0.000	0.016	0.2027	0.0000	.0000E+00	.0000E+00
24			0.00	0.000	0.015	0.2020	0.0000	.0000E+00	.0000E+00
25	*		0.00	0.000	0.015	0.2014	0.0000	.0000E+00	.0000E+00
26			0.00	0.000	0.015	0.2008	0.0000	.0000E+00	.0000E+00
27			0.00	0.000	0.015	0.2002	0.0000	.0000E+00	.0000E+00
28			0.00	0.000	0.015	0.1996	0.0000	.0000E+00	.0000E+00
29			0.00	0.000	0.015	0.1989	0.0000	.0000E+00	.0000E+00
30			0.00	0.000	0.015	0.1983	0.0000	.0000E+00	.0000E+00
31			0.00	0.000	0.015	0.1977	0.0000	.0000E+00	.0000E+00
32			0.00	0.000	0.015	0.1970	0.0000	.0000E+00	.0000E+00
33			0.00	0.000	0.014	0.1964	0.0000	.0000E+00	.0000E+00
34			0.00	0.000	0.014	0.1959	0.0000	.0000E+00	.0000E+00
35			0.02	0.000	0.028	0.1955	0.0000	.0000E+00	.3496E-05
36			1.21	0.050	0.040	0.2422	0.0000	.0000E+00	.0000E+00
37			0.00	0.000	0.046	0.2403	0.0000	.0000E+00	.1627E-04
38			0.00	0.000	0.058	0.2378	0.0000	.0000E+00	.0000E+00
39			0.00	0.000	0.054	0.2356	0.0000	.0000E+00	.0000E+00
40			0.00	0.000	0.060	0.2331	0.0000	.0000E+00	.0000E+00
41			0.00	0.000	0.057	0.2307	0.0000	.0000E+00	.0000E+00

42	0.00	0.000	0.066	0.2279	0.0000	.0000E+00	.0000E+00
43	0.00	0.000	0.068	0.2251	0.0000	.0000E+00	.0000E+00
44	0.00	0.000	0.072	0.2221	0.0000	.0000E+00	.0000E+00
45	0.00	0.000	0.071	0.2191	0.0000	.0000E+00	.0000E+00
46	0.00	0.000	0.058	0.2167	0.0000	.0000E+00	.0000E+00
47	0.00	0.000	0.050	0.2147	0.0000	.0000E+00	.0000E+00
48	0.00	0.000	0.043	0.2129	0.0000	.0000E+00	.9419E-04
49	0.14	0.000	0.066	0.2159	0.0000	.0000E+00	.0000E+00
50	0.00	0.000	0.036	0.2144	0.0000	.0000E+00	.1050E-03
51	0.00	0.000	0.033	0.2131	0.0000	.0000E+00	.0000E+00
52	0.00	0.000	0.033	0.2117	0.0000	.0000E+00	.0000E+00
53	0.00	0.000	0.031	0.2104	0.0000	.0000E+00	.2224E-04
54	0.00	0.000	0.028	0.2092	0.0000	.0000E+00	.0000E+00
55	0.00	0.000	0.027	0.2081	0.0000	.0000E+00	.0000E+00
56	0.00	0.000	0.026	0.2070	0.0000	.0000E+00	.0000E+00
57	0.00	0.000	0.025	0.2060	0.0000	.0000E+00	.0000E+00
58	0.00	0.000	0.024	0.2050	0.0000	.0000E+00	.0000E+00
59	0.00	0.000	0.023	0.2041	0.0000	.0000E+00	.0000E+00
60	0.00	0.000	0.022	0.2031	0.0000	.0000E+00	.0000E+00
61	0.00	0.000	0.022	0.2022	0.0000	.0000E+00	.0000E+00
62	0.00	0.000	0.021	0.2013	0.0000	.0000E+00	.0000E+00
63	0.10	0.000	0.047	0.2036	0.0000	.0000E+00	.0000E+00
64	0.00	0.000	0.021	0.2027	0.0000	.0000E+00	.0000E+00
65	0.00	0.000	0.021	0.2018	0.0000	.0000E+00	.0000E+00
66	0.00	0.000	0.020	0.2010	0.0000	.0000E+00	.0000E+00
67	0.00	0.000	0.020	0.2001	0.0000	.0000E+00	.0000E+00
68	0.00	0.000	0.020	0.1993	0.0000	.0000E+00	.0000E+00
69	0.00	0.000	0.020	0.1985	0.0000	.0000E+00	.0000E+00
70	0.00	0.000	0.019	0.1977	0.0000	.0000E+00	.0000E+00
71	0.00	0.000	0.017	0.1970	0.0000	.0000E+00	.2390E-07
72	0.00	0.000	0.017	0.1963	0.0000	.0000E+00	.0000E+00
73	0.00	0.000	0.017	0.1956	0.0000	.0000E+00	.0000E+00
74	0.00	0.000	0.017	0.1949	0.0000	.0000E+00	.0000E+00
75	0.00	0.000	0.016	0.1942	0.0000	.0000E+00	.0000E+00
76	0.00	0.000	0.016	0.1935	0.0000	.0000E+00	.0000E+00
77	0.00	0.000	0.016	0.1929	0.0000	.0000E+00	.0000E+00
78	0.00	0.000	0.016	0.1922	0.0000	.0000E+00	.0000E+00
79	0.00	0.000	0.015	0.1916	0.0000	.0000E+00	.0000E+00
80	0.00	0.000	0.015	0.1909	0.0000	.0000E+00	.0000E+00
81	0.00	0.000	0.015	0.1903	0.0000	.0000E+00	.0000E+00
82	0.00	0.000	0.015	0.1897	0.0000	.0000E+00	.0000E+00
83	0.00	0.000	0.016	0.1890	0.0000	.0000E+00	.0000E+00
84	0.00	0.000	0.016	0.1884	0.0000	.0000E+00	.0000E+00
85	0.00	0.000	0.016	0.1877	0.0000	.0000E+00	.0000E+00
86	0.00	0.000	0.015	0.1871	0.0000	.0000E+00	.0000E+00
87	0.00	0.000	0.016	0.1864	0.0000	.0000E+00	.0000E+00
88	0.00	0.000	0.014	0.1859	0.0000	.0000E+00	.0000E+00
89	0.00	0.000	0.015	0.1852	0.0000	.0000E+00	.0000E+00
90	0.00	0.000	0.014	0.1847	0.0000	.0000E+00	.0000E+00
91	0.00	0.000	0.014	0.1841	0.0000	.0000E+00	.0000E+00
92	0.00	0.000	0.014	0.1835	0.0000	.0000E+00	.0000E+00
93	0.00	0.000	0.014	0.1829	0.0000	.0000E+00	.0000E+00
94	0.00	0.000	0.014	0.1823	0.0000	.0000E+00	.0000E+00
95	0.00	0.000	0.014	0.1817	0.0000	.0000E+00	.0000E+00
96	0.00	0.000	0.014	0.1811	0.0000	.0000E+00	.0000E+00
97	0.00	0.000	0.014	0.1805	0.0000	.0000E+00	.0000E+00
98	0.00	0.000	0.014	0.1799	0.0000	.0000E+00	.0000E+00
99	0.00	0.000	0.014	0.1793	0.0000	.0000E+00	.0000E+00
100	0.00	0.000	0.015	0.1787	0.0000	.0000E+00	.0000E+00
101	0.00	0.000	0.014	0.1781	0.0000	.0000E+00	.0000E+00
102	0.00	0.000	0.014	0.1776	0.0000	.0000E+00	.0000E+00
103	0.00	0.000	0.014	0.1770	0.0000	.0000E+00	.0000E+00
104	0.00	0.000	0.015	0.1764	0.0000	.0000E+00	.0000E+00

105	0.00	0.000	0.015	0.1757	0.0000	.0000E+00	.0000E+00
106	0.00	0.000	0.015	0.1751	0.0000	.0000E+00	.0000E+00
107	0.04	0.000	0.036	0.1753	0.0000	.0000E+00	.0000E+00
108	0.00	0.000	0.014	0.1747	0.0000	.0000E+00	.0000E+00
109	0.00	0.000	0.014	0.1741	0.0000	.0000E+00	.0000E+00
110	0.00	0.000	0.015	0.1735	0.0000	.0000E+00	.0000E+00
111	0.00	0.000	0.016	0.1728	0.0000	.0000E+00	.0000E+00
112	0.00	0.000	0.016	0.1722	0.0000	.0000E+00	.0000E+00
113	0.00	0.000	0.016	0.1715	0.0000	.0000E+00	.0000E+00
114	0.00	0.000	0.016	0.1708	0.0000	.0000E+00	.0000E+00
115	0.00	0.000	0.016	0.1701	0.0000	.0000E+00	.0000E+00
116	0.00	0.000	0.017	0.1695	0.0000	.0000E+00	.0000E+00
117	0.00	0.000	0.014	0.1689	0.0000	.0000E+00	.0000E+00
118	0.00	0.000	0.003	0.1688	0.0000	.0000E+00	.0000E+00
119	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
120	0.04	0.000	0.023	0.1695	0.0000	.0000E+00	.0000E+00
121	0.00	0.000	0.002	0.1694	0.0000	.0000E+00	.0000E+00
122	0.00	0.000	0.003	0.1693	0.0000	.0000E+00	.0000E+00
123	0.00	0.000	0.003	0.1691	0.0000	.0000E+00	.0000E+00
124	0.00	0.000	0.003	0.1690	0.0000	.0000E+00	.0000E+00
125	0.00	0.000	0.003	0.1689	0.0000	.0000E+00	.0000E+00
126	0.00	0.000	0.003	0.1688	0.0000	.0000E+00	.0000E+00
127	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
128	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
129	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
130	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
131	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
132	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
133	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
134	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
135	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
136	0.00	0.000	0.000	0.1688	0.0000	.0000E+00	.0000E+00
137	0.13	0.000	0.030	0.1729	0.0000	.0000E+00	.0000E+00
138	0.00	0.000	0.002	0.1729	0.0000	.0000E+00	.0000E+00
139	0.00	0.000	0.008	0.1725	0.0000	.0000E+00	.0000E+00
140	0.00	0.000	0.008	0.1722	0.0000	.0000E+00	.0000E+00
141	0.00	0.000	0.009	0.1719	0.0000	.0000E+00	.0000E+00
142	0.00	0.000	0.010	0.1714	0.0000	.0000E+00	.0000E+00
143	0.00	0.000	0.005	0.1712	0.0000	.0000E+00	.0000E+00
144	0.00	0.000	0.004	0.1711	0.0000	.0000E+00	.0000E+00
145	0.00	0.000	0.004	0.1709	0.0000	.0000E+00	.0000E+00
146	0.05	0.000	0.026	0.1719	0.0000	.0000E+00	.0000E+00
147	0.00	0.000	0.003	0.1718	0.0000	.0000E+00	.0000E+00
148	0.00	0.000	0.006	0.1715	0.0000	.0000E+00	.0000E+00
149	0.00	0.000	0.005	0.1713	0.0000	.0000E+00	.0000E+00
150	0.00	0.000	0.004	0.1711	0.0000	.0000E+00	.0000E+00
151	0.00	0.000	0.004	0.1710	0.0000	.0000E+00	.0000E+00
152	0.00	0.000	0.004	0.1708	0.0000	.0000E+00	.0000E+00
153	0.00	0.000	0.003	0.1707	0.0000	.0000E+00	.0000E+00
154	0.00	0.000	0.004	0.1705	0.0000	.0000E+00	.0000E+00
155	0.00	0.000	0.004	0.1704	0.0000	.0000E+00	.0000E+00
156	0.00	0.000	0.004	0.1702	0.0000	.0000E+00	.0000E+00
157	0.00	0.000	0.004	0.1701	0.0000	.0000E+00	.0000E+00
158	0.00	0.000	0.004	0.1699	0.0000	.0000E+00	.0000E+00
159	0.00	0.000	0.004	0.1698	0.0000	.0000E+00	.0000E+00
160	0.00	0.000	0.004	0.1696	0.0000	.0000E+00	.0000E+00
161	0.00	0.000	0.003	0.1695	0.0000	.0000E+00	.0000E+00
162	0.00	0.000	0.003	0.1693	0.0000	.0000E+00	.0000E+00
163	0.15	0.000	0.031	0.1743	0.0000	.0000E+00	.0000E+00
164	0.00	0.000	0.003	0.1742	0.0000	.0000E+00	.0000E+00
165	0.00	0.000	0.009	0.1738	0.0000	.0000E+00	.0000E+00
166	0.00	0.000	0.009	0.1734	0.0000	.0000E+00	.0000E+00
167	0.76	0.000	0.040	0.2034	0.0000	.0000E+00	.0000E+00

168		0.00	0.000	0.009	0.2030	0.0000	.0000E+00	.0000E+00
169		0.00	0.000	0.015	0.2024	0.0000	.0000E+00	.0000E+00
170		0.00	0.000	0.016	0.2017	0.0000	.0000E+00	.0000E+00
171		0.00	0.000	0.016	0.2011	0.0000	.0000E+00	.0000E+00
172		0.00	0.000	0.016	0.2004	0.0000	.0000E+00	.0000E+00
173		0.00	0.000	0.017	0.1997	0.0000	.0000E+00	.0000E+00
174		0.00	0.000	0.018	0.1989	0.0000	.0000E+00	.0000E+00
175		0.00	0.000	0.017	0.1982	0.0000	.0000E+00	.0000E+00
176		0.00	0.000	0.017	0.1975	0.0000	.0000E+00	.0000E+00
177		0.33	0.000	0.046	0.2094	0.0000	.0000E+00	.0000E+00
178		0.00	0.000	0.021	0.2085	0.0000	.0000E+00	.0000E+00
179		0.00	0.000	0.021	0.2076	0.0000	.0000E+00	.0000E+00
180		0.00	0.000	0.020	0.2068	0.0000	.0000E+00	.0000E+00
181		0.00	0.000	0.020	0.2059	0.0000	.0000E+00	.0000E+00
182		0.00	0.000	0.021	0.2051	0.0000	.0000E+00	.0000E+00
183		0.00	0.000	0.020	0.2042	0.0000	.0000E+00	.0000E+00
184		0.00	0.000	0.018	0.2035	0.0000	.0000E+00	.0000E+00
185		0.00	0.000	0.021	0.2026	0.0000	.0000E+00	.0000E+00
186		0.02	0.000	0.035	0.2020	0.0000	.0000E+00	.0000E+00
187		0.00	0.000	0.022	0.2010	0.0000	.0000E+00	.0000E+00
188		0.51	0.000	0.052	0.2201	0.0000	.0000E+00	.0000E+00
189		0.00	0.000	0.027	0.2190	0.0000	.0000E+00	.0000E+00
190		0.00	0.000	0.025	0.2179	0.0000	.0000E+00	.0000E+00
191	*	0.38	0.000	0.082	0.2188	0.0000	.0000E+00	.0000E+00
192		0.07	0.000	0.281	0.2216	0.0000	.0000E+00	.0000E+00
193		0.00	0.000	0.028	0.2204	0.0000	.0000E+00	.0000E+00
194		0.00	0.000	0.034	0.2189	0.0000	.0000E+00	.3995E-07
195		0.00	0.000	0.032	0.2176	0.0000	.0000E+00	.0000E+00
196		0.00	0.000	0.035	0.2161	0.0000	.0000E+00	.0000E+00
197		0.00	0.000	0.035	0.2147	0.0000	.0000E+00	.0000E+00
198		0.00	0.000	0.037	0.2131	0.0000	.0000E+00	.0000E+00
199		0.31	0.000	0.068	0.2232	0.0000	.0000E+00	.0000E+00
200		0.00	0.000	0.037	0.2217	0.0000	.0000E+00	.0000E+00
201		0.15	0.000	0.073	0.2249	0.0000	.0000E+00	.0000E+00
202		0.00	0.000	0.182	0.2173	0.0000	.0000E+00	.0000E+00
203		0.00	0.000	0.043	0.2155	0.0000	.0000E+00	.0000E+00
204		0.00	0.000	0.048	0.2135	0.0000	.0000E+00	.0000E+00
205		0.00	0.000	0.048	0.2115	0.0000	.0000E+00	.0000E+00
206		0.00	0.000	0.053	0.2093	0.0000	.0000E+00	.0000E+00
207		0.00	0.000	0.048	0.2073	0.0000	.0000E+00	.0000E+00
208		0.00	0.000	0.047	0.2053	0.0000	.0000E+00	.0000E+00
209		0.00	0.000	0.049	0.2033	0.0000	.0000E+00	.0000E+00
210		0.00	0.000	0.047	0.2013	0.0000	.0000E+00	.0000E+00
211		0.00	0.000	0.049	0.1993	0.0000	.0000E+00	.0000E+00
212		0.00	0.000	0.051	0.1972	0.0000	.0000E+00	.0000E+00
213		0.00	0.000	0.049	0.1951	0.0000	.0000E+00	.0000E+00
214		0.00	0.000	0.049	0.1931	0.0000	.0000E+00	.0000E+00
215		0.05	0.000	0.069	0.1923	0.0000	.0000E+00	.0000E+00
216		0.10	0.000	0.088	0.1928	0.0000	.0000E+00	.0000E+00
217		0.98	0.013	0.086	0.2295	0.0000	.0000E+00	.0000E+00
218		0.00	0.000	0.178	0.2221	0.0000	.0000E+00	.0000E+00
219		0.83	0.013	0.193	0.2480	0.0000	.0000E+00	.0000E+00
220		0.57	0.002	0.249	0.2613	0.0000	.0000E+00	.0000E+00
221		2.25	0.784	0.146	0.3163	0.0000	.0000E+00	.7272E-03
222		0.00	0.000	0.170	0.3092	0.0000	.0000E+00	.0000E+00
223		0.00	0.000	0.208	0.3005	0.0000	.0000E+00	.0000E+00
224		0.35	0.000	0.198	0.3068	0.0000	.0000E+00	.0000E+00
225		0.00	0.000	0.170	0.2998	0.0000	.0000E+00	.0000E+00
226	*	0.00	0.000	0.107	0.2953	0.0000	.0000E+00	.0000E+00
227		0.25	0.000	0.252	0.2952	0.0000	.0000E+00	.0000E+00
228		1.22	0.149	0.264	0.3288	0.0000	.0000E+00	.0000E+00
229	*	1.22	0.000	0.071	0.3296	0.0000	.0000E+00	.0000E+00
230		0.13	0.257	0.100	0.3672	0.0000	.0000E+00	.0000E+00

231		0.00	0.000	0.186	0.3593	0.0000	.0000E+00	.3764E-02
232		0.00	0.000	0.227	0.3499	0.0000	.0000E+00	.0000E+00
233		0.00	0.000	0.223	0.3376	0.0000	.0000E+00	.7296E-01
234		0.00	0.000	0.181	0.3251	0.0000	.0000E+00	.1182
235		0.00	0.000	0.193	0.3129	0.0000	.0000E+00	.9845E-01
236	*	0.46	0.000	0.072	0.3108	0.0000	.0000E+00	.7032E-01
237		0.00	0.000	0.073	0.3095	0.0000	.0000E+00	.5830E-01
238		0.00	0.000	0.277	0.3069	0.0000	.0000E+00	.5294E-01
239		0.59	0.000	0.248	0.3192	0.0000	.0000E+00	.4759E-01
240		0.20	0.000	0.200	0.3177	0.0000	.0000E+00	.3554E-01
241		0.20	0.000	0.198	0.3165	0.0000	.0000E+00	.3234E-01
242		0.38	0.000	0.183	0.3236	0.0000	.0000E+00	.2588E-01
243		0.00	0.000	0.167	0.3153	0.0000	.0000E+00	.3146E-01
244		0.00	0.000	0.179	0.3066	0.0000	.0000E+00	.2908E-01
245		0.00	0.000	0.172	0.2984	0.0000	.0000E+00	.2559E-01
246		0.10	0.000	0.172	0.2944	0.0000	.0000E+00	.2258E-01
247		0.00	0.000	0.145	0.2875	0.0000	.0000E+00	.2148E-01
248		0.00	0.000	0.144	0.2805	0.0000	.0000E+00	.2394E-01
249		0.00	0.000	0.130	0.2743	0.0000	.0000E+00	.1822E-01
250		0.00	0.000	0.116	0.2689	0.0000	.0000E+00	.1455E-01
251		0.00	0.000	0.120	0.2633	0.0000	.0000E+00	.1250E-01
252		0.00	0.000	0.127	0.2576	0.0000	.0000E+00	.1112E-01
253		0.00	0.000	0.119	0.2522	0.0000	.0000E+00	.9619E-02
254		0.00	0.000	0.129	0.2465	0.0000	.0000E+00	.8984E-02
255		0.00	0.000	0.121	0.2414	0.0000	.0000E+00	.1116E-02
256		0.00	0.000	0.100	0.2372	0.0000	.0000E+00	.0000E+00
257		0.00	0.000	0.079	0.2339	0.0000	.0000E+00	.0000E+00
258		0.00	0.000	0.067	0.2311	0.0000	.0000E+00	.0000E+00
259		0.00	0.000	0.058	0.2287	0.0000	.0000E+00	.0000E+00
260		0.00	0.000	0.053	0.2265	0.0000	.0000E+00	.0000E+00
261		0.00	0.000	0.049	0.2245	0.0000	.0000E+00	.0000E+00
262		0.00	0.000	0.045	0.2226	0.0000	.0000E+00	.0000E+00
263		0.00	0.000	0.042	0.2209	0.0000	.0000E+00	.0000E+00
264		0.00	0.000	0.039	0.2193	0.0000	.0000E+00	.0000E+00
265		0.77	0.000	0.072	0.2484	0.0000	.0000E+00	.0000E+00
266		0.00	0.000	0.115	0.2435	0.0000	.0000E+00	.0000E+00
267		0.06	0.000	0.062	0.2434	0.0000	.0000E+00	.0000E+00
268		0.00	0.000	0.033	0.2421	0.0000	.0000E+00	.0000E+00
269		0.00	0.000	0.031	0.2408	0.0000	.0000E+00	.0000E+00
270		0.00	0.000	0.029	0.2396	0.0000	.0000E+00	.0000E+00
271		0.00	0.000	0.028	0.2384	0.0000	.0000E+00	.0000E+00
272		0.00	0.000	0.027	0.2373	0.0000	.0000E+00	.0000E+00
273		0.00	0.000	0.026	0.2362	0.0000	.0000E+00	.0000E+00
274		0.00	0.000	0.025	0.2352	0.0000	.0000E+00	.0000E+00
275		0.00	0.000	0.024	0.2342	0.0000	.0000E+00	.0000E+00
276		0.00	0.000	0.023	0.2332	0.0000	.0000E+00	.0000E+00
277		0.00	0.000	0.022	0.2323	0.0000	.0000E+00	.0000E+00
278		0.00	0.000	0.022	0.2314	0.0000	.0000E+00	.0000E+00
279		0.00	0.000	0.021	0.2305	0.0000	.0000E+00	.0000E+00
280		0.00	0.000	0.020	0.2297	0.0000	.0000E+00	.0000E+00
281		0.00	0.000	0.020	0.2289	0.0000	.0000E+00	.0000E+00
282		0.00	0.000	0.019	0.2280	0.0000	.0000E+00	.0000E+00
283		0.05	0.000	0.043	0.2283	0.0000	.0000E+00	.0000E+00
284		0.06	0.000	0.045	0.2290	0.0000	.0000E+00	.0000E+00
285		0.00	0.000	0.018	0.2282	0.0000	.0000E+00	.0000E+00
286		0.00	0.000	0.018	0.2274	0.0000	.0000E+00	.0000E+00
287		0.00	0.000	0.018	0.2267	0.0000	.0000E+00	.7017E-03
288		0.00	0.000	0.017	0.2259	0.0000	.0000E+00	.2168E-02
289		0.00	0.000	0.017	0.2251	0.0000	.0000E+00	.1515E-02
290		0.00	0.000	0.017	0.2244	0.0000	.0000E+00	.0000E+00
291		0.00	0.000	0.017	0.2237	0.0000	.0000E+00	.0000E+00
292		0.00	0.000	0.017	0.2230	0.0000	.0000E+00	.0000E+00
293		0.00	0.000	0.017	0.2223	0.0000	.0000E+00	.0000E+00

294	0.00	0.000	0.017	0.2216	0.0000	.0000E+00	.0000E+00
295	0.12	0.000	0.044	0.2248	0.0000	.0000E+00	.0000E+00
296	0.00	0.000	0.017	0.2241	0.0000	.0000E+00	.0000E+00
297	0.00	0.000	0.017	0.2234	0.0000	.0000E+00	.0000E+00
298	0.00	0.000	0.017	0.2227	0.0000	.0000E+00	.0000E+00
299	0.00	0.000	0.016	0.2219	0.0000	.0000E+00	.1729E-02
300	0.00	0.000	0.017	0.2212	0.0000	.0000E+00	.1611E-02
301	0.00	0.000	0.017	0.2204	0.0000	.0000E+00	.8942E-03
302	0.00	0.000	0.016	0.2197	0.0000	.0000E+00	.1576E-02
303	0.00	0.000	0.016	0.2190	0.0000	.0000E+00	.0000E+00
304	0.00	0.000	0.016	0.2183	0.0000	.0000E+00	.0000E+00
305	0.00	0.000	0.017	0.2176	0.0000	.0000E+00	.0000E+00
306	0.00	0.000	0.016	0.2169	0.0000	.0000E+00	.0000E+00
307	0.00	0.000	0.017	0.2162	0.0000	.0000E+00	.0000E+00
308	0.00	0.000	0.017	0.2155	0.0000	.0000E+00	.0000E+00
309	0.00	0.000	0.017	0.2148	0.0000	.0000E+00	.0000E+00
310	0.00	0.000	0.017	0.2141	0.0000	.0000E+00	.0000E+00
311	0.00	0.000	0.017	0.2134	0.0000	.0000E+00	.0000E+00
312	0.00	0.000	0.017	0.2127	0.0000	.0000E+00	.0000E+00
313	0.00	0.000	0.018	0.2119	0.0000	.0000E+00	.0000E+00
314	0.00	0.000	0.018	0.2112	0.0000	.0000E+00	.0000E+00
315	0.00	0.000	0.017	0.2104	0.0000	.0000E+00	.0000E+00
316	0.00	0.000	0.013	0.2099	0.0000	.0000E+00	.0000E+00
317	0.00	0.000	0.013	0.2094	0.0000	.0000E+00	.0000E+00
318	0.00	0.000	0.013	0.2089	0.0000	.0000E+00	.0000E+00
319	0.00	0.000	0.012	0.2083	0.0000	.0000E+00	.0000E+00
320	0.00	0.000	0.012	0.2078	0.0000	.0000E+00	.0000E+00
321	0.00	0.000	0.012	0.2073	0.0000	.0000E+00	.0000E+00
322	0.00	0.000	0.012	0.2068	0.0000	.0000E+00	.0000E+00
323	0.00	0.000	0.012	0.2063	0.0000	.0000E+00	.0000E+00
324	0.00	0.000	0.012	0.2058	0.0000	.0000E+00	.0000E+00
325	0.00	0.000	0.012	0.2053	0.0000	.0000E+00	.0000E+00
326	0.00	0.000	0.012	0.2048	0.0000	.0000E+00	.0000E+00
327	0.00	0.000	0.012	0.2043	0.0000	.0000E+00	.0000E+00
328	0.00	0.000	0.012	0.2038	0.0000	.0000E+00	.0000E+00
329	0.00	0.000	0.012	0.2034	0.0000	.0000E+00	.0000E+00
330	0.00	0.000	0.011	0.2029	0.0000	.0000E+00	.0000E+00
331	0.00	0.000	0.011	0.2024	0.0000	.0000E+00	.0000E+00
332	0.00	0.000	0.011	0.2019	0.0000	.0000E+00	.0000E+00
333	0.00	0.000	0.011	0.2015	0.0000	.0000E+00	.0000E+00
334	0.00	0.000	0.011	0.2010	0.0000	.0000E+00	.0000E+00
335	0.00	0.000	0.011	0.2005	0.0000	.0000E+00	.0000E+00
336	0.00	0.000	0.011	0.2001	0.0000	.0000E+00	.0000E+00
337	0.00	0.000	0.011	0.1996	0.0000	.0000E+00	.0000E+00
338	0.00	0.000	0.011	0.1992	0.0000	.0000E+00	.0000E+00
339	0.00	0.000	0.011	0.1987	0.0000	.0000E+00	.0000E+00
340	0.00	0.000	0.011	0.1983	0.0000	.0000E+00	.0000E+00
341	0.00	0.000	0.011	0.1978	0.0000	.0000E+00	.0000E+00
342	0.00	0.000	0.011	0.1974	0.0000	.0000E+00	.0000E+00
343	0.00	0.000	0.011	0.1969	0.0000	.0000E+00	.0000E+00
344	0.68	0.000	0.023	0.2243	0.0000	.0000E+00	.0000E+00
345	0.00	0.000	0.010	0.2239	0.0000	.0000E+00	.0000E+00
346	0.00	0.000	0.010	0.2234	0.0000	.0000E+00	.0000E+00
347	0.00	0.000	0.010	0.2230	0.0000	.0000E+00	.0000E+00
348	0.00	0.000	0.010	0.2226	0.0000	.0000E+00	.0000E+00
349	0.00	0.000	0.010	0.2222	0.0000	.0000E+00	.0000E+00
350	0.00	0.000	0.010	0.2217	0.0000	.0000E+00	.0000E+00
351	0.00	0.000	0.010	0.2213	0.0000	.0000E+00	.0000E+00
352	0.00	0.000	0.010	0.2209	0.0000	.0000E+00	.0000E+00
353	0.00	0.000	0.010	0.2205	0.0000	.0000E+00	.0000E+00
354	0.54	0.000	0.021	0.2421	0.0000	.0000E+00	.0000E+00
355	0.00	0.000	0.072	0.2391	0.0000	.0000E+00	.0000E+00
356	0.00	0.000	0.010	0.2387	0.0000	.0000E+00	.0000E+00

357		0.00	0.000	0.010	0.2383	0.0000	.0000E+00	.0000E+00
358		0.00	0.000	0.010	0.2379	0.0000	.0000E+00	.0000E+00
359		0.00	0.000	0.010	0.2375	0.0000	.0000E+00	.0000E+00
360		0.00	0.000	0.010	0.2371	0.0000	.0000E+00	.0000E+00
361		0.00	0.000	0.010	0.2367	0.0000	.0000E+00	.0000E+00
362	*	0.00	0.000	0.010	0.2363	0.0000	.0000E+00	.0000E+00
363	*	0.00	0.000	0.010	0.2359	0.0000	.0000E+00	.0000E+00
364	*	0.00	0.000	0.010	0.2355	0.0000	.0000E+00	.0000E+00
365	*	0.00	0.000	0.010	0.2351	0.0000	.0000E+00	.0000E+00
366	*	0.00	0.000	0.009	0.2347	0.0000	.0000E+00	.0000E+00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.22	1.37	0.10	0.08	0.18	1.24
	1.44	9.78	0.93	0.23	0.00	1.22
RUNOFF	0.000	0.050	0.000	0.000	0.000	0.000
	0.000	1.218	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.715	1.189	0.558	0.432	0.146	0.418
	1.678	5.209	2.474	0.641	0.410	0.401
PERCOLATION/LEAKAGE THROUGH	0.0001	0.0002	0.0000	0.0000	0.0000	0.0000
LAYER 2	0.0000	0.6775	0.1697	0.0102	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 1988

	INCHES	CU. FEET	PERCENT
PRECIPITATION	16.79	2437908.500	100.00
RUNOFF	1.268	184126.969	7.55
EVAPOTRANSPIRATION	14.271	2072183.000	85.00
PERC./LEAKAGE THROUGH LAYER 2	0.857718	124540.703	5.11
CHANGE IN WATER STORAGE	0.393	57058.496	2.34
SOIL WATER AT START OF YEAR	5.239	760735.937	
SOIL WATER AT END OF YEAR	5.632	817794.437	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	-0.727	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1984 THROUGH 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.40	0.62	0.34	0.20	0.54	1.87
	1.29	4.16	0.99	1.52	0.96	1.48
STD. DEVIATIONS	0.49	0.50	0.18	0.35	0.29	1.16
	0.49	3.22	0.63	1.63	1.24	0.98
RUNOFF						
TOTALS	0.000	0.010	0.000	0.000	0.000	0.058
	0.000	0.301	0.001	0.088	0.042	0.001
STD. DEVIATIONS	0.000	0.022	0.000	0.000	0.000	0.087
	0.000	0.524	0.001	0.198	0.094	0.001
EVAPOTRANSPIRATION						
TOTALS	1.009	0.569	0.407	0.372	0.570	1.545
	1.618	3.158	1.263	0.960	1.046	1.029
STD. DEVIATIONS	0.604	0.465	0.151	0.156	0.410	1.100
	0.404	1.537	0.905	0.588	0.757	0.591
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.0022	0.0000	0.0001	0.0000	0.0003	0.0001
	0.0001	0.1356	0.0340	0.0021	0.0003	0.0001
STD. DEVIATIONS	0.0028	0.0001	0.0001	0.0000	0.0007	0.0002
	0.0002	0.3029	0.0758	0.0045	0.0005	0.0001

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1984 THROUGH 1988

	INCHES		CU. FEET	PERCENT
PRECIPITATION	14.38	(2.073)	2087685.7	100.00
RUNOFF	0.500	(0.4432)	72665.19	3.481
EVAPOTRANSPIRATION	13.546	(1.4889)	1966841.87	94.212

PERCOLATION/LEAKAGE THROUGH LAYER 2	0.17497 (0.38167)	25405.965	1.21694
CHANGE IN WATER STORAGE	0.157 (0.9709)	22772.97	1.091

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PEAK DAILY VALUES FOR YEARS 1984 THROUGH 1988

	(INCHES)	(CU. FT.)
PRECIPITATION	2.25	326700.000
RUNOFF	0.784	113810.9450
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.118181	17159.88480
SNOW WATER	1.22	177189.7340

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3672
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1688

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FINAL WATER STORAGE AT END OF YEAR 1988

LAYER	(INCHES)	(VOL/VOL)
1	1.5622	0.2604
2	4.0700	0.2261
SNOW WATER	0.000	

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APPENDIX E

Monitoring Plan

WSMR Environmental Document ES-EC-TO-015-06-168

REVISED FINAL

RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3)

White Sands Missile Range

May 2008

White Sands Missile Range
Directorate of Public Works - Environment Division
White Sands Missile Range, New Mexico 88002

WHITE SANDS TECHNICAL SERVICES

REPORT DOCUMENTATION PAGE

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1. REPORT DATE *(DD-MM-YYYY)* May 2008	**2. REPORT TYPE** Revised Final	**3. DATES COVERED** *(From - To)*
4. TITLE AND SUBTITLE RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3)		**5a. CONTRACT NUMBER** W9124Q-04-D-0012 **5b. GRANT NUMBER** **5c. PROGRAM ELEMENT NUMBER**
6. AUTHOR(S) William Little, Senior Engineer, WTS		**5d. PROJECT NUMBER** **5e. TASK NUMBER** 15
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) White Sands Technical Services, LLC P.O. Box 363 WSMR, NM 88002		**5f. WORK UNIT NUMBER** **8. PERFORMING ORGANIZATION REPORT NUMBER** ES-EC-TO-015-06-168
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Department of the Army U.S. Army White Sands Missile Range 100 Headquarters Avenue ATTN: IMWE-WSM-PWEEC (Jose Gallegos) White Sands Missile Range, NM 88002		**10. SPONSOR/MONITOR'S ACRONYM(S)** **11. SPONSORING/MONITORING AGENCY REPORT NUMBER** ES-EC-TO-015-06-168

12. DISTRIBUTION AVAILABILITY STATEMENT

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This RCRA Monitoring Plan addresses the requirements identified in the New Mexico Environment Department (NMED) letter of 24 August 2007 concerning NMED Notice of Disapproval, RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82) at White Sands Missile Range. This letter identified specific actions for WSMR to undertake, including a ground water monitoring program.

15. SUBJECT TERMS

RCRA, WSMR, STP Percolation Ditches, ground water

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
			none	7	Jose Gallegos
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER (*Include area code*)**
unclassified	unclassified	unclassified			575-678-1007

RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3)

Submitted to:

U.S. Army
White Sands Missile Range
Directorate of Public Works - Environment Division
White Sands Missile Range, New Mexico 88002-5048

May 2008

Submitted by:

White Sands Technical Services, LLC
Building 126
White Sands Missile Range, New Mexico 88002

WSMR response to

1. **NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007.**
2. **NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.**
3. **NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.**

Comment Number		NMED Comments		WSMR Response and Discussion
NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007				
1		In Section 3.2 (Corrective Measures Studies), the Permittee states "[a] revised Corrective Measures Study (CMS) is currently (2007) in preparation which addresses current conditions, understandings and agency concerns." Solid Waste Management Unit (SWMU) 82 is a regulated unit and therefore a Closure Plan, rather than a CMS, is required to be submitted to NMED. This issue is being addressed in the June 11, 2007 White Sands Missile Range (WSMR) Draft Resource Conservation and Recovery Act (RCRA) Permit.		WSMR will cease preparation of the previously agreed-to revised CMS. Closure Plan issues will be addressed during negotiation concerning the draft RCRA Permit.
2		In Section 5.3 (Groundwater Sampling), the Permittee references NMED's Comment 6 of the August 7, 2006 Response Letter (located in Appendix A). In the letter, NMED asks the Permittee to provide an explanation for dissolved oxygen level measurements that appear to be uncharacteristic of possible groundwater conditions at the site. NMED also asks the Permittee to explain how the data was collected and if any data collection problems were encountered. The Permittee has not addressed this Comment in the current Monitoring Plan. The Permittee must address this issue in the revised Monitoring Plan.		At the present time, WSMR has no ready explanation for the apparent anomalies, nor do we have recorded difficulties with data collection. Sampling preparations, collection techniques, and recordkeeping have been double-checked and observed by third parties with no anomalies noted. Examination of the sampling record shows that, while there were anomalies reported during 2005, there have been no obvious problems since. We intend to continue to carefully follow sampling and measurement protocols in order to discover and correct any problems. Care will be taken to insure that field measurements are collected properly (equipment calibration and sampling technique). Sampling and data collection procedures are presented in the cited and provided SOPs, which are appropriate for the site and the assigned tasks. See Section 5.0, pages 3 – 4.
3		In Section 5.3 (Groundwater Sampling), page 5, the Permittee states "WSMR will continue the ongoing groundwater monitoring program, with sampling scheduled to occur on & semi-annual basis, usually in December and June of each Year.. -This Program was initiated in 2005 and is due for re-evaluation in 2010." The groundwater monitoring dates are subject to change based on pending requirements in the June 11, 2007 White Sands Missile Range RCRA Permit Draft. The Permittee must remove the reference to re-evaluation in 2010.		Noted.
4		In Section 5.3 (Groundwater Sampling), page 5, the Permittee states "[c]are will be taken to insure that field measurements are collected properly (equipment calibration and sampling technique)." The Permittee must include descriptions of proposed methods and procedures for sampling and data collection. The Permittee must also include a step test(s) to determine pumping rates at the well(s) proposed for constant discharge aquifer testing (listed in Table 5-1). The Permittee must provide a detailed description of these procedures in the aquifer characterization work plan submittal.		1) The requested information is provided in the supplied SOPs. 2) The proposed aquifer test will be addressed in a separate work plan and executed by the U.S. Geological Survey.

WSMR response to 1. **NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007.** 2. **NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.** 3. **NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
5		In Table 5-2 (Planned Analytical Program), the Permittee lists the proposed analytical methods for the sample analysis. The methods proposed for analysis of Volatile Organic Compounds (VOCs) and cyanide are not the most current according to Environmental Protection Agency (EPA) methods. The most current are Method 8260C for VOCs and Method 9010C for cyanide. Please refer to http://www.epa.gov/sw-846/new-meth.htm and http://www.epa.gov/fedfac/pdf/mra_hbook_5_05.pdf. The Permittee must revise the Monitoring Plan to propose using these updated analytical methods. This correction must also be included in the aquifer characterization work plan.		We acknowledge the new methods, but recognize that the guidance leaves it to our discretion, we will propose using new methods if readily available, and otherwise, current methods will continue to be used.
6		In Section 5.4 (Aquifer Testing), the Permittee references NMED' Comment 2 of the December 8, 2006 (located in Appendix A). In the response letter, NMED requires the Permittee to provide aquifer testing in multiple wells that include, but are not limited to, wells MPL-02, MPL-17 and SMW-03, In the Monitoring Plan the Permittee states "[t]hese wells are too far to allow measurable drawdown in adjacent wells." The Permittee must propose a well or wells that will allow for a multiple-well constant discharge test(s) in the area near SMW-03. The well or wells proposed for this study, along with a description of the detailed proposed aquifer testing, must be included in the aquifer characterization work plan.		Aquifer Testing details will be addressed in the separately provided Aquifer Characterization Work Plan.
7		In the Comment Response table (located in Appendix A) addressing NMED's Comment Response Letter dated August 7, 2006, and NMED's Notice of Deficiency (NOD), dated December 8, 2006, the Permittee states that a work plan is being prepared and will be submitted to NMED. The Permittee must include all proposed aquifer testing details in the aquifer characterization work plan to be submitted to NMED. Monitoring addressed in the Comment Response tables must be included in the revised Monitoring Plan.		By prior agreement with NMED [fonecon 18 April 2007, Gallegos / Frischkorn and follow-up C. Frischkorn e-mail message, 19 April 2007], the provided Monitoring Plan contained the planned aquifer testing program. However, the revised Monitoring Plan will not address aquifer tests. Aquifer testing details will be addressed in the separate Aquifer Characterization Work Plan.
8		The Permittee failed to provide the details for conducting any aquifer tests at the site. As stated in previous comments, the Permittee must submit an aquifer characterization work plan for NMED's approval that provides the details for conducting aquifer tests at a minimum of four wells, including at least one multiple well constant discharge test.		See responses to Comments 4 and 7.

WSMR response to 1. **NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007.** 2. **NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.** 3. **NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
9		In the Comment Response table (located in Appendix A) addressing NMED's Comment Response Letter, dated August 7, 2006, Comment 7, NMED requires that the Permittee provide reliable information to support current aquifer conditions at the site. In response to NMED's comment, the Permittee states "WSMR believes that, properly interpreted, the available data provide a coherent, plausible, and acceptable description of current and past hydrogeologic conditions. These data provide an adequate basis for interpreting and predicting future conditions." In the past, the Permittee has not provided current aquifer data; therefore, based on proposed investigations and results, the Permittee must therefore re-evaluate the data collected during the upcoming well characterization activities and develop a model of current hydrogeologic conditions. Results from this study must be included in the Closure Plan. (See Comment 1)		WSMR will conduct an additional aquifer test (as described in the separate Aquifer Characterization Work Plan) and will consider this new data with data previously collected (e.g., *Considerations of Aquifer Permeability in the Vicinity of the Former Sewage Treatment Plant (STP) Percolation Ditches*, WTS, May 2006) to describe aquifer conditions.
10		In the Comment Response table addressing NMED's NOD dated December 8, 2006 (Appendix A), the Permittee proposes to submit a Work Plan that describes proposed activities in response to NMED's request, as well as a complete CMS. As stated in Comment 1, the Permittee must submit a Closure Plan to NMED, not a CMS. This issue is being addressed in the WSMR Draft RCRA Permit dated, June 11, 2007.		See response to Comment 1.
NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.				
1		NMED has determined that the Permittee did not respond to the comments established in the NOD, but instead addressed a former NOD dated August 7, 2006. NMED hereby rejects the Monitoring Plan.		The ambiguity should be cleared up throughout the current version.
NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.				
1		Discussion specified certain portions of the Monitoring Plan to be removed.		All such material has been removed.
2		Discussion questioned accuracy of citations for cyanide methods in Table 5-2.		Full method citations have been provided. WSMR has verified that appropriate methods are being employed.

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APPENDIX A NMED Letters and WSMR Responses

APPENDIX B WTS SOPs

LIST OF ACRONYMS

MNA	Monitored Natural Attenuation
MPL	Main Post Landfill
NMED	New Mexico Environment Department
RCRA	Resource Conservation & Recovery Act of 1976
RFI	RCRA Facility Investigation
SOP	Standard Operating Procedures
STP	Sewage Treatment Plant
SWMU	Solid Waste Management Unit
VOCs	Volatile Organic Compounds
WSMR	White Sands Missile Range
WTS	White Sands Technical Services, LLC

RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES WSMR-62 (SWMU 82)

1.0 INTRODUCTION

This RCRA Monitoring Plan addresses the requirements identified in the New Mexico Environment Department (NMED) letter of 24 August 2007, *Notice of Disapproval, RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001.*

The 24 August 2007 letter is a continuation and amplification of a previous NMED letter of 7 August 2006, *NMED Response to the White Sands Missile Range (WSMR) Comment Response Letter Regarding the Evaluation of Monitored Natural Attenuation (MNA) STP Ditches (SWMUs 82 and 83) White Sands Missile Range, EPA ID NO. NM2750211235 HWB-WSMR-99-007.*

The current document has been modified to incorporate the contents of NMED 18 March 2008 letter, *Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001,* and NMED 25 March 2008 E-mail message, *Monitoring plan clarifications – STP Ditches*.

A copy of each of these letters is provided in Appendix A, together with the relevant WSMR response-to-comments document.

SWMUs 82 and 83 were administratively combined as SWMU 82 and designated as Surface Impoundment(SI)-3, per *Final Settlement Agreement No. HRM-00-05(A)*, 4 Dec 2000.

This plan constitutes a monitoring plan, as defined in 20NMAC4.2.7.Y. The Monitoring Plan format has been tailored to focus on the specific actions involved.

2.0 SITE DESCRIPTION

The focus of this study is to address groundwater contamination at the former Sewage Treatment Plant (STP) percolation ditches and effluent impoundment area. From 1958 to 1967, sewage effluent from the STP was initially discharged to a natural surface drainage channel. From 1967 to 1986, the effluent was diverted to one of two parallel drainage ditches. Each of the drainage areas channeled effluent from the STP to impoundment areas which acted as evaporation and percolation beds. For almost thirty years, a significant amount of effluent was reportedly discharged to these areas.

2.1 Location

The immediate area around the former STP discharge ditches is undeveloped, with the Main Post Landfill (MPL) to the northeast and the STP to the west. The Main Post Headquarters and residential areas are located approximately three miles west of the STP ditches. A site map of the immediate area around SWMUs 82 and 83 is provided in Figure 2-1.

2.2 Hydrogeology

The former STP Percolation Ditches are located on the distal portion of the alluvial fan extending eastward from the Organ Mountains. Sediments consist of varying layers of sands and clays to below the zone of interest, becoming somewhat more fine-grained to the east (toward the center of the Tularosa Basin). Depth to groundwater varies from roughly 170 to 250 feet below land surface. Measured potentiometric surface elevations suggest a groundwater flow direction to the southeast. The configuration of the land surface and the water table (based on measurements taken in 1999) is shown in Figure 2-2. As a conceptual model, little change appears to have occurred in the interim.

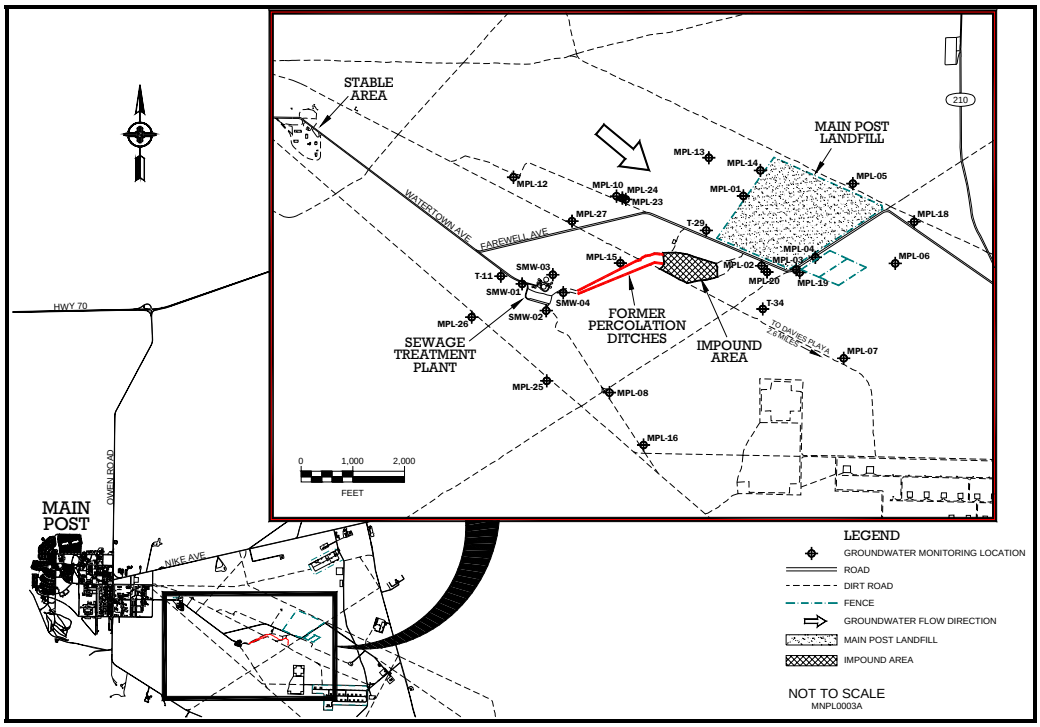

FIGURE 2-1. SWMU 82 SITE MAP.

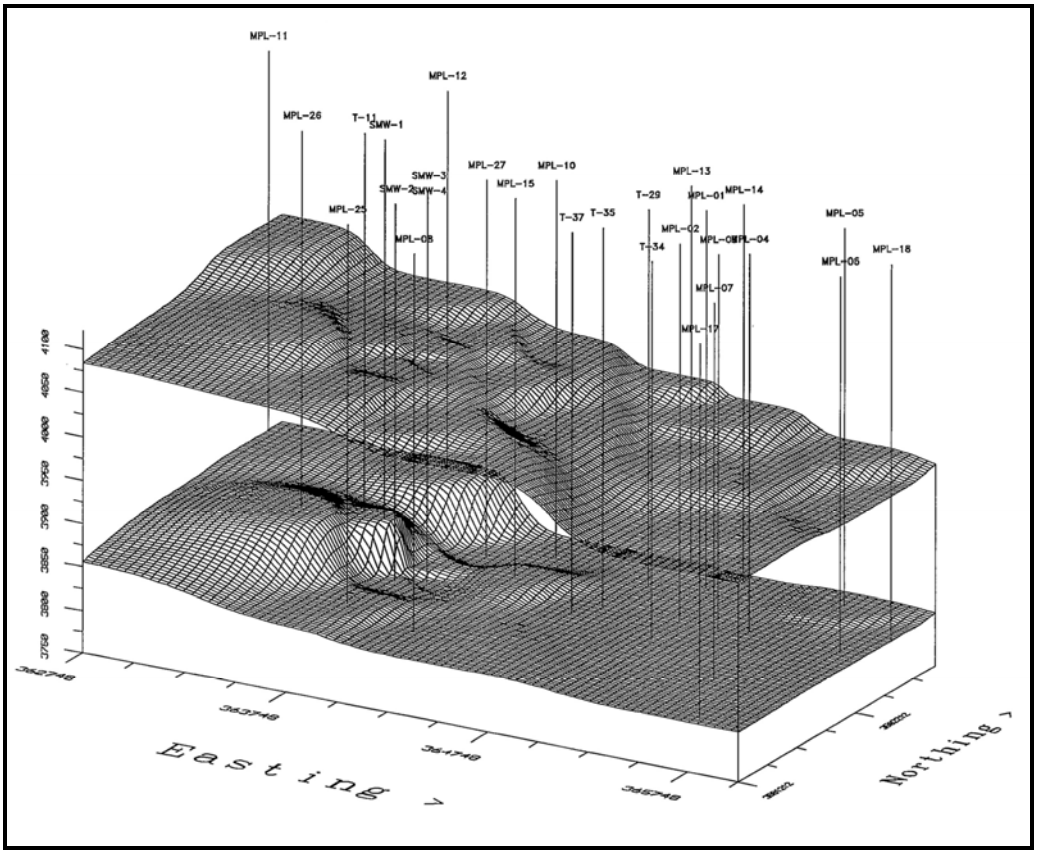

FIGURE 2-2. TOPOGRAPHY OF LAND SURFACE AND WATER TABLE IN THE VICINITY OF THE FORMER STP PERCOLATION DITCHES

3.0 PREVIOUS INVESTIGATIONS

Total cyanide concentrations in groundwater at WSMR were first identified during the groundwater monitoring program at the Main Post Landfill (MPL) in June 1996 (MEVATEC 1997a). Other investigative activities are described below.

3.1 Site Investigations

The former STP Percolation Ditches (SWMU 82) were studied as part of the Phase I (IT Corporation 1992) and Phase II (Sverdrup Environmental, Inc. 1994) RCRA Facility Investigations (RFIs). In response to the Phase I and Phase II RFI soil sampling results, approximately 4,000 cubic yards (3,058 cubic m) of surface soils from the parallel drainage ditches and impoundment areas were excavated from March through April 1997 (Radian 1997). Following the groundwater monitoring program at the MPL, two additional studies were conducted to provide additional information regarding the extent and possible source area of the cyanide groundwater concentrations (MEVATEC 1997b and MEVATEC 1999). Most recently, three additional monitor wells (MPL 28-30) were installed at the request of NMED (WTS 2005).

3.2 Corrective Measures Studies

A Corrective Measures Study (CMS) was published in 2000 (MEVATEC 2000), based on the findings of the previous studies. An addendum to the CMS, expanding on the preferred alternative of Monitored Natural Attenuation (MNA) was published in 2004 (BAE Systems 2004).

4.0 CURRENT CONDITIONS

The current distribution of cyanide is a relict of the former mounding caused by the recharge from the STP Ditches resulting in a greater hydraulic gradient and transport mechanism during their time of use. Once the water supply was cut off, the system slowed to near-static conditions (current conditions). These current conditions are illustrated in Figure 2-2, above, which shows both the low gradient across most of the site as well as the groundwater ridge which bounds the system to the west. The former STP Percolation Ditches are in the east-central portion of the figure, near well T-35.

5.0 SCOPE OF WORK

The monitoring plan scope is described below.

Planned Scope: WSMR will continue the ongoing groundwater monitoring program, with sampling scheduled to occur on a semi-annual basis, usually in December and June of each year. This program was initiated in 2005. The wells to be sampled are shown in Table 5-1, below. The analytical parameters are as shown in Table 5-2, below.

Two sampling events incorporating analyses for volatile organic compounds (VOCs) have been conducted. Since no VOCs have been detected, analysis for them has been deleted from the sampling program.

At the present time, WSMR has no ready explanation for the apparent anomalies in dissolved oxygen values reported, nor do we have recorded difficulties with data collection. Sampling preparations, collection techniques, and recordkeeping have been double-checked and observed by third parties with no anomalies noted. Examination of the sampling record shows that, while there were anomalies reported during 2005, there have been no obvious problems since. We intend to continue to carefully follow sampling and measurement protocols in order to discover and correct any problems. Care will be taken to insure that field measurements are collected properly (equipment calibration and sampling technique).

Sampling and data collection procedures are presented in the cited and provided SOPs, which are appropriate for the site and the assigned tasks. Relevant WTS SOPs (provided in Appendix B) are:

SOP 1 **Field Quality Program**
SOP 1.1 - Chain of Custody
SOP 1.2 - Field Activity Documentation
SOP 2 **Sample Handling, Packing, and Shipping**
SOP 2.1 - Sample Labeling
SOP 2.2 - Sample Numbering
SOP 2.3 - On-Site Sample Storage
SOP 4 **Calibration and Maintenance of Field Instrumentation**
SOP 4.1 - Field Instrument
SOP 5 **Water Level Measurements in Monitoring Wells**
SOP 6 **Field Equipment Decontamination**
SOP 9.3 **Low-Flow Groundwater Sampling**
SOP 13 **Field Quality Control Sampling**
SOP 14 **Management of Investigation-Derived Waste**
SOP 16 **Quality Inspection and Inspection Records**

Monitoring equipment to be used includes various nitrogen gas-powered bladder pumps and controllers for low-flow sampling. Discharge tubing is dedicated to each well, separately bagged and labeled between events. For the shallower wells, pumps with disposable bladders (such as QED Sample-Pro) are used, so that only new parts contact the sample. For the deeper wells (greater than 300'), a high-lift bladder pump is used and decontaminated between wells.

For each sampling event, 26 wells are sampled; three wells are sampled in duplicate; and three wells are sampled in duplicate for laboratory matrix-spike analyses. An equipment blank is collected to document decontamination of the deep-well bladder pump.

TABLE 5-1. PLANNED MONITORING PROGRAM – SEMIANNUAL SAMPLING FREQUENCY

Well ID	Type	Depth Category	Notes
MPL01	Center plume	interface	Required for landfill monitoring program
MPL02	Center plume	interface	Required for landfill monitoring program
MPL03	Center plume	interface	maintain as part of southern nested well group and required for landfill monitoring program
MPL04	Center plume	interface	Required for landfill monitoring program
MPL05	Center plume	interface	maintain as part of northeast nested well group
MPL06	Plume edge	interface	maintain for monitoring potential eastward plume movement
MPL07	Center plume	interface	n/a
MPL10	Center plume	interface	maintain as part of northwest nested well group
MPL13	Plume	interface	n/a
MPL16	Plume edge	interface	n/a
MPL17	Plume edge	interface	maintain for monitoring potential eastward plume movement
MPL18	plume edge	interface	maintain for monitoring potential eastward plume movement
MPL19	center plume	deep-level	maintain as part of southern nested well group

TABLE 5-1. PLANNED MONITORING PROGRAM – SEMIANNUAL SAMPLING FREQUENCY			
Well ID	**Type**	**Depth Category**	**Notes**
MPL20	center plume	mid-level	maintain as part of southern nested well group
MPL21	center plume	deep-level	maintain as part of northeast nested well group
MPL22	center plume	mid-level	maintain as part of northeast nested well group
MPL23	center plume	deep-level	maintain as part of northwest nested well group
MPL24	center plume	mid-level	maintain as part of northwest nested well group
MPL25	plume edge	interface	maintain for monitoring potential southwest plume movement
MPL26	up gradient	interface	Keep sampling as background comparison
MPL28	center plume	interface	New well 2005
MPL29	plume edge	interface	New well 2005
MPL30	plume edge	interface	New well 2005
SMW01	up gradient	mid-level	n/a
SMW04	plume edge	interface	n/a
T40	down gradient	interface	[Existing] Sentinel well down-gradient
Center plume wells within area of plume HISTORICALLY above 0.2 mg/L total cyanide. Plume wells are those consistently within the defined plume, but outside of the 0.2 mg/L isopleth. Plume edge wells are those wells located on or near the 0.0 mg/L total cyanide isopleth.			

TABLE 5-2. PLANNED ANALYTICAL PROGRAM		
PARAMETER	**REFERENCE METHOD**	**METHOD TYPE**
FIELD PARAMETERS		
pH	SM 4500-H^+ B	Field / Probe
Conductivity	SM 2510 B	
Turbidity	SM 2130 B	
Dissolved Oxygen	SM 4500-O G	
Temperature	SM 2550 B	
Oxidation Reduction Potential	SM 2580 B	
ORGANICS		
NONE		
CYANIDE		
Total and amenable	SM 4500-CN C,E and SM 4500-CN^- G	Distillation
Free cyanide	SW846 9213	Electrode
OTHER ANALYSES		
Dissolved ions		
Chloride Fluoride Sulfate	EPA 300.0	Ion chromatography

TABLE 5-2. PLANNED ANALYTICAL PROGRAM			
PARAMETER		**REFERENCE METHOD**	**METHOD TYPE**
Nutrients			
Ammonia (NH_3+NH_4) Nitrate/nitrite (NO_3+NO_2)		EPA 350.1 SM 4500	Colorimetric Cd column
Water quality			
pH Specific conductance Residue, dissolved (TDS) Bicarbonate & carbonate (alkalinity)		EPA 150.1 EPA 120.1 EPA 160.1 EPA 310.1	Electrometric Conductivity meter Gravimetric Titrimetric
TOTAL METALS			
Antimony Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper	Lead Nickel Selenium Silver Thallium Tin Vanadium Zinc	SW846 6010A	Inductively coupled Plasma emission Spectroscopy
Mercury (total)		SW846 7470A	Atomic absorption Cold vapor

6.0 REPORTS OF FINDINGS

The results of the field efforts described above will be reported and incorporated into future documents. The results of the ongoing ground water sampling events will be reported through the existing series of long-term monitoring reports for WSMR.

7.0 SCHEDULE OF IMPLEMENTATION

The groundwater monitoring program described in Section 5.0 has been initiated.

REFERENCES

NMED 2006a. *NMED Response to the White Sands Missile Range (WSMR) Comment Response Letter Regarding the Evaluation of Monitored Natural Attenuation (MNA) STP Ditches (SWMUs 82 and 83) White Sands Missile Range, EPA ID NO. NM2750211235 HWB-WSMR-99-007.* 7 August 2006.

NMED 2007. *Notice of Disapproval, RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001.* 24 August 2007.

NMED 2008a. *Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.*

NMED 2008b. E-mail message, *Monitoring plan clarifications – STP Ditches*, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008.

APPENDIX A

NMED Letters and WSMR Responses

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone (505) 428-2500
Fax (505) 428-2567
www.nmenv.state.nm.us

BILL RICHARDSON
GOVERNOR

RON CURRY
SECRETARY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

August 7, 2006

Thomas A. Ladd
Director, Environment and Safety Directorate
100 Headquarters Avenue
White Sands Missile Range, New Mexico 88002-5000

RE: NMED RESPONSE TO THE WHITE SANDS MISSLE RANGE (WSMR) COMMENT RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) STP DITCHES (SWMUs 82 AND 83) WHITE SANDS MISSLE RANGE, EPA ID NO. NM2750211235 HWB-WSMR-99-007

Dear Mr. Ladd:

The New Mexico Environment Department (NMED) has reviewed the comment response letter referenced above and associated summary data table dated April 27, 2006. NMED has determined that White Sands Missile Range (WSMR) (Permittee) has not collected data critical to demonstrating that monitored natural attenuation (MNA) is an acceptable remediation method for this site. The Permittee must address the following comments in order to support any action other than conducting active remediation to reduce cyanide concentrations in groundwater.

COMMENT 1

The Permitee must survey all existing monitoring wells to a common coordinate system. In addition, all monitoring wells must have a surveyed permanent notch or other permanent mark fixed in the riser to provide reliable measuring points prior to collecting groundwater measurements.

Rid 8/9/06

The horizontal and vertical coordinates of the top of each monitoring well casing and the ground surface at each monitoring well location shall be determined by a registered New Mexico professional land surveyor in accordance with the State Plane Coordinate System (NMSA 1978 47-1-49-56 (Repl. Pamp. 1993)). The surveys must be conducted in accordance with Sections 500.1 through 500.12 of the Regulations and Rules of the Board of Registration for Professional Engineers and Surveyors Minimum Standards for Surveying in New Mexico. Horizontal positions shall be measured to the nearest 0.1-ft, and vertical elevations shall be measured to an accuracy of 0.01-ft. The Permittee must prepare site map(s), certified by a registered New Mexico professional land surveyor, presenting all surveyed locations and elevations including relevant site features and structures for submittal with all associated reports to NMED.

Other site attributes (e.g., soil sample locations, sediment sample locations, springs, outfalls, pertinent structures, monitoring stations, as well as staked out sampling grids), may be located by using the global positioning system (GPS), another NMED-approved surveying system, or by using a registered New Mexico Registered Land Surveyor using the methods described in the paragraph above. If using GPS, horizontal locations must be measured to 0.5 ft. The Permittee must provide NMED a statement of accuracy for survey data upon request.

COMMENT 2

It is evident that there are inconsistencies in groundwater elevation measurements specifically for measurements taken at wells MPL-26 (elevation 3885.25 ft) and MPL-25 (3825.21 ft). These wells are approximately 2000 ft apart with a 60 ft vertical elevation difference; although the hydraulic gradient at the site is estimated to be significantly less than 0.03 ft/ft.

After all wells have been evaluated and resurveyed, groundwater elevation measurements must be collected from all monitoring wells, including those proposed for abandonment, with the exception of the dry wells. All measurements must be obtained within a 48 hour period (refer to Comment 1 for further details). WSMR must also inspect the integrity of all monitoring wells during the survey.

COMMENT 3

In the WSMR Comment Response Table, the Permittee proposed to discontinue monitoring the following wells: MPL08, MPL11, MPL12, MPL14, MPL27, SMW02, and SMW03.

If these wells are still competent, the Permittee must not abandon them. Since there are relatively large distances between wells at this site, these wells must be included in the network of wells to be surveyed and used for the collection of groundwater elevation measurements.

COMMENT 4
The Permittee must collect the following from the appropriate wells and submit results to NMED: dissolved oxygen, oxidation reduction potential, nitrate, total dissolved solids, pH, temperature, conductivity, metals (target analyte list metals only), total cyanide, free cyanide, amendable cyanide and ammonia. During the first sampling event, the Permittee must sample for VOCs. If VOCs are not detected, the Permittee may discontinue sampling for VOCs during subsequent sampling events. The Permittee must propose the wells to be sampled in the Work Plan. The Work Plan must include analysis for all of the constituents listed along with the proposed sampling methods and procedures.

COMMENT 5
The Permittee must perform slug tests on the following wells: MPL-17, SMW-03, and MPL-02. Results from the tests must be submitted to NMED within 90 days after NMEDs approval of the Work Plan requested in this letter. The slug tests at each well must include both falling head and rising head tests.

The Permittee must submit specific data for each test and a description of the testing processes including any slug tests conducted prior to this request. Based on the results of this hydraulic testing, the Permittee must explain why the plume has traveled more than one mile from the source area.

COMMENT 6
In the 2005 Field Water Quality Parameters Tables C-1 to C-3 from the 2005 Groundwater Monitoring Program Report, reported dissolved oxygen levels appear to be somewhat uncharacteristic for the area.

The Permittee must provide an explanation for these dissolved oxygen level measurements. The Permittee must also explain how the data was collected and any data collection problems that were experienced during field activities.

COMMENT 7
NMED has reviewed the historic data referenced in previous reports by the Permittee. This historic data appears to be unreliable, specifically relating to groundwater velocity and the rate of plume migration. NMED requires that the Permittee provide information regarding the current aquifer conditions in the vicinity of the Sewage Treatment Plant (STP) Ditches and associated contaminant migration. (See Comment 5)

COMMENT 8
WSMR must submit engineering drawings of the STP. The drawings must include influent and effluent piping schematics and pipeline maps, as well as structures associated with the site.

Within 120 days of receipt of this letter the Permittee must submit a work plan proposing investigation activities that will address the comments included in this letter. In summary the Work Plan should include the following: procedures for measuring groundwater elevations, survey techniques, sampling methods and procedures, and slug test procedures and techniques. The work plan must also include a response letter that addresses the remainder of the comments in this letter cross-referencing NMED's numbered comments.

If you have any questions concerning this letter, please contact Tammy Diaz of my staff at 505-428-2552.

Sincerely,

for James P. Bearzi
Bureau Chief
Hazardous Waste Bureau

JPB:td

cc: Dave Cobrain, NMED HWB
Tammy Diaz, NMED HWB
C. Frischkorn, NMED HWB
L. King, EPA Region 6 (6PD-N)
Jose Gallegos, WSMR
File: Reading File & WSMR 2006 File

DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON WHITE SANDS
100 Headquarters Avenue
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5000

13 OCT 2006

REPLY TO
ATTENTION OF

Office of the Garrison Commander

Mr. James Bearzi
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Subject: WSMR Response to August 2006 NMED Letter Concerning the Former STP Percolation Ditches (IRP Site WSMR-62; SWMU 82 and 83) and Time Extension Request

Dear Mr. Bearzi:

This letter is in response to your August 7, 2006 letter with subject matter *NMED Response to the White Sands Missile Range (WSMR) Comment Response Letter Regarding the Evaluation of Monitored Natural Attenuation (MNA), STP Ditches (SWMU 82 and 83).* Our responses to individual comments are included in the attached response table (1 print copy). The response table will also be provided to you via email.

WSMR will provide a work plan as requested in your letter. However, due to the current workload presented by the HELSTF Phase III RCRA Facility Investigation, **we request a time extension of an additional 120 days for work plan submittal.** If granted, the work plan would be provided by April 2007. The time extension would allow our staff adequate time to fully address your concerns, obtain funding required for contractual support, and provide a comprehensive and complete plan.

Finally, given the site's complexities, we propose a face-to-face discussion to clarify technical issues and the path forward. The meeting can take place in early December or some other mutually agreeable time.

We look forward to working with your staff in accomplishing a sound, satisfactory and mutually agreeable resolution for this site.

The following certification is provided as required by our permit and according to NMAC 20.4.1.900, incorporating 40 CFR 270.11:

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

Copies furnished, with enclosure (1 print copy), to Ms. Cheryl Frischkorn, NMED-HWB; Mr. T.A. Ladd, WSMR; Mr. Chuck Hendrickson, Region VI EPA; Mr. Bill Davis, U.S. Army Environmental Center; and, without enclosure, to Mr. John Kieling, NMED-HWB; and White Sands Technical Services, LLC.

Should you have any questions regarding this matter, please contact Mr. Jose Gallegos of our Environmental Compliance office at (505) 678-1007.

Sincerely,

Gary D. Griebel
Colonel, U.S. Army
Commanding

Enclosure

WSMR response to **NMED RESPONSE TO THE WHITE SANDS MISSILE RANGE (WSMR) COMMENT RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) STP DITCHES (SWMUs 82 AND 83) WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235 HWB-WSMR-99-007, 7 August 2006**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
1		The Permittee must survey all existing monitoring wells to a common coordinate system. In addition, all monitoring wells must have a surveyed permanent notch or other permanent mark fixed in the riser to provide reliable measuring points prior to collecting groundwater measurements. The horizontal and vertical coordinates of the top of each monitoring well casing and the ground surface at each monitoring well location shall be determined by a registered New Mexico professional land surveyor in accordance with the State Plane Coordinate System (NMSA 1978 471-49-56 (Repl. Ramp. 1993)). The surveys must be conducted in accordance with Sections 500.1 through 500.12 of the Regulations and Rules of the Board of Registration for Professional Engineers and Surveyors Minimum Standards for Surveying in New Mexico. Horizontal positions shall be measured to the nearest 0.1-ft, and vertical elevations shall be measured to an accuracy of 0.01-ft. The Permittee must prepare site map(s), certified by a registered New Mexico professional land surveyor, presenting all surveyed locations and elevations including relevant site features and structures for submittal with all associated reports to NMED. Other site attributes (e.g., soil sample locations, sediment sample locations, springs, outfalls, pertinent structures, monitoring stations, as well as staked out sampling grids), may be located by using the global positioning system (GPS), another NMED-approved surveying system, or by using a registered New Mexico Registered Land Surveyor using the methods described in the paragraph above. If using GPS, horizontal locations must be measured to 0.5 ft. The Permittee must provide NMED a statement of accuracy for survey data upon request.		WSMR will contract a licensed professional surveyor to acquire the requested well data. The deliverable will be a table of well locations and elevations, prepared to the required accuracy and certified by the licensed professional surveyor. We propose to overlay the survey results on a site map prepared from the WSMR GIS database. This will provide a site map with rich detail while complying with the referenced standards. The WSMR GIS is compliant to the Spatial Data Standards for Facilities, Infrastructure, and the Environment (SDSFIE), version 2.500, promulgated by the US Army Corps of Engineers CADD/GIS Technology Center. The Standards (SDS) provide basic data standards for use with geographic information system (GIS),and similar computerized geospatial data systems. They should provide for locational data equivalent to that provided by the licensed surveyor.

WSMR response to **NMED RESPONSE TO THE WHITE SANDS MISSILE RANGE (WSMR) COMMENT RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) STP DITCHES (SWMUs 82 AND 83) WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235 HWB-WSMR-99-007, 7 August 2006**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
2		It is evident that there are inconsistencies in groundwater elevation measurements specifically for measurements taken at wells MPL-26 (elevation 3885.25 ft) and MPL-25 (3825.21 ft). These wells are approximately 2000 ft apart with a 60 ft vertical elevation difference; although the hydraulic gradient at the site is estimated to be significantly less than 0.03 ft/ft. After all wells have been evaluated and resurveyed, groundwater elevation measurements must be collected from all monitoring wells, including those proposed for abandonment, with the exception of the dry wells. All measurements must be obtained within a 48 hour period (refer to Comment I for further details). WSMR must also inspect the integrity of all monitoring wells during the survey.		There are apparent ambiguities with the observations in this well pair. WSMR believes these to be representative of the groundwater ridge between the WSMR well field and the basin, proper. This ridge has been documented and described in previous documents (see separate discussion). These anomalous observations in Wells MPL 25 and 26 should not be an impediment to understanding the cyanide site as a whole. WSMR will plan and conduct a synoptic water level survey. Details will be presented in the work plan. The requirement to inspect the integrity of the wells will require some additional planning. Details of the proposed inspection process will be provided in the forthcoming work plan.
3		In the WSMR Comment Response Table, the Permittee proposed to discontinue monitoring the following wells: MPL08, MPL11, MPL12, MPL14, MPL27, SMW02, and SMW03. If these wells are still competent, the Permittee must not abandon them. Since there are relatively large distances between wells at this site, these wells must be included in the network of wells to be surveyed and used for the collection of groundwater elevation measurements.		Agree. WSMR has no active plans for well abandonment.

WSMR response to **NMED RESPONSE TO THE WHITE SANDS MISSILE RANGE (WSMR) COMMENT RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) STP DITCHES (SWMUs 82 AND 83) WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235 HWB-WSMR-99-007, 7 August 2006**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
4		The Permittee must collect the following from the appropriate wells and submit results to NMED: dissolved oxygen, oxidation reduction potential, nitrate, total dissolved solids, pH, temperature, conductivity, metals (target analyte list metals only), total cyanide, free cyanide, amendable cyanide and ammonia. During the first sampling event, the Permittee must sample for VOCs. If VOCs are not detected, the Permittee may discontinue sampling for VOCs during subsequent sampling events. The Permittee must propose the wells to be sampled in the Work Plan. The Work Plan must include analysis for all of the constituents listed along with the proposed sampling methods and procedures.		WSMR has sampled and analyzed the monitor wells associated with the former STP Percolation Ditches for VOCs from 2000 through 2003. No VOCs were detected. Since then, only wells MPL-01 – 04 have been sampled for VOCs, in support of the Main Post Landfill monitoring program. Only acetone (present in the trip blank at similar levels) and bromoform have occurred. Both have been at low levels and are not repeatable. We see no merit in resuming sampling and analysis for VOCs. Details of the continuing groundwater monitoring plan will be presented in the work plan. WSMR plans to use the same wells that have been used in the most recent sampling event. See the table at right. **Well Name** MPL01, MPL02, MPL03, MPL04, MPL05, MPL06, MPL07, MPL10, MPL13, MPL16, MPL17, MPL18, MPL19, MPL20, MPL21, MPL22, MPL23, MPL24, MPL25, MPL26, MPL28, MPL29, MPL30, SMW01, SMW04, T40
5		The Permittee must perform slug tests on the following wells: MPL-17, SMW-03, and MPL-02. Results from the tests must be submitted to NMED within 90 days after NMEDs approval of the Work Plan requested in this letter. The slug tests at each well must include both failing head and rising head tests. The Permittee must submit specific data for each test and a description of the testing processes including any slug tests conducted prior to this request. Based on the results of this hydraulic testing, the Permittee must explain why the plume has traveled more than one mile from the source area		The selected wells were all constructed with substantial artificial sand packs. As discussed in ASTM D5912, slug tests on sand-pack wells are of limited value. WSMR has discussed the implications of aquifer permeability at length in previous documents. The issue of aquifer permeability will be further discussed in the work plan. As has been explained previously, the current distribution of cyanide is a relict of the former mounding caused by the recharge from the STP Ditches resulting in a greater hydraulic gradient and transport mechanism in the past. Once the water supply was cut off, the system slowed to near-static conditions (current conditions). The origin and evolution of the current distribution of cyanide will be more fully explained in the work plan.

WSMR response to **NMED RESPONSE TO THE WHITE SANDS MISSILE RANGE (WSMR) COMMENT RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) STP DITCHES (SWMUs 82 AND 83) WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235 HWB-WSMR-99-007, 7 August 2006**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
6		In the 2005 Field Water Quality Parameters Tables C-1 to C-3 from the 2005 Groundwater Monitoring Program Report, reported dissolved oxygen levels appear to be somewhat uncharacteristic for the area. The Permittee must provide an explanation for these dissolved oxygen level measurements. The Permittee must also explain how the data was collected and any data collection problems that were experienced during field activities.		We do not understand the anomalies. Techniques, including calibration, seen to be in order. Somehow, air is being entrained in the pumping system. The issue will be further addressed in the work plan.
7		NMED has reviewed the historic data referenced in previous reports by the Permittee. This historic data appears to be unreliable, specifically relating to groundwater velocity and the rate of plume migration. NMED requires that the Permittee provide information regarding the current aquifer conditions in the vicinity of the Sewage Treatment Plant (STP) Ditches and associated contaminant migration. (See Comment 5)		WSMR believes that, properly interpreted, the available data provide a coherent, plausible, and acceptable description of current and past hydrogeologic conditions. These data provide an adequate basis for interpreting and predicting future conditions. Available information will be organized and discussed in the work plan.
8		WSMR must submit engineering drawings of the STP. The drawings must include influent and effluent piping schematics and pipeline maps, as well as structures associated with the site.		Drawings will be procured from the engineering files and provided in the work plan.
		Within 120 days of receipt of this letter the Permittee must submit a work plan proposing investigation activities that will address the comments included in this letter. In summary the Work Plan should include the following: procedures for measuring groundwater elevations, survey techniques, sampling methods and procedures, and slug test procedures and techniques. The work plan must also include a response letter that addresses the remainder of the comments in this letter cross-referencing NMED's numbered comments.		A Work Plan will be prepared. WSMR is requesting a 120-day delay in delivering the work plan, since the principal investigator for the STP Percolation Ditches is also in charge of the current HELSTF Phase III RFI. The document would be scheduled for delivery on or before 3 April 2007.

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone (505) 476-6000
Fax (505) 476-6030
www.nmenv.state.nm.us

BILL RICHARDSON
GOVERNOR

RON CURRY
SECRETARY

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

December 8, 2006

Thomas A. Ladd
Director, Environment and Safety Directorate
100 Headquarters Avenue
White Sands Missile Range, New Mexico 88002-5000

RE: WHITE SANDS MISSLE RANGE (WSMR)
NOTICE OF DEFICIENCY RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) AT STP DITCHES (SWMU 82 AND 83).
WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235
HWB-WSMR-99-007

Dear Mr. Ladd:

The New Mexico Environment Department (NMED) has reviewed White Sands Missile Range's (the Permittee) response to NMED's Notice of Deficiency (NOD) dated October 23, 2006. NMED does not approve monitored natural attenuation (MNA) as an acceptable remediation method for this site at this time. The Permittee must address the following comments:

COMMENT 1

(Permittee Response #4): Reiterating what was stated in NMED's August 7, 2006 letter, the Permittee must collect the following information from the wells located within a two-mile radius of the STP Ditches and submit results to NMED no later than January 30, 2007: dissolved oxygen, oxidation reduction potential, nitrate, total dissolved solids, pH, temperature, conductivity, metals (target analyte list metals only), total cyanide, free cyanide, amendable cyanide, and ammonia. Although the Permittee states that it sees no "merit" in sampling for Volatile Organic Compounds (VOCs), NMED requires that the Permittee sample all of the wells for VOCs. However, if VOCs are not detected, the Permittee may discontinue sampling for

VOCs during subsequent groundwater sampling events. NMED requires up-to-date and current data to assess natural attenuation processes. Initial VOC sampling must therefore be included to characterize current groundwater conditions at the site.

COMMENT 2

(Permittee Response #5): The Permittee has stated that "slug tests on sand-pack wells are of limited value"; NMED concurs with this conclusion. If the Permittee believes that a slug test will not provide adequate data regarding the aquifer characteristics at the site, then the Permittee must select another method for obtaining representative aquifer characteristics (e.g., step test, pump test). These tests must be conducted utilizing multiple wells including but not limited to use of MPL-17, SMW-03 and MPL-02 as pumping wells. The Permittee must identify and describe the chosen test method and wells to be used for each test in the required Work Plan.

COMMENT 3

(Permittee Response #5): The Permittee states that "the current distribution of cyanide is a relict of the former mounding caused by the recharge from the STP ditches…." The Permittee is referencing the Sedillo, 1969 document that discusses the groundwater mound and the plume migration. While the Sedillo study provides useful information, it is not an acceptable reference for current hydrogeologic conditions at the site for the reason that it is a 40 year old document and conditions may have changed. NMED requires that the Permittee address current hydrogeologic conditions for plume migration with current empirical data.

COMMENT 4

(Permittee Response #7): NMED does not concur with the idea that "properly interpreted" data can be inferred from a 1969 reference. The Permittee must collect current data for interpreting hydrogeologic conditions at the site. This information must be included in the required Work Plan to be approved by NMED. See also Comment 3.

The Permittee has requested an extension for the submittal of the Work Plan in the letter dated October 23, 2006. NMED hereby approves the extension. The Permittee must submit a Work Plan that includes actions to comply with the above comments by April 27, 2007. The work plan must also include a response letter that addresses the remainder of the comments in this letter cross-referencing NMED's numbered comments.

Failure to address the comments above will result in NMED's rejection of MNA as a viable remedy for these SWMUs. Moreover, NMED will require the Permittee to select a more aggressive method.

The NMED Hazardous Waste Bureau is in the process of switching to a new phone system. On or about December 7, 2006 the phone number for Ms. Diaz-Martinez will change from the current number (505) 428-2552 to the new number (505) 476-6056. The NMED Hazardous Waste Bureau's main number will be (505) 476-6000. If you have any questions concerning this letter, please contact Tammy Diaz-Martinez of my staff.

Sincerely,

James P. Bearzi
Chief
Hazardous Waste Bureau

JPB:tdm

cc: J. Kieling, NMED HWB
D. Cobrain, NMED HWB
T. Diaz-Martinez, NMED HWB
C. Frischkorn, NMED HWB
L. King, EPA Region 6 (6PD-N)
Jose Gallegos, WSMR
File: WSMR 2006 and Reading File
WSMR-99-007

WSMR response to **WHITE SANDS MISSILE RANGE (WSMR) NOTICE OF DEFICIENCY RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) AT STP DITCHES (SWMU 82 AND 83). WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235 HWB-WSMR-99-007, December 8, 2006**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
NMED introductory remarks.		The New Mexico Environment Department (NMED) has reviewed White Sands Missile Range's (the Permittee) response to NMED's Notice of Deficiency (NOD) dated October 23, 2006. NMED does not approve monitored natural attenuation (MNA) as an acceptable remediation method for this site at this time. The Permittee must address the following comments:		As discussed during the December 5, 2006 conference call, WSMR will be preparing two documents: a straightforward RCRA Facility Investigation Work Plan that describes field efforts to be accomplished in direct response to NMED requests; and a complete revision to the 2000 Corrective Measures Study (CMS). Insofar as it is practicable, discussions of issues will be deferred to the CMS. Field work can commence after the Work Plan is approved. The revised CMS is in preparation.
1		**(Permittee Response #4):** Reiterating what was stated in NMED's August 7, 2006 letter, the Permittee must collect the following information from the wells located within a two-mile radius of the STP Ditches and submit results to NMED no later than January 30, 2007: dissolved oxygen, oxidation reduction potential, nitrate, total dissolved solids, pH, temperature, conductivity, metals (target analyte list metals only), total cyanide, free cyanide, amendable cyanide, and ammonia. Although the Permittee states that it sees no "merit" in sampling for Volatile Organic Compounds (VOCs), NMED requires that the Permittee sample all of the wells for VOCs. However, if VOCs are not detected, the Permittee may discontinue sampling for VOCs during subsequent groundwater sampling events. NMED requires up-to-date and current data to assess natural attenuation processes. Initial VOC sampling must therefore be included to characterize current groundwater conditions at the site.		1. Note that VOC data are available (and have been reported to NMED) for 2000 – 2003. Additionally, VOC data for wells MPL01 – 04 have been reported for 2004 and 2005. 2. The requirement to present the data by January 30, 2007 is not supportable. We are initiating the next round of routine sampling (26 wells, new analytical schedule) in mid- to late-January. A request for an extension will be filed to allow the data from the January 2007 sample event to support this requirement. 3. VOCs will be added to analytical schedule, as requested, with the provision that such analyses will be continued only if VOCs are detected.
2		**(Permittee Response #5):** The Permittee has stated that "slug tests on sand-pack wells are of limited value"; NMED concurs with this conclusion. If the Permittee believes that a slug test will not provide adequate data regarding the aquifer characteristics at the site, then the Permittee must select another method for obtaining representative aquifer characteristics (e.g., step test, pump test). These tests must be conducted utilizing multiple wells including but not limited to use of MPL-17, SMW-03 and MPL-02 as pumping wells. The Permittee must identify and describe the chosen test method and wells to be used for each test in the required Work Plan.		1. For MPL-02 and -17, we will substitute single-well pump tests in lieu of the slug tests, but continue to use these wells as identified by NMED. SMW-03 is not productive enough to support a pump test, so a slug test will be performed. 2. All three of these wells are too far from their neighbors to allow measurable drawdown in adjacent wells. 3. Disposal of produced water is an issue. Disposal options will be presented in the Work Plan.

WSMR response to **WHITE SANDS MISSILE RANGE (WSMR) NOTICE OF DEFICIENCY RESPONSE LETTER REGARDING THE EVALUATION OF MONITORED NATURAL ATTENUATION (MNA) AT STP DITCHES (SWMU 82 AND 83). WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235 HWB-WSMR-99-007, December 8, 2006**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
3		**(Permittee Response #5):** The Permittee states that "the current distribution of cyanide is a relict of the former mounding caused by the recharge from the STP ditches...." The Permittee is referencing the Sedillo, 1969 document that discusses the groundwater mound and the plume migration. While the Sedillo study provides useful information, it is not an acceptable reference for current hydrogeologic conditions at the site for the reason that it is a 40 year old document and conditions may have changed. NMED requires that the Permittee address current hydrogeologic conditions for plume migration with current empirical data.		1. The Sedillo (1969) document was cited as a description of initial conditions, Contemporary hydrogeologic conditions across the site were reported in the 2000 CMS; data have been updated with each subsequent sampling event supporting the current conclusion that a relict condition still exists. 2. The synoptic water level measurements to be conducted under the Work Plan will further update the existing site information. 3. Discussion of current conditions and historical data will be deferred to the CMS.
4		**(Permittee Response** #7): NMED does not concur with the idea that "properly interpreted" data can be inferred from a 1969 reference. The Permittee must collect current data for interpreting hydrogeologic conditions at the site. This information must be included in the required Work Plan to be approved by NMED. See also Comment 3.		See response to Comment 3. Discussion of current conditions and historical data will be deferred to the CMS.
		The Perrnittee has requested an extension for the submittal of the Work Plan in the letter dated October 23, 2006. NMED hereby approves the extension. The Pennittee must submit a Work Plan that includes actions to comply with the above comments by April 27, 2007. The work plan· must also include a response letter that addresses the remainder of the comments in this letter cross-referencing NMED's numbered comments.		The Work Plan will be delivered as soon as practicable, but no later than April 27, 2007. Field work will be initiated within 30 days of receipt of Work Plan approval and, contingent upon funding, will be completed 120 days thereafter. Delivery of the CMS is to be determined.
		Failure to address the comments above will result in NMED's rejection of MNA as a viable remedy for these SWMUs. Moreover, NMED will require the Permittee to select a more aggressive method.		Noted.

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
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BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

RON CURRY
Secretary

CINDY PADILLA
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

March 18, 2008

T.A. Ladd
U.S. Army Garrison White Sands
100 Headquarters Avenue (B. 1510)
ATTN: IMSW-WSM-PW
White Sands Missile Range, NM 88002

RE: **REJECTION OF THE REVISED RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE EPA ID NO. NM2750211235 WSMR-07-001**

Dear Mr. Ladd:

The New Mexico Environment Department (NMED) has received the Department of the Army's (the Permittee) *Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82)* (Monitoring Plan), dated February 2008. The revised Monitoring Plan was required by NMED's Notice of Deficiency letter dated August 24, 2007. NMED has determined that the Permittee did not respond to the comments established in the NOD, but instead addressed a former NOD dated August 7, 2006. NMED hereby rejects the Monitoring Plan.

The Permittee must address all comments contained in the August 24, 2007 NOD and submit a revised Monitoring Plan. NMED will re-evaluate the Monitoring Plan once the required information is provided. The Permittee must submit the revised Plan by April 11, 2008.

If you have any questions regarding this letter, please contact Tammy Diaz-Martinez of my staff at (505) 476-6056.

Sincerely,

John E. Kieling
Program Manager
Permits Management Program
Hazardous Waste Bureau

cc: Dave Cobrain, NMED HWB
Tammy Diaz, NMED HWB
C. Frischkorn, NMED HWB
Jose Gallegos, WSMR

File: WSMR 2008 and Reading File
WSMR-07-001

William Little

From: Diaz, Tammy, NMENV [Tammy.Diaz@state.nm.us]
Sent: Tuesday, March 25, 2008 11:28 AM
To: Gallegos, Jose A Mr CIV USA IMCOM; wlittle@ws-tech.com
Cc: Frischkorn, Cheryl, NMENV; Cobrain, Dave, NMENV
Subject: Monitoring plan clarification-STP Ditches

Hello-I just wanted to provide some clarification for the February 2008 Monitoring Plan (MP). There are not many technical comments in the August 24, 2007 NOD that should be addressed in the revised MP; however, the comments that are currently in the MP as listed below are from the August 4, 2006 NOD and are also addressed in the 2008 Work Plan (WP):

Section 5.1 NMED's requirement is a WP type comment and should be removed from the MP, it does not address monitoring at the site. This comment has already been addressed in the 2/2008 Work Plan as well.

Section 5.2 this too is a WP type comment and has already been addressed in the 2/2008 WP, it should be removed from the MP.

Section 5.4 has also been incorporated in the WP and is not part of the MP.

Section 5.3 is from the August 7, 2006 NOD, but should still remain in the current MP, instead as presenting it as a quote from the 8/7/06 NOD, it should be presented as part of the proposed Groundwater Sampling Section, or the Permittee must include a statement that states that the comment is not addressing the 8/24/2007 NOD but the 8/04/2006 rather, for clarification to the readers.

The Permittee did not address Comment 2 from the 8/24/2007 NOD, this should be incorporated in the MP along with the corresponding response that is included in the Comment Response Table located in Appendix A of the 2008 MP.

Basically a Monitoring Plan should include proposed monitoring efforts for planned monitoring. Because the current 2008 MP is the same as the May 2007 Monitoring Plan, the comments that were required to be included in a separate Work Plan still remain in the Monitoring Plan, therefore the Permittee did not address the 8/24/2007 NOD.

The Comment Response Table included in Appendix A of the 2008 MP is in an Appendix and is not part of the actual Monitoring "Plan", typically readers do not refer to Appendices unless directed to, but for monitoring purposes a reader should be able to

pickup a monitoring plan read the body of the text and know what is being proposed for monitoring at a site.

I hope this provides some clarification for what should be included in a monitoring plan. If you have any questions please feel free to contact me. I will be in the office the rest of today, but will be out from March 26 through April 2, I will be back in the office on April 3.

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WSMR response to

1. **NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007.**
2. **NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.**
3. **NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.**

Comment Number		NMED Comments		WSMR Response and Discussion
NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007				
1		In Section 3.2 (Corrective Measures Studies), the Permittee states "[a] revised Corrective Measures Study (CMS) is currently (2007) in preparation which addresses current conditions, understandings and agency concerns." Solid Waste Management Unit (SWMU) 82 is a regulated unit and therefore a Closure Plan, rather than a CMS, is required to be submitted to NMED. This issue is being addressed in the June 11, 2007 White Sands Missile Range (WSMR) Draft Resource Conservation and Recovery Act (RCRA) Permit.		WSMR will cease preparation of the previously agreed-to revised CMS. Closure Plan issues will be addressed during negotiation concerning the draft RCRA Permit.
2		In Section 5.3 (Groundwater Sampling), the Permittee references NMED's Comment 6 of the August 7, 2006 Response Letter (located in Appendix A). In the letter, NMED asks the Permittee to provide an explanation for dissolved oxygen level measurements that appear to be uncharacteristic of possible groundwater conditions at the site. NMED also asks the Permittee to explain how the data was collected and if any data collection problems were encountered. The Permittee has not addressed this Comment in the current Monitoring Plan. The Permittee must address this issue in the revised Monitoring Plan.		At the present time, WSMR has no ready explanation for the apparent anomalies, nor do we have recorded difficulties with data collection. Sampling preparations, collection techniques, and recordkeeping have been double-checked and observed by third parties with no anomalies noted. Examination of the sampling record shows that, while there were anomalies reported during 2005, there have been no obvious problems since. We intend to continue to carefully follow sampling and measurement protocols in order to discover and correct any problems. Care will be taken to insure that field measurements are collected properly (equipment calibration and sampling technique). Sampling and data collection procedures are presented in the cited and provided SOPs, which are appropriate for the site and the assigned tasks. See Section 5.0, pages 3 – 4.
3		In Section 5.3 (Groundwater Sampling), page 5, the Permittee states "WSMR will continue the ongoing groundwater monitoring program, with sampling scheduled to occur on & semi-annual basis, usually in December and June of each Year.. -This Program was initiated in 2005 and is due for re-evaluation in 2010." The groundwater monitoring dates are subject to change based on pending requirements in the June 11, 2007 White Sands Missile Range RCRA Permit Draft. The Permittee must remove the reference to re-evaluation in 2010.		Noted.
4		In Section 5.3 (Groundwater Sampling), page 5, the Permittee states "[c]are will be taken to insure that field measurements are collected properly (equipment calibration and sampling technique)." The Permittee must include descriptions of proposed methods and procedures for sampling and data collection. The Permittee must also include a step test(s) to determine pumping rates at the well(s) proposed for constant discharge aquifer testing (listed in Table 5-1). The Permittee must provide a detailed description of these procedures in the aquifer characterization work plan submittal.		1) The requested information is provided in the supplied SOPs. 2) The proposed aquifer test will be addressed in a separate work plan and executed by the U.S. Geological Survey.

WSMR response to 1. **NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007.** 2. **NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.** 3. **NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
5		In Table 5-2 (Planned Analytical Program), the Permittee lists the proposed analytical methods for the sample analysis. The methods proposed for analysis of Volatile Organic Compounds (VOCs) and cyanide are not the most current according to Environmental Protection Agency (EPA) methods. The most current are Method 8260C for VOCs and Method 9010C for cyanide. Please refer to http://www.epa.gov/sw-846/new-meth.htm and http://www.epa.gov/fedfac/pdf/mra_hbook_5_05.pdf. The Permittee must revise the Monitoring Plan to propose using these updated analytical methods. This correction must also be included in the aquifer characterization work plan.		We acknowledge the new methods, but recognize that the guidance leaves it to our discretion, we will propose using new methods if readily available, and otherwise, current methods will continue to be used.
6		In Section 5.4 (Aquifer Testing), the Permittee references NMED' Comment 2 of the December 8, 2006 (located in Appendix A). In the response letter, NMED requires the Permittee to provide aquifer testing in multiple wells that include, but are not limited to, wells MPL-02, MPL-17 and SMW-03, In the Monitoring Plan the Permittee states "[t]hese wells are too far to allow measurable drawdown in adjacent wells." The Permittee must propose a well or wells that will allow for a multiple-well constant discharge test(s) in the area near SMW-03. The well or wells proposed for this study, along with a description of the detailed proposed aquifer testing, must be included in the aquifer characterization work plan.		Aquifer Testing details will be addressed in the separately provided Aquifer Characterization Work Plan.
7		In the Comment Response table (located in Appendix A) addressing NMED's Comment Response Letter dated August 7, 2006, and NMED's Notice of Deficiency (NOD), dated December 8, 2006, the Permittee states that a work plan is being prepared and will be submitted to NMED. The Permittee must include all proposed aquifer testing details in the aquifer characterization work plan to be submitted to NMED. Monitoring addressed in the Comment Response tables must be included in the revised Monitoring Plan.		By prior agreement with NMED [fonecon 18 April 2007, Gallegos / Frischkorn and follow-up C. Frischkorn e-mail message, 19 April 2007], the provided Monitoring Plan contained the planned aquifer testing program. However, the revised Monitoring Plan will not address aquifer tests. Aquifer testing details will be addressed in the separate Aquifer Characterization Work Plan.
8		The Permittee failed to provide the details for conducting any aquifer tests at the site. As stated in previous comments, the Permittee must submit an aquifer characterization work plan for NMED's approval that provides the details for conducting aquifer tests at a minimum of four wells, including at least one multiple well constant discharge test.		See responses to Comments 4 and 7.

WSMR response to 1. **NMED NOTICE OF DISAPPROVAL, RCRA MONITORING PLAN, FORMER STP PERCOLATION DITCHES, WSMR-62 (SWMU 82), WHITE SANDS MISSILE RANGE, EPA ID NO. NM2750211235, WSMR-07-001, 24 August 2007.** 2. **NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.** 3. **NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.**				
Comment Number		**NMED Comments**		**WSMR Response and Discussion**
9		In the Comment Response table (located in Appendix A) addressing NMED's Comment Response Letter, dated August 7, 2006, Comment 7, NMED requires that the Permittee provide reliable information to support current aquifer conditions at the site. In response to NMED's comment, the Permittee states "WSMR believes that, properly interpreted, the available data provide a coherent, plausible, and acceptable description of current and past hydrogeologic conditions. These data provide an adequate basis for interpreting and predicting future conditions." In the past, the Permittee has not provided current aquifer data; therefore, based on proposed investigations and results, the Permittee must therefore re-evaluate the data collected during the upcoming well characterization activities and develop a model of current hydrogeologic conditions. Results from this study must be included in the Closure Plan. (See Comment 1)		WSMR will conduct an additional aquifer test (as described in the separate Aquifer Characterization Work Plan) and will consider this new data with data previously collected (e.g., *Considerations of Aquifer Permeability in the Vicinity of the Former Sewage Treatment Plant (STP) Percolation Ditches*, WTS, May 2006) to describe aquifer conditions.
10		In the Comment Response table addressing NMED's NOD dated December 8, 2006 (Appendix A), the Permittee proposes to submit a Work Plan that describes proposed activities in response to NMED's request, as well as a complete CMS. As stated in Comment 1, the Permittee must submit a Closure Plan to NMED, not a CMS. This issue is being addressed in the WSMR Draft RCRA Permit dated, June 11, 2007.		See response to Comment 1.
NMED Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001, 18 March 2008.				
1		NMED has determined that the Permittee did not respond to the comments established in the NOD, but instead addressed a former NOD dated August 7, 2006. NMED hereby rejects the Monitoring Plan.		The ambiguity should be cleared up throughout the current version.
NMED E-Mail Message, Monitoring plan clarifications – STP Ditches, T. Diaz, NMED, to José Gallegos, WSMR, 25 March 2008, and 18 April 2008 telephone conversation, C. Frischkorn/J. Gallegos, further clarifying NMED comments.				
1		Discussion specified certain portions of the Monitoring Plan to be removed.		All such material has been removed.
2		Discussion questioned accuracy of citations for cyanide methods in Table 5-2.		Full method citations have been provided. WSMR has verified that appropriate methods are being employed.

APPENDIX B

Standard Operating Procedures

APPENDIX B

White Sands Technical Services, LLC, has a set of Standard Operating Procedures (SOPs) addressing common tasks. For each project, an SOP can be used, *verbatim*, or it can be modified to meet the needs of the specific program. Listed below are the SOPs to be used for execution of this Work Plan. The documents, themselves, are included on the following pages.

SOP 1 Quality Control Program

SOP 1.1 - Chain of Custody

SOP 1.2 - Field Activity Documentation

SOP 2 Sample Handling, Packing, and Shipping

SOP 2.1 - Sample Labeling

SOP 2.2 - Sample Numbering

SOP 2.3 - On-Site Sample Storage

SOP 4 Calibration and Maintenance of Measurement and Test Equipment

SOP 4.1 - Field Instrument

SOP 5 Water Level Measurements in Monitoring Wells

SOP 6 Field Equipment Decontamination

SOP 9.3 Low-Flow Ground Water Sampling

SOP 13 Field Quality Control Sampling

SOP 14 Management of Investigation-Derived Waste

SOP 15 Preparation, Revision, and Approval of Plans and Procedures

SOP 16 Quality Inspection and Inspection Records

FIELD QUALITY PROGRAM

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the Field Quality Program developed to implement the quality requirements applicable to the field activities at the various sites at White Sands Missile Range, New Mexico.

2.0 REFERENCES

None.

3.0 RESPONSIBILITIES

The Project Manager is responsible for the overall implementation of the Work Assignment Orders. He/she should establish and cultivate principles and practices that integrate field quality requirements into the daily work and provide individuals performing the work with proper information, tools, support, and encouragement to properly perform their assigned work. He/she will coordinate the preparation of project specific Quality Control Project Plans (QCPPs) (i.e., Sampling and Analysis Plans, Field Sampling Plans, etc.).

The Project Technical Manager, Technical Coordinator, and Project Chemist are responsible for assisting the Program Manager to assure that the project's goals and objectives are clearly stated and communicated to participating personnel. Each will provide direct oversight and coordination of operations in order to assure that they are suitably controlled, including acting on the behalf of the Program Manager in his/her absence. Each will prepare portions of project specific Quality Control Project Plans appropriate to his/her background and experience.

The Quality Assurance Officer is responsible for preparing the programmatic documents and applicable SOPs that describe the implementation of the requirements of the field work and related QC activities. He/She will assign project specific Quality Assurance Officers as appropriate, and provide oversight and assistance in the implementation of the SOPs.

4.0 DEFINITIONS/MATERIALS

Quality Control Project Plans (QCPPs) (i.e., Sampling and Analysis Plans, Field Sampling Plans, etc.)

5.0 PROCEDURE

The SOPs are designed to implement the quality requirements applicable to the program/project specific activities. The SOPs will be reviewed and approved by responsible management prior to their implementation.

Quality affecting SOPs prepared to perform work assignment orders are prepared and revised by technical personnel under the direction of the Project Environmental Engineer or Project Geologist and are reviewed and approved by the Program Manager, Quality Assurance Officer and as applicable by the Health and Safety Manager.

6.0 REQUIRED FORMS/DOCUMENTATION

None

CHAIN OF CUSTODY

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the method and responsibilities associated with the maintenance and custody of samples that are to be used to provide data that form a basis for making project related decisions. It outlines the general procedures for maintaining and documenting sample chain of custody from the time of sample collection through sample disposition.

2.0 REFERENCES

USEPA, Test Methods for Evaluating Hazardous Waste, (SW-846), current revision.

3.0 RESPONSIBILITIES

The Project Technical Manager or Technical Coordinator is responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Project Chemist is responsible for assuring that the proper chain of custody is initiated at the time the sample(s) are collected and maintained throughout the handling and subsequent transportation of the sample(s) to the designated laboratory. Additionally, the Project Chemist is the project authority for determining the disposition and fate of sample(s) that have identified deficiencies (e.g., missed holding times, elevated temperature at receipt, etc.).

The Quality Assurance Officer is responsible for periodic review of Chain of Custody records generated and other documentation associated with this SOP. The Quality Assurance Officer is also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader is responsible for properly documenting and maintaining the Chain of Custody from the time of sample collection until the sample is delivered to the laboratory.

Laboratory Personnel are responsible for receipt and entry of samples into the laboratory that have been submitted to the laboratory under a Chain of Custody document. Additionally, samples received will be entered into the laboratory Chain of Custody procedures by properly documenting and maintaining chain of custody from the moment that they take custody of the sample at the laboratory until the sample is disposed of or returned to the client.

4.0 DEFINITIONS/MATERIALS

4.1 Chain of Custody

The Chain of Custody document sometimes called the “cradle to grave” record is the written record that traces the sample possession from the time each sample is collected until its final disposition. Chain of Custody is maintained by compliance with one of the following criteria:

- The sample is in the individual’s physical possession.
- The sample is maintained in the individual’s physical view after being in his/her possession.
- The sample is transferred to a designated secure area restricted to authorized personnel.
- The sample is sealed and maintained under lock and key to prevent tampering, after having been in physical possession.
- The sample is transferred under proper manifesting and documentation from one party to another with documentation being maintained throughout the sampling and analysis period.

4.2 Waybill

A waybill is a document that contains a list of the goods and shipping instructions relative to a shipment.

4.3 Common Carrier

For the purpose of this procedure, the common carrier is any commercial carrier utilized for the transportation of the sample(s) from the field to the laboratory.

5.0 PROCEDURE

5.1 General

The ability to demonstrate that the samples were obtained from the locations stated and that they reached the laboratory without alteration is required to maintain documented chain-of-custody. Evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal must be documented to accomplish this. Documentation will be accomplished through a Chain of Custody Record that lists each sample and the individuals performing the sample collection, shipment, and receipt.

The Chain of Custody document is a preprinted form. The original will accompany the samples to the laboratory and a copy will be retained in the field project file.

5.2 Field Sample Custody

Sampling personnel, upon collection of samples for analysis, will properly complete a Chain of Custody record form. The Chain of Custody document will be the controlling document to assure that sample maintenance and custody are maintained; thereby assuring the sample(s) are representative of the environment from which they were collected. At a minimum, the following information will be recorded on the Chain of Custody document:

- The unique identification number assigned to each sample.
- A brief description of the sampling location and a physical description of the sample type.
- The date and time of the sample collection.
- The general environmental conditions (i.e. temperature, weather) at the time of sample collection.
- Container type (e.g., glass, poly, brass sleeve, etc.).
- Sample volume and number of containers (e.g., 2 x 40 ml, 3 x 1 liter)
- Sample preservation (e.g., HNO_3, H_2SO_4, 4^oC).
- Requested analyses.
- Special instructions to the laboratory including handling requirements, quality assurance / quality control, health and safety, and sample disposition.
- The project name and number.
- The date the analytical report is due.
- The names of all sampling personnel.
- The name and telephone number of the project contact.
- The name and telephone number of the laboratory contact.
- The name of the courier and the waybill number (if applicable).
- A unique document reference number.

5.3 Transferring Chain-of-Custody

The Chain of Custody document will be initiated in the field by the person collecting the sample and signed by each individual who has the samples in their possession. Each time that sample custody is transferred, the former custodian must sign over the Chain of Custody as “Relinquished By,” and the new custodian must sign on to the Chain of Custody as “Received By.” The date, time, and the name of their

FIELD ACTIVITY DOCUMENTATION

1.0 PURPOSE

This purpose of this Standard Operating Procedure (SOP) is to define the minimum requirements for documenting field activities in the field logbooks. Field logbooks provide a detailed daily handwritten record, kept in real time, of field activities performed at an investigation site. Logbooks are permanently bound by glue or thread into a hard cover, and should be waterproof. Field logbooks may be assigned to specific activities, positions, or areas within the site. Field logbook covers must be sequentially numbered and indicate the position, task, activity, or area assigned to the logbook.

2.0 REFERENCES

None.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities and geotechnical measurements are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field-generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing nonconformances, etc.) quality issues are identified.

The Sampling Team Leader is responsible for ensuring that field logbooks are completed daily in accordance with this procedure.

The Sampling Team Members are responsible for making timely and complete entries in the field logbook and for reporting daily activities to the Project Technical Manager, Technical Coordinator, or Quality Assurance Officer, as appropriate.

4.0 DEFINITIONS/MATERIALS

4.1 Field Logbook

The field logbook is a surveyor's book or record book, bound and ruled/gridded, with sequentially numbered and water proof pages.

4.2 Waterproof black ink pens

Required for entry into field logbook.

5.0 PROCEDURE

5.1 Field Logbook Cover

Label the front cover of the field logbook with the project name and number, subcontractor name, client name, the start date and, when complete, the finish date. The field logbooks must be sequentially numbered.

project or company affiliation must accompany each signature. Shipping by common carrier is addressed separately, elsewhere in this subsection.

Transferring of Chain of Custody from sampling personnel to the analytical laboratory will be performed in accordance with the requirements stated below. If the sampling personnel deliver the samples to the laboratory directly, transfer of Chain of Custody occurs as follows:

- The sample collector delivers the samples to the laboratory and relinquishes the sample directly to a laboratory representative.
- The collector signs the Chain of Custody listing his/her name, affiliation, the date, and time. Any person involved in the collection of the sample may act as the sample custodian.
- The laboratory representative must receive the samples by signing his/her name, affiliation, the date, and time of the Chain of Custody Record. The laboratory representative may decline to take receipt of the samples if the Chain of Custody Record is not properly completed or if the samples are not properly packaged. All designated laboratory personnel may act as the sample custodian.

If the sampling personnel transfer sample(s) to the laboratory utilizing a common carrier, sampling personnel will retain Chain of Custody responsibility and the common carrier is not responsible for maintaining sample custody. The sample collectors are responsible for packaging the samples in a manner that meets the Chain of Custody definition criteria, that is; the samples are sealed to prevent tampering. When transferring samples to the courier for transport, Chain of Custody procedures are maintained as follows:

- The sample collector lists the courier affiliation and waybill number on the Chain of Custody Record.
- The sample collector relinquishes custody by signing his name, affiliation, date, and time. The collector keeps a copy of the relinquished Chain of Custody Record for the project file.
- The relinquished original Chain of Custody Record is sealed in a watertight plastic bag and taped to the inside of the lid of the transport container.
- The transportation container is sealed to prevent tampering and given to the courier for delivery to the laboratory.
- The sample collector obtains a copy of the waybill from the courier for the project file.
- The laboratory representative must receive the samples by signing his/her name, affiliation, the date, and time on the Chain of Custody Record. This copy is maintained with the samples at the laboratory.
- The laboratory representative obtains a copy of the waybill from the courier for the project file.

5.4 Analytical Laboratory Custody

Upon receipt at the analytical laboratory, the field generated Chain of Custody document will be signed, dated, time marked, temperature marked, and laboratory identification will be provided in the appropriate spaces. Laboratory receipt personnel will enter the samples into the laboratory by implementing the sample custody procedures addressed within their approved Program Plan.

After completion of analytical testing, sample remnants not consumed during testing may be kept for six months beyond the completion of analysis, unless otherwise specified by a notation on the Chain of Custody record that samples are to be returned to the project site for disposal. Once this time period has elapsed, the samples will be disposed of and the disposal record number will be recorded on the laboratory record copy of the Chain of Custody Record.

6.0 REQUIRED FORMS/DOCUMENTATION

Chain of Custody Record
Shipping waybill (as applicable)

5.2 Field Logbook

The following steps must be followed when making entries in the field logbook:

1. Enter the day and date; time the task started; weather conditions; and the names, titles, and organizations of personnel performing the task.
2. Record the name, title and organization, time of arrival, and time of departure of all personnel and visitors to the task area.
3. Describe all site activities in specific detail or indicate the forms used to record such information (e.g., soil boring log or well completion log). A partial data list is given below:
   - Monitor wells: complete the Monitor Well Construction Log form.
   - Monitor well development: complete the Well Development Log.
   - Monitor well purging and sampling: complete the Monitor Well Purge and Sample Log form.
   - Surface water and sediment/sludge sampling: complete the Surface Water/Sediment Sampling Log form.
   - Subsurface soil sampling:
   - Soil borings: complete the Soil Boring Log and include borehole size, depth, sample equipment, method, and sample collected. Detailed lithologic data will be recorded on the boring log.
   - Trenches, and test pits: record the excavation dimensions, sampling equipment or method(s), and samples collected. Detailed lithologic data will be recorded on the Test Pit Information Log.
   - Soil gas and geophysical surveys: grid or line dimensions, probe or sensor spacing, depths, survey and recording equipment type and serial or identification number, and location of resulting data (e.g., strip chart, analog data record, computer file, and file name). Sketches are valuable additions to field notes and should be used where possible.
4. Describe in specific detail any field tests that were conducted and instruments used. Reference any forms that were used, other data records, and the procedures followed in conducting the test. If the final results of any field activity are obtained in the field, these data should be annotated in the field logbook.
5. Changes in procedures or sample locations and reasons for change.
6. Describe in specific detail any samples collected and whether splits, duplicates, matrix spikes or blanks were prepared.
7. Upgrades or downgrades of personal protective equipment and the rationale for such action, and health and safety information such as level of personal protective equipment (PPE) used.
8. List the time, equipment type, and the procedure followed for all decontamination actions carried out. Reference the page number(s) in the decontamination log (if any) where detailed information is recorded; if not referenced, detailed information shall appear in the field logbook.
9. List all instrument calibrations, person(s) performing calibration, and the page number of the calibration log that provided specific information on calibration procedures and results when the calibrations occur in the field.
10. Record all photographs by number and includes a description of the subject, the direction the photographer is facing, and the photographer's initials. If the event photographed is the collection of a sample, record the sample ID number.
11. List any equipment failures or breakdowns that occurred, together with a brief description of repairs or replacements.

12. List in specific detail any exceptions or modifications to any applicable SOP's or standards and provide full description of justification for such variances.
13. No pages may be removed from the site or field logbooks for any reason. Blank pages must be marked "page intentionally left blank".
14. Mistakes must be crossed out with a single line, initialed, and dated. Only persons authorized by the Project Technical Manager or Technical Coordinator may make entries in the logbook.
15. The Project Technical Manager, Technical Coordinator, or Sampling Team Leader must sign the field logbook at the bottom of each page.

6.0 REQUIRED FORMS/DOCUMENTATION

None.

SAMPLE HANDLING, PACKING, AND SHIPPING

1.0 PURPOSE

This Standard Operating Procedure (SOP) outlines the methods and responsibilities for field personnel to use in the packaging and shipping of environmental samples for chemical and physical analysis. This SOP only applies to the packaging and shipping of limited quantity, low concentration environmental samples. This procedure does not apply to those samples considered hazardous materials, hazardous waste, mixed waste, radioactive waste, and/or dangerous goods. Those requirements are specified in the Department of Transportation (DOT) 49 CFR 114-327 and the International Air Transport Association (IATA) procedures. The details within this SOP are only applicable to the general requirements for sample packaging and shipping and should only be used as a guide for developing more job-specific work plans.

2.0 REFERENCES

EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER directive 9355.3-01.

Code of Federal Regulations, DOT 49 CFR parts 100 to 177, revised October 1, 1992.

Dangerous Goods Regulations, IATA, January 1, 1994.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Project Chemist is responsible for the development and review of site-specific work plans that address the specific sample handling, packaging, and shipping requirements for the project. Review the project specific documentation forms to ensure they are appropriate for the field activities. The Project Chemist is also responsible for seeing that field personnel receive proper training and maintain quality assurance/quality control (QA/QC). If problems arise, the Project Chemist is responsible for swift implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to requirements, issuing nonconformances, etc.).

The Quality Assurance Officer is responsible for periodic review of documentation generated during sample handling, packaging, and shipping and the periodic review and audit of field personnel as they perform the work.

The Sampling Team Leader(s) is responsible for ensuring that samples are handled, packed and shipped in accordance with this procedure.

4.0 DEFINITIONS/MATERIALS

4.1 Environmental Sample

A limited quantity, low concentration sample that does not require DOT or IATA hazardous waste labeling as a hazardous waste or material.

4.2 Hazardous Waste Sample

Medium or high concentration sample requiring either DOT or IATA labeling as a hazardous waste or material.

4.3 Hazardous Waste

Any substance listed in 40 CFR Subpart D (260.30 et seq.) or otherwise characterized as ignitable, corrosive, reactive, or toxic as specified in Subpart C (261.20 et seq.) and that would be subject to manifest and packaging requirements specified in 40 CFR 262. Hazardous waste is defined and regulated by the U.S. Environmental Protection Agency (USEPA).

4.4 Hazardous Material

A substance or material in a quantity or form that may pose an unreasonable risk to health, safety, and/or property when transported in commerce and as specifically defined and regulated by DOT (49 CFR 173.2 and 172.101) and IATA (Section 4.2).

4.5 Sample

Physical evidence collected from a facility or the environment that is representative of conditions at the point and time at which the sample is collected.

5.0 PROCEDURE

5.1 Sample Handling

Inspect the sampling containers (as applicable, generally obtained from the analytical laboratory prior to the sampling event) to ensure that they are appropriate for the samples being collected, correctly preserved, and undamaged.

When collecting or handling a sample, always use approved/site specific personal protective equipment (e.g., gloves, etc.) not only to prevent cross-contamination from sample to sample but also as a health and safety requirement.

5.2 Field Packaging

1. Collect the samples in accordance with the site-specific work plans and applicable SOPs.
2. As soon as possible after sample collection, tightly seal the container, and place a piece of custody tape over or around the cap. The custody tape should be placed over the cap so that any attempt to remove the cap will cause the tape to be broken. Do not place custody tape over a volatile organic analysis (VOA) vial septum.
3. Place each container in a separate, appropriately sized, airtight, seam-sealing polyethylene bag (e.g., ZiplocTM or equivalent). Seal the bag, removing any excess air.
4. Place the bagged container inside an insulating shipping container, “cooler”. This cooler should have frozen blue ice or airtight, seam-sealing polyethylene bags of ice inside to assure samples remain cool, 4°C ± 2°C, during transit from field to the packaging location.
5. Because blue ice does not maintain 4°C standard required for sample shipping, it should only be used while in the field collecting samples.
6. Maintain the samples under chain of custody in accordance with the site-specific work plans and appropriate SOPs.

5.3 Sample Packaging

1. Inspect the integrity of the shipping container. The container is generally a "cooler" constructed of heavy plastic or metal with appropriate insulating properties so that variation in temperature during shipping is minimized. Also make sure that the drain plug has been sealed with nylon reinforced strapping tape or mailing tape.
2. Place two or four inches of absorbent packaging material (e.g., Styrofoam bubbles, Vermiculite™ etc.) in the bottom of the shipping container.
3. Carefully check the chain of custody record against the collected sample labels and containers to ensure that the sample numbers, sample description, date and time of collection, container type and volume, preservative, and the required analytical methods are correct and in agreement.
4. Place the samples in the shipping container, allowing sufficient room between the samples to place ice and/or packing material.
5. Double bag and seal crushed or cubed ice in heavy-duty polyethylene bags (Ziplock™ or equivalent). Place these bags of ice on top of and between samples. Blue ice should not be used for sample shipping; it does not maintain the 4°C temperature necessary for regulatory compliance. Include a VOA vial of tap water clearly labeled "temperature blank" so that the laboratory can verify the temperature of the samples upon receipt. The remaining space will be filled with packing material.
6. All samples requiring temperature preservation stated at 4°C will be acceptable "as is" within the range of 4°C ± 2°C. The laboratory should record the temperature of receipt upon the chain of custody report. For all samples received at less than 2°C (note not frozen), or at greater than 6°C, the sample(s) and temperature (in 1°C increments) will be identified on the chain of custody and the Project Chemist notified in order to provide a determination and written authorization to proceed to analysis.

5.4 Sample Shipping

1. The laboratory will be contacted prior to sample shipments. Delivery on weekends and holidays will be confirmed in advance, and prior to shipment.
2. The person in charge of sample custody will note the time, date, and sign over relinquishment of custody on the Chain of Custody. When a common carrier is to be used for sample shipment, also record the air/waybill number (tracking number) and the name of the carrier on the Chain of Custody record.
3. Place the original copy of the Chain of Custody record and a copy of the task specific analyte list in a sealed, clear plastic envelop or bag and tape the envelope to the inside lid of the shipping container. Retain a copy of the Chain of Custody record and shipping waybill (as applicable) for tracking purposes.
4. Using nylon reinforced strapping tape or mailing tap, seal the shipping container. Place custody tape over opposite ends of the lid. Apply a label stating the name and address of the shipper and the receiving laboratory on the outside of the cooler.
5. If QA split samples are shipped the Project Chemist or Project Manager shall notify the QA Laboratory in advance of sample shipment (for large numbers of samples, greater than 20).

   NOTE: The courier or carrier is not responsible for sample custody and is not required to sign the Chain of Custody record. Contact the appropriate laboratory personnel to advise them of the sample shipment.
6. Review the Chain of Custody and sample collection forms for completeness and turn them over to site or project management.

6.0 REQUIRED FORMS/DOCUMENTATION

Chain of Custody Record

Shipping Waybill (as applicable)

Task Specific Analyte List (as applicable)

SAMPLE LABELING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for sample labeling. Sample labeling is required to identify, track and trace samples from the time of collection until the time of disposal. Additional specific procedures and requirements will be provided in the project work plans.

2.0 REFERENCES

EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection and labeling activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this sample labeling SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retaining personnel, additional review of work plans and SOPs, variances to sample labeling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to sampling and sample labeling activities are responsible for completing their tasks to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager or Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Sample Label

Sample labels include all forms of sample identification (labels and tags) that are physically attached to samples collected and provide, at a minimum, the information required by this SOP and related project work plans.

5.0 PROCEDURE

This section contains the procedures involved with sample labeling. Sample labeling is required to identify, track and trace samples from the time of collection until the time of disposal. The details within this SOP should be used in conjunction with the project work plans and other related SOPs. The project work plans will commonly provide the following information:

- Sample collection objectives.
- Number, types and locations of samples to be collected.
- Any additional sample labeling requirements or procedures beyond those covered in this or related SOPs, as applicable.

5.1 Sample Labeling

Document all the information necessary on the sample label and ensure that the label is physically attached to each respective sample. Each sample label must contain at a minimum the following information:

- Project name
- Project number
- Date and Time of collection
- Sample location
- Sample identification number
- Collector's name
- Preservative used (if any)

Additional information may also be required per the project work plans and must accordingly be included on all sample labels. Indelible ink should be used in filling out all sample labels. Ensure that each sample collected has a sample label.

Ensure that the information documented on the sample label corresponds with the information documented on the Field Logbook and Chain of Custody Record.

6.0 REQUIRED FORMS

Sample Labels

Chain of Custody Record

SAMPLE NUMBERING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for sample numbering. Sample numbering is required to identify, track and trace samples from the time of collection until the time of disposal. Additional specific procedures and requirements will be provided in the project work plans and/or related SOPs.

2.0 REFERENCES

EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection and numbering activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this sample numbering SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retaining personnel, additional review of work plans and SOPs, variances to sample numbering requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to sampling and sample-numbering activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager or Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Area

An area is a common name given to a subdivision of White Sands Missile Range (WSMR).

4.2 Composite Sample

A composite sample is one that was obtained by thoroughly mixing two or more distinct samples until the individual ones were no longer distinguishable.

4.3 Sample Number

A sample number is a unique alphanumeric identification (ID) assigned to all samples of air, soil, water and waste collected as part of any given project. It is also known as the sample ID.

4.4 Site Code

A Site Code is a unique identifier given to a specific solid waste management unit (SWMU), area of concern (AOC), or locality where an investigation is being conducted. It is generally a small area defined by the boundaries of contamination or investigation.

5.0 PROCEDURE

5.1 Introduction

The following is a site-specific sample identification system that will ensure the uniform documentation of soil borings, soil and sediment samples, monitoring wells, groundwater samples and surface water samples.

A unique identification number (ID) will be assigned to each sample. This ID is called the sample number. It references information pertaining to a particular sample including the location of the site, the type of sample, sample location number and other information contained in the suffix, such as the date, sample interval. The sample identification number is recorded on the sample container label, in the field logbook, and on the chain of custody form.

5.2 Location

Each sample collected will be designated with a prefix which identifies the site where it was taken using two identifiers. These identifiers include the area and site code. Both are a four character alphanumeric code.

An index of these identifiers is maintained in the Environmental Data Management System (EDMS), which is an online database located in WTS's Intranet. The following is an example of the identifiers for a particular site:

> The systemic diesel spill site is located at the High Energy Laser System Test Facility (HELSTF). HELSTF is identified as an area and has been given the abbreviation "HLSF". The systemic diesel spill also known as solid waste management unit (SWMU 154) is identified specifically with a site code of "0154". Therefore every sample at the HELSTF systemic diesel spill site will be identified with the prefix "HLSF-0154".

When a particular site or area is not identified in the EDMS, the Task Coordinator should contact the database administrator for directions on adding it to the online database. If the sample is being collected to determine site-wide background concentrations in a large area, the site code "BKGD" should be used.

5.3 Location Number

Each sample will be identified by a unique three digit number. The first digit is a marker to identify and improve the electronic data management of replicate and other QA/QC samples and analytical results (see Section 4.4.10). The last two digits are used to indicate different sample locations of identical sample types. An example would be that most sites have multiple monitoring wells which are numbered 01, 02, 03 etc.

5.4 Types of Samples

There are many types of samples that may be taken. The most common ones are listed in the following sections. Directions are provided for identifying them in a meaningful and consistent manner.

5.4.1 Surface Soil and Sediment Sample Identification

The sample ID for surface soil, sediment and wash sediment samples contains the area identifier, site code, and location number along with the abbreviation "SD" for sediment.

The surface soil and sediment samples are identified as follows:

ABCD-####-SD-$$$

Where:

- ABCD = Area Identifier
- #### = Site Code
- SD = Surface soil or sediment
- $$$ = Location number

5.4.2 Composite Samples

The sample ID for composite samples contains the area identifier, site code, and location number along with the abbreviation “CS” for composite.

The composite samples are identified as follows:

ABCD-####-CS-$$$

Where:

- ABCD = Area Identifier
- ## = Site Code
- CS = Composite sample
- $$$ = Location number

5.4.3 Subsurface Soil Samples

The sample ID for subsurface soil samples contains the area identifier, site code, location number, and depth interval, along with the abbreviation “SB” for soil boring.

The subsurface soil samples are identified as follows:

ABCD-####-SB-$$$-(yy.y-zz.z)

Where:

- ABCD = Area Identifier
- #### = Site Code
- SB = Soil boring
- $$$ = Location number
- (yy.y-zz.z) = Depth interval where soil sample was taken in feet

5.4.4 Surface Water Samples

The sample ID for surface water samples contains the area identifier, site code, and location number, along with the abbreviation “SW” for surface water.

The surface water samples are identified as follows:

ABCD-####-SW-$$$

Where:

- ABCD = Area Identifier
- #### = Site Code
- SW = Surface water
- $$$ = Location number
- Groundwater Samples

The sample ID for groundwater samples contains the area identifier, site code, location number (monitoring well number), and date, along with the site specific well abbreviation. Many different well abbreviations have been previously used to identify wells at a particular site. Examples include MW, B, DRW, HCF, HMW, SRW, TTF, etc. Up to four alphanumeric characters may be used to uniquely identify the wells. The existing abbreviations already in use at a given site should generally continue to be used for consistency when possible. If an existing well abbreviation exceeds four characters it must be truncated with a note in the log book indicating the new well name. In addition, inform the EDMS database administrator of the change so that it can be noted in the database. Do not confuse the well abbreviation with the well number. The specific number for the well must go after the abbreviation as designated below with $$$.

The groundwater samples are identified as follows:

ABCD-##-WXYZ-$$$-MMYY

Where:

- ABCD = Area Identifier
- ## = Site Code
- WXYZ = Monitoring well abbreviation
- $$$ = Monitoring well number
- MMYY = Sample date indicated by the month and year by four numbers.

5.4.5 Rinsate Blank Samples

The sample ID for rinsate blank water samples contains the area identifier, site code, rinsate blank number, and date, along with the abbreviation “RB” for rinsate blank.

The subsurface soil samples are identified as follows:

ABCD-####-RB-$$$-MMYY

Where:

- ABCD = Area Identifier
- #### = Site Code
- RB = Rinsate blank
- $$$ = Rinsate blank sample number
- MMYY = Sample date indicated by the month and year by four numbers.

5.4.6 Waste Samples

The sample ID for waste samples contains the area identifier, site code, sample number and date, along with the waste type abbreviation.

Investigation Derived Waste such as purge water, soil cuttings, personal protective equipment and decontamination water will be identified with the following alphanumeric abbreviation containing no more than four digits:

Purge Water	–	PW
Soil Cuttings	–	SC
Personal Protective Equipment	–	PPE
Decontamination Water	–	DCON

Generic solid and liquid waste will be designated as follows:

Solid	–	SL
Liquid	–	LQ

The waste samples are identified as follows:

ABCD-####-XXXX-$$$-MMYY

Where:

- ABCD = Area Identifier
- #### = Site Code
- XXXX = Waste type
- $$$ = sample number
- MMYY = Sample date indicated by the month and year by four numbers.

5.4.7 Trip Blank Samples

The sample ID for trip blank samples contains the area identifier, site code, year and chain of custody number, along with the abbreviation "TB" for trip blank. The chain of custody number is a sequential three digit number which starts at 001 each calendar year.

The trip blank samples are identified as follows:

ABCD-####-TB-YY-&&&

Where:

- ABCD = Area Identifier
- #### = Site Code
- TB = Trip blank
- YY = Calendar Year designated by a two digit number
- &&& = Chain of custody number

5.4.8 Replicate Samples

As previously noted, there is an "extra" digit or marker in the sample ID format. It is placed in the location number to provide a more discreet identifier of QA related samples.

For normal (non-QA related) samples the digit remains a zero. For replicate or other QA/QC-related samples co-located with the first sample, the first replicate will have this place filled with a "1", the second replicate or QA/QC sample will have this place filled with a "2", etc. For example, a duplicate sample might be collected on January 7, 2003 from DRW01 at the HELSTF systemic diesel spill site.

The identical groundwater samples would be identified as follows:

The original sample ID would be: HLSF-0154-DRW-001-0103

The duplicate sample ID would be: HLSF-0154-DRW-101-0103

5.4.9 Matrix Spike Samples

Matrix spike and matrix spike duplicate samples are provided as a courtesy to the laboratory for complying with data quality objectives. The abbreviation "-MS/MSD" is added at the end of any sample ID used for this purpose.

6.0 REQUIRED FORMS

Field Log Book

Chain of Custody Record

ON-SITE SAMPLE STORAGE

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for on-site sample storage. On-site sample storage may be required for samples collected during a given project. Additional on-site sample storage procedures and requirements will be provided in the project work plans and/or related SOPs.

2.0 REFERENCES

EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all on-site sample storage activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retaining personnel, additional review of work plans and SOPs, variances to sample numbering requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to sample storage activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager or Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Field Sample

A sample that has been collected at a project site, during the execution phase of the project, and for the purposes of the project, as defined in the project work plans.

4.2 On-site

For purposes of this SOP, “on-site” is defined as any area within the project site.

4.3 On-site sample storage

For purposes of this SOP, “on-site sample storage” applies to samples stored within the project site for a temporary period of time. Typically, samples may be stored on-site if they are in transit between the project site and a designated laboratory.

5.0 PROCEDURE

This section contains the requirements pertaining to on-site sample storage. Proper storage is essential to maintain in the quality and integrity of samples collected during a field project.

The details within this SOP should be used in conjunction with project specific work plans. At a minimum, the project work plans will provide the following information:

- Sample collection objectives.
- Number, types and locations of samples to be collected.
- Any additional sample numbering requirements or procedures beyond those covered in this SOP, as necessary.

5.1 On-Site Sample Storage

Samples of all types of media may require being stored on-site. The manner in which these samples are stored will be appropriate for individual samples and each sample type.

Samples collected for chemical analysis are typically required to be stored at approximately 4° Centigrade (°C). Therefore, such samples should either be preserved in a "cooler" using water ice, or a "Sample-Only" refrigerator until received by the assigned laboratory. Blue ice is not recommended for on-site sample storage as is does not maintain the 4°C temperature necessary for regulatory compliance. If a refrigerator is used to store samples at the project site, this refrigerator will be dedicated for the sole use of samples and will be located in an area that is access controlled; no food, drinks, or other personal items will be allowed in this refrigerator.

Samples that do not require refrigeration (e.g., air samples and samples for geotechnical or radionuclide analysis) should be stored on-site in a designated, marked area which is access controlled.

Samples that are stored on-site must be stored in appropriate containers per the project-specific work plans and be maintained under custody per SOP No. 1.1.

Samples that are stored on-site must not be stored in a manner in which they may threaten the integrity of other samples in the holding location.

All samples that are stored on-site must be labeled per SOP No. 2.1, numbered per SOP 2.2, and appropriately handled per SOP 2.0.

The Sampling Team Leader or other designee is responsible for maintaining a master sample log listing sample numbers and a brief description of samples collected. The master log should be reviewed on a daily basis for samples that are under storage on site. The samples should then be appropriately shipped, following procedures per SOP No. 2.1, to ensure that holding time is not missed.

6.0 REQUIRED FORMS

Chain of Custody Record

Master Sampling Log

SURFACE AND SHALLOW SUBSURFACE SOIL SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for use by field personnel in the collection and documentation of surface (0 to 6-inch depth below ground surface (bgs)) and shallow subsurface (6-inch to 6-feet in depth bgs) soil samples for physical and chemical analysis. Proper collection procedures are necessary to assure the quality and integrity of all surface and shallow subsurface soil samples. Additional specific procedures and requirements will be provided in the project work plans.

2.0 REFERENCES

EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures and/or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retaining personnel, additional review of work plans and SOPs, variances to sample numbering requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to surface and shallow subsurface soils sampling activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures and/or related SOPs. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager, Technical Coordinator, or Quality Assurance Officer as appropriate.

4.0 DEFINITIONS/MATERIALS

4.1 Surface Soil Sample

Soil collected form the surface to a depth of no more than 6 inches bgs.

4.2 Shallow Subsurface Soil Sample

Soil collected from a depth of 6 inches to 6 feet bgs.

4.3 Subsurface Soil Sample

Soil collected at any depth interval greater than 6 inches.

4.4 Disturbed Soil Sample

Soil sample whose in situ physical structure and fabric has been disturbed as the direct result of sample collection.

4.5 Undisturbed Soil Sample.

Soil sample whose in situ physical structure and fabric has not been disturbed as the result of sample collection.

4.6 Grab Samples

Representative disturbed soil sample that is collected by using such devices as a shovel, stainless steel spoon, etc.

5.0 PROCEDURE

This section contains both the responsibilities and procedures involved with surface and shallow subsurface soil sampling. Proper surface and shallow soil sampling procedures are necessary to insure the quality and integrity of the samples. The details within this SOP should be used in conjunction with project work plans. The project work plans will generally provide the following information:

- Sample collection objectives.
- Locations and depths of soil samples to be collected.
- Number and volumes of samples to be collected.
- Types of analyses to be conducted for the samples.
- Specific quality control (QC) procedures and sampling required.

Any additional surface or shallow subsurface soil sampling requirements or procedures beyond those covered in this SOP, as necessary.

At a minimum, the procedures outlined below for surface and shallow subsurface soil sampling will be followed unless otherwise directed within project specific work plans or SOPs.

5.1 Surface Soil Sampling Equipment

A number of devices are available for the collection of surface soil samples. These include, but are not limited to, core samplers, hand augers, spoons, scoops, trowels and, shovels. These devices are constructed of a number of materials including, but not limited to, stainless steel, brass, glass and, Teflon. The sampling and analytical requirements, as well as site characteristics, must be taken into account when determining the proper surface soil sampling equipment to use.

At present, the method commonly used for the collection of surface samples and shallow subsurface samples, both disturbed and undisturbed, is with a core sampler. The core sampler is usually a hollow, stainless steel cylinder, tapered at the leading end. A sample sleeve (brass, stainless steel, lexan, etc.) is inserted into the trailing end. The trailing end is then connected to a piston-type drive hammer. The core is driven into the soil by a hammer so that a relatively undisturbed sample is collected in the sleeve. The sample is then handled and shipped in the sample sleeve.

When a core sample is not feasible or planned, such devices as a stainless steel shovel, hand auger, trowel and, spoon, can be used to collect a sample. The soil is transferred from the collection device into decontaminated sample containers (commonly glass jars). The project work plans will specify the type of sampling equipment containers to be used; the sample to be used will be specified in the project work plans.

5.2 Surface Soil Sample Collection

Prior to sampling and between sampling locations, decontaminate the sample equipment according to WTS-SOP 6.0 and procedures outlined in the project work plans.

1. Ensure that all surface and shallow subsurface soil sampling locations have been appropriately cleared of all underground utilities and buried objects per the project work plans. Review all forms and diagrams documenting the location of the cleared sampling locations, as well as that of any underground utilities or lines, or other buried objects.
2. As required, calibrate any health and safety monitoring equipment according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate form(s), as specified in the project work plans. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.
3. Don appropriate personal protection equipment as specified in the project work plans.
4. Using equipment that will not be used for sample collection, clear the area to be sampled of surface debris and vegetation.
5. If using the coring device, place the sleeve into the device and drive the assembly into the soil using the drive hammer. Drive the device into the soil until the trailing end of the sleeve is at the soil surface.
6. Retrieve the device; check to see that soil recovery is adequate in the sample sleeve. If there is sufficient recovery, mark or note the leading end of the sample sleeve.
7. If using a different sample collection device (other than the coring device), use the other device to scoop or collect soil and directly transfer the soil into the sample container (e.g., glass jar, brass sample sleeve, etc.). Fill the sample container such that little to no headspace exists.
8. If using sample sleeves, place Teflon squares over each end of the sleeve and seal each end with plastic end caps. With a permanent marker, write a "T" for top on the trailing end and a "B" for bottom on the leading end.
9. Appropriately label and number the sample containers per WTS-SOP 2.1 and 2.2, respectively, and the project work plans. The label will be filled out with waterproof ink and will contain, at a minimum, the following information:
   - Project number
   - Sample number
   - Sample location
   - Sample depth
   - Sample type
   - Date and time of collection
   - Parameters for analysis
   - Sampler's initials.
10. Document the sampling event on the Field Logbook or an equivalent form as specified in the project work plans. Note any pertinent field observations, conditions or problems on the Field Logbook. Any encountered problems or unusual conditions should also be immediately brought to the attention of the field geologist.
11. Appropriately preserve, handle, package, and ship the samples per WTS-SOP No. 2.0 and the project work plans. The samples shall also be maintained under custody per WTS-SOP No. 1.1.
12. Fill and abandon the sample hole as required by the project work plans.

5.3 Subsurface Soil Sample Collection

The common method to collect shallow subsurface soil samples is to use a hand auger to bore to the desired sampling depth and then retrieve the sample with a core sampler. The hand auger might also be used to recover the sample for direct transfer into glass jars. The exact methodology to be used will be specified in the project work plans.

For subsurface soil samples of less than 18 inches in depth, successive drives of the core sampler may potentially be used to recover shallow subsurface soil samples. In all methods cited above, borehole stability should be maintained to prevent the recovery of slough in the samples. If sloughing cannot be controlled, than another sampling methodology may have to be considered.

As with surface soil samples, shallow subsurface soil sampling follows the same sample collection procedures specified in Section 5.2.1 through 5.2.13.

6.0 REQUIRED FORMS

Chain of Custody

Master Sampling Log

Field Log Books

SUBSURFACE SOIL SAMPLING WHILE DRILLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for subsurface soil sampling while drilling. Proper collection procedures are necessary to assure the quality and integrity of all subsurface soil samples. Additional specific procedures and requirements will be provided in the project work plans, as necessary.

2.0 REFERENCES

American Society for Testing Materials (ASTM), 1989, Standard Method for Penetration Test and Split-Barrel Sampling of Soils, Method D-1586-84, Philadelphia. PA.

American Society for Testing Materials (ASTM), 1986, Standard Practice for Thin-Walled Tube Sampling of Soils, Method D-1587-83, Philadelphia. PA, pp. 304-307.

American Society for Testing Materials (ASTM), 1986, Standard Practice for Ring-Lined Barrel Sampling of Soils, Method D-3550-84, Philadelphia. PA, pp. 560-563.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures and/or other SOPs as applicable. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retaining personnel, additional review of work plans and SOPs, variances to sample numbering requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to subsurface soils sampling activities during drilling is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures and/or other SOPs as applicable. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager, Technical Coordinator, or Quality Assurance Officer as appropriate.

4.0 DEFINITIONS/MATERIALS

4.1 Borehole

Any hole drilled into the subsurface for the purpose of identifying lithology, collecting soil samples, and/or installing a monitor well.

4.2 Split-Spoon Sampler

A steel tube, split in half lengthwise, with the halves held together by threaded collars at either end of the tube. This device can be driven into resistant (semiconsolidated) materials using a drive weight or drilling jars mounted in the drilling rig. A standard split-spoon sampler (used for performing standard penetration tests) is 2 inches in outside diameter and 1 ⅜ inches in inside diameter. This standard spoon typically is available in two common lengths, providing either 20-inch or 26-inch internal longitudinal clearance for obtaining 18-inch or 24-inch long samples, respectively. Six-inch long sleeves (tubes) of brass, stainless steel, or plastic are commonly placed inside the sampler to collect and retain soil samples. A five-foot long split-spoon sampler is also available. A California modified split-spoon sampler is also commonly used. The design is similar to the standard split-spoon except the outside diameter is 2 ½ inches and the inside diameter is 2 inches.

4.3 Shelby Tube Sampler

A thin-walled metal tube used to recover relatively undisturbed samples. These tubes are available in various sizes, ranging from 2 to 5 inches in outside diameter and 18 to 54 inches in length. A stationary piston device is included in the sampler to reduce sampling disturbance and increase sample recovery.

5.0 PROCEDURE

This section contains both the responsibilities and procedures involved with subsurface soil sampling while drilling. Proper subsurface soil sampling procedures are necessary to insure the quality and integrity of the samples. The details within this SOP should be used in conjunction with project work plans. The project work plans will generally provide the following information:

- Sample collection objectives.
- Locations of soil boreholes and target horizons or depths of soil samples to be collected.
- Number and volumes of samples to be collected.
- Types of chemical analyses to be conducted for the samples.
- Specific quality control (QC) procedures and sampling required.
- Any additional subsurface soil boring sampling requirements or procedures beyond those covered in this SOP, as necessary.

There are many different methods that may be used for subsurface soil sample collection during drilling. This SOP focuses on the two most common methods of soil sample collection: split-spoon sampling and Shelby tube sampling. At a minimum, the procedure outlined below for these two subsurface soil-sampling methods will be followed unless specifically noted within project specific work plans. If other subsurface soil sampling methods are deemed necessary to meet project objectives, the procedures for these methods will be updated in this SOP or included in the project work plans.

5.1 General Sampling Considerations

The two subsurface soil sampling methods covered in this SOP, split-spoon and Shelby tube, are commonly used in conjunction with hollow stem auger, air rotary, and dual tube percussion drilling methods. Split-spoon or Shelby tube sampling may be conducted when drilling with mud rotary methods. However, when using this drilling method, the samples are not generally useful for chemical analyses. This is because the samples may become invaded or chemically altered when they are tripped through the drilling mud during sample retrieval. In addition, loose unconsolidated soils may also literally wash out of the samplers when they are tripped through the mud column.

The procedures described in the SOP must be used in conjunction with the SOP proscribed for the specific drilling method used at the site. These also include, but are not limited to, site clearance, site preparation, and health and safety requirements. Consequently, the SOP for the specific drilling method to be used at the site, the project work plans, and this SOP must be reviewed together in their entirety before the initiation of drilling and sampling.

5.2 Split-Spoon Sampling

Split-spoon samples for chemical analysis will be obtained in brass, plastic, or stainless steel sleeves. The types, dimensions and number of sleeves to be used, along with the length and type of sampler will be stated in the project work plans. The split-spoon sampler, lined with the brass, plastic, or stainless steel sleeves, is connected to the drill rod string or a wireline sampling string. The procedure for collecting samples from the split-spoon sampler will be outlined in the project work plans.

- ✓ Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate form(s) as specified by the project-specific work plans. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.

- ✓ Wear the appropriate personal protection equipment as specified in the project work plans and the applicable drilling method SOP. Personnel protection will typically include a hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.
- ✓ Between each sampling location and prior to each sampling run, decontaminate the sampler, sleeves, and other sampling equipment as described in WTS-SOP No. 6.0.
- ✓ Advance the borehole to the desired depth or target horizon where the sampling run is to begin. During drilling, monitor vapors in the breathing zone according to the project work plans, and drilling method SOP.
- ✓ Insert the sleeves into the split-spoon sampler, connect the halves, and screw together the rear threaded collar and front drive shoe. Attach the split-spoon sampler to the bottom end of the drill rod string or wireline sampling string. Set up and attach the specified weight, if used.
- ✓ Drive the sampler into the soil at the bottom of the borehole. Record the type of sampler assembly and hammer weight on the Visual Classification of Soils form and/or other appropriate form(s), as specified in the project work plans. To minimize off gassing of the volatiles, the sampler should not be driven until the sampling team is ready to process the sample.
- ✓ When conducting penetration testing, observe and record on the Visual Classification of Soils form the number of hammer blows as described in WTS-SOP No. 10.0.
- ✓ Pull the drill rod or wireline sampling string up from the bottom of the borehole and remove the sampler.
- ✓ Remove the drive shoe and rear collar from the sampler and open the split barrel.
- ✓ Remove the sleeves one at a time, starting with the sleeve adjoining the drive shoe. Observe and record the amount of sample recovery on the Visual Classification of Soils form per WTS-SOP No. 10.0. Any observed field problems associated with the sampling attempt (e.g., refusal) or lack of recovery should be noted on the Visual Classification of Soils form within a clean area on a stand or table between samples.
- ✓ Select sleeve(s) to be submitted for laboratory analysis. Sample sleeve selection should be based on four factors: judgment that the sample represents relatively undisturbed intact material, not slough; proximity to the drive shoe; minimal exposure to air; lithology; and obvious evidence of contamination. The project work plans will specify the sample sleeve to be submitted for specific analyses and confirm the selection criteria.
- ✓ Place Teflon film over each end of sleeves to be submitted for chemical analysis and seal each end with plastic end caps. Place custody tape over each end cap so that any attempt to remove the cap will break the tape.
- ✓ Appropriately label and number each sleeve to be submitted for analysis per WTS-SOP No. 2.1 and 2.2, respectively. The label will be filled out using waterproof ink and will contain, at a minimum, the follow information:
  - Project number
  - Boring number
  - Sample number
  - Bottom depth of sleeve
  - Date and time of sample collection
  - Parameters for analysis
  - Sampler's initials.
- ✓ Document the sampling event on the Field Logbook or an equivalent form as specified in the project work plans. At a minimum, this log will contain:
  - Project name and number
  - Date and time of the sampling event
  - Drilling and sampling methods
  - Sample number

- Sample location
- Boring number
- Sample depth
- Sample description
- Weather conditions
- Unusual events
- Signature or initials of the sampler.

✓ Appropriately preserve, package, handle, and ship the sample in accordance with the procedures outlined in WTS-SOP No. 2.0 and the project work plans. The samples shall also be maintained under custody per WTS-SOP No 1.1. Samples stored on-site will be subject to the provisions of WTS-SOP No. 2.3.

✓ One of the sample sleeves shall be utilized for lithologic logging per WTS-SOP No. 10.0. This sleeve may not then be retained for chemical analysis, as soil must be removed from the sleeve to effectively describe the soils/lithology and compile the lithologic log.

✓ When VOCs or petroleum hydrocarbons are of concern, remove the soil from one of the remaining sleeves and place in a glass mason jar (fill to one half volume of jar) and seal for organic vapor screening using either Teflon tape or aluminum foil. Place the jar in a warm water bath or in the sunlight (warm) for at least five minutes, shake vigorously for one minute, then using an organic vapor probe (e.g., portable photoionization detector, flame ionization detector, or other appropriate instrument), pierce the lid seal with the probe and monitor the soil for organic vapors. Record the reading on the Visual Classification of Soils form, the Field Logbook, and any other form(s) specified in the project work plans.

✓ Repeat this sampling procedure at the intervals specified in the project work plans until the bottom of the borehole is reached and/or last sample is collected.

5.3 Thin Walled or Shelby Tube Sampling

A thin-walled tube or Shelby tube sampler may be used to collect relatively undisturbed soil samples. The procedure for collecting soil samples using a Shelby tube sampler should be outlined in the project work plans. The standard procedure is described below.

✓ Calibrate all field analytical and health and safety monitoring equipment as discussed in Section 5.2.1.

✓ Wear the appropriate personal protective equipment as described in Section 5.2.2.

✓ Between each sampling location and prior to each sampling run, decontaminate the sampler and other sampling equipment as described in WTS-SOP No. 6.0.

✓ Advance the borehole to the desired depth or target horizon where the sampling run is to begin. While drilling, monitor the breathing zone according to the project work plans and applicable drilling method SOP.

✓ Connect the sampling tube to the drill rod string and advance the tube to the bottom of the boring. The tube is then pushed about 2 to 2.5 feet into the soil with a continuous, rapid motion without impact or twisting.

✓ Pull the drill rod strip up from the bottom of the borehole and remove the sampling tube from the string. Observe and record the amount of sample recovery and any associated problems as discussed in Section 5.2.11.

✓ Place Teflon film over each end of the tube if it is to be submitted for chemical analysis and seal the ends with plastic end caps. Place custody tape over each end cap so that any attempt to remove the cap will break the tape. With a waterproof marker, write a “T” for top on the trailing end and a “B” for bottom on the leading end of the tube.

- ✓ Appropriately label and number the tube as described in Section 5.2.14.
- ✓ Document the sampling event on the Field Logbook as discussed in Section 5.2.15.
- ✓ Appropriately preserve, package, handle, and ship the sample in accordance with the procedures outlined in WTS-SOP No. 2.0 and the project work plans. The samples shall also be maintained under custody per WTS-SOP No. 1.1. Samples stored on-site will be subject to the provisions of WTS-SOP 2.3.
- ✓ Repeat this sampling procedure at the intervals specified in the project work plans until the bottom of the borehole is reached and/or last sample is collected.

6.0 REQUIRED FORMS

Visual Classification of Soils Form

Chain of Custody

Master Sampling Log

Field Log Books

COMPOSITE SAMPLE PREPARATION

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the requirements for compositing techniques. Composite samples, regardless of the media, consist of two or more subsamples taken from a specific media and site at different depth intervals. The subsamples are collected and mixed. A single average sample is taken from the mixture.

The composite sampling will be used at sites where hand augered borings are to be performed. Composite samples are useful in estimating the overall contamination properties of a specific site. They are less expensive than non-composite samples because one sample for analysis represents many subsample locations. Composite samples do not provide detailed information of contamination variability as a function of the location.

2.0 REFERENCES

None.

3.0 DEFINITIONS/MATERIALS

The equipment required to obtain a composite sample is identical to that for primary media sampling.

4.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all composite sample collection activities are conducted in accordance with this SOP and any other appropriate procedures and/or other SOPs as applicable. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for ensuring that this procedure is correctly implemented and that the quantity and quality of composite samples meet the requirements of the project Sample and Analysis Plan.

The Sampling Team Leader(s) assigned to composite soil sampling activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures and/or other SOPs as applicable. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager, Technical Coordinator, or Quality Assurance Officer as appropriate.

5.0 PROCEDURE

5.1 Preparation

Site preparation for the purpose of composite sampling is not different from that required for any of the media/waste sampling activities.

5.2 Surface Soil Compositing

The following steps must be followed when compositing surface soil samples in the field:

1. Determine where composite sample(s) will be obtained as indicated in the site-specific sampling plan.
2. Volatile organic compound (VOC) and, in some cases, semivolatile organic compound (SVOC) samples of solids (e.g., soils, sludge) must be collected and contained immediately as stand-alone samples and, therefore, <u>cannot</u> be composited.

3. Collect a minimum of three equal-volume samples from the specific sample location. The volume of each sample must be at least the amount required for a single sample.
4. Place the samples on an appropriate mixing tray. Thoroughly homogenize the pooled samples using the appropriate equipment.
5. Transfer subsamples of the composite sample into the appropriate sample containers. Seal, decontaminate, and label sample containers. Use the same care in handling these samples as that used for other samples from the site.
6. Document activities in field log book(s) as appropriate. Documentation should consist of detailed notes of locations and methods used to collect individual samples included in each composite sample.
7. Decontaminate sampling equipment between sample events.

5.3 Subsurface Soil Compositing

Compositing of subsurface soils refers to a single borehole in which several consecutively sampled depths are combined for a single sample. This is done to allow sufficient sample volume for the required analysis.

The following steps must be followed when compositing subsurface soil samples:

1. Determine where composite sample(s) will be obtained as indicated in the site-specific sampling plan.
2. Obtain samples by the methods:
3. For split-spoon or Shelby tube cores from a specified depth or range of depths:
   - Extract or extrude the sample from the split-spoon or Shelby tube onto an appropriate mixing tray, peel sample, and discard ends.
   - Continue with the four-quarters mixing method.
   - Document activities.
   - Decontaminate sampling equipment.
4. For hand auger samples:
   - The sample is acquired directly from the withdrawn auger.
   - Extract or extrude the sample from the bucket to an appropriate mixing tray.
   - Continue with the four-quarters mixing method.
   - Document activities.
   - Decontaminate sampling equipment.

5.4 Surface Water Compositing in the Field

The following steps must be followed when compositing surface water samples:

1. Determine where composite sample(s) will be obtained as detailed in the site-specific sampling plan.
2. VOC and, in some cases, SVOC samples must be collected and contained immediately as stand-alone samples and, therefore, <u>cannot</u> be composited.
3. Collect a minimum of three equal volume samples from the specified sample locations. The volume of each sample must be at least the amount required for a single sample.
4. Place the samples in the appropriate mixing container. Thoroughly homogenize the pooled samples using the appropriate equipment.
5. Transfer aliquots of the composited sample into the appropriate sample containers. Seal, wipe clean, and label sample container. Handle with the same care as that used for other samples from the site.

6. Document activities in field log book(s) as appropriate. Documentation should consist of detailed notes of locations and methods used to collect individual samples included in each composite sample.
7. Decontaminate sampling equipment between sampling events.

5.5 Collection of Replicate Samples

The following steps must be followed when compositing ground water samples:

1. Determine the well that a composite sample(s) will be obtained as detailed in the site-specific sampling plan.
2. VOC and, in some cases, SVOC samples must be collected and contained immediately as stand-alone samples and, therefore, cannot be composited.
3. Collect a minimum of three equal volume samples from the specified sample locations. The volume of each sample must be at least the amount required for a single sample.
4. Place the samples in the appropriate mixing container. Thoroughly homogenize the pooled samples using the appropriate equipment.
5. Transfer aliquots of the composited sample into the appropriate sample containers. Seal, wipe clean, and label sample container. Handle with the same care as that used for other samples from the site.
6. Document activities in field log book(s) as appropriate. Documentation should consist of detailed notes of locations and methods used to collect individual samples included in each composite sample.
7. Decontaminate sampling equipment between sampling events.

6.0 REQUIRED FORMS / DOCUMENTATION

Filed Log Books

Master Sampling Log

Chain of Custody

DUPLICATE AND SPLIT SAMPLE PREPARATION

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the requirements for the collection and preparation of duplicate, split, and/or co-located samples.

Duplicate, split, and co-located samples are typically obtained for either of two purposes: (1) as a means of quality control (QC) from the point of sample collection through all analytical processes (if the initial and duplicate samples are not within specification, the reasons for the discrepancy must be found and corrected, if possible), or (2) for later laboratory analyses, if needed. For WTS projects, co-located or duplicate samples will be collected to provide information on the variability of the contaminants in the field.

Duplicate or co-located samples are samples collected from a location as close to the primary sample location as possible. They are collected to provide a means of assessing the reliability of field sampling methods and analytic data resulting from field samples.

Split samples are normally obtained for the express purpose of submitting identical samples to different laboratories for comparative analytical results. Duplicate, split, and co-located samples may be collected as composite or grab samples from most media or waste types.

The same equipment and techniques will be required when obtaining duplicate and/or split samples as for primary samples. Briefly, the sampling requirements are: (1) grab samples will be collected for surface soil, surface water, ground water, sediment, and sludge, destined for volatile organic compound (VOC) analysis, and, (2) composite or grab sampling techniques can be used for non-VOCs and for subsurface soils.

Comparative analyses between laboratories can also be obtained for semivolatile organic compounds and/or metals. Duplicate samples can also be obtained for VOC and non-VOC contaminated media by careful grab samples. For most duplicate, split, or co-locate sampling for non-VOC parameters, in all media, compositing is recommended.

2.0 REFERENCES

None.

3.0 DEFINITIONS/MATERIALS

The equipment necessary to obtain a duplicate, split, and/or co-located sample is identical to that for primary media sampling.

4.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all duplicate, split, and co-located sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for ensuring that this procedure is correctly implemented and that the quantity and quality of duplicate and split samples meet the requirements of the project Quality Assurance Project Plan.

The Sampling Team Leader(s) assigned to duplicate, split, or co-located sampling activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager, Technical Coordinator, or Quality Assurance Officer as appropriate.

5.0 PROCEDURE

5.1 Duplicate or Co-located Samples

The following steps must be followed when collecting duplicate or co-located samples:

1. Determine the frequency of obtaining duplicate samples as specified in the site-specific sampling plan.
2. Proceed with site sampling to the point that a duplicate or co-located sample is required.
3. The duplicate or co-located sample is a sample taken at the same time, as close as possible, and under the exact conditions as those required for the primary sample. Note: any sample or portion of a sample that is to be analyzed for VOCs shall be collected and contained immediately. Do not stir, mix, or agitate samples for VOC analysis before containment.
4. Follow the specific media-sampling plan. The preparation and disposition of the duplicates will be the same as those for the primary samples.
5. Obtain VOC samples first (without mixing or compositing), then proceed to Step 6. Samples for VOCs must be collected and contained immediately. Agitation by mixing, stirring, or shaking will cause vaporization of the volatile fraction to a significant degree. Resample if agitation has occurred. Mix all non-VOC duplicate samples or when taking duplicates of surface water or ground water samples. Mixing may be accomplished by pouring a portion of the sample directly from the sampling device into the original container, and then pouring an equal portion into the duplicate container, alternating between the two until the sample containers are full.
6. Place the sample(s) in the appropriate sample container. Duplicate and co-located samples will be labeled or tagged according to their intended use as detailed in the site-specific sampling plan. If the sampling plan duplicates are to be held for possible later analyses, they may be labeled as “sample XXX duplicate”, where the number “XXX” refers to the primary sample. If the duplicates are intended for QC measures, they may be given discrete sample numbers. Duplicate and co-located samples must be properly identified in the field logbook.
7. Seal, pack, and transport duplicate and co-located samples in the same manner as that used for other samples from the sampling site.
8. Decontaminate all equipment. Place all disposable liquids and solids in the appropriate receptacles.
9. Remove personal protective clothing and equipment and place in the designated receptacles. Field sampling personnel must be contamination-free before leaving the sampling site.
10. Document activities.

5.2 Split Samples for Surface Soils, Sediments, and Sludges

The following steps must be followed when collecting split samples of surface soils, sediments, and sludges:

1. Determine the number and frequency of required sample splits as specified in the site-specific sampling plan.
2. Proceed with site sampling to the point of obtaining split sample(s).
3. Follow the specific media sampling procedure.

   <u>NOTE</u>: Split samples for VOCs are not recommended. Adequate cross-laboratory checks can be obtained by splits of non-VOC samples. If QA is required for VOC samples, obtain duplicates as outlined in Section 5.1 of the SOP. All split samples for VOC analysis for the above media are grab samples taken as specified in Step (3), Section 5.1 of this SOP.

4. For non-VOC grab samples, obtain a sufficient volume to fill all required sample containers, including those required for splits.
5. Composite these samples.
6. Split the composite sample equally and place the required volumes into the sample containers.
7. Seal and decontaminate the outside surfaces of the containers.
8. Label split samples as specified in the site-sampling plan. Record all pertinent information in the field logbook.
9. Split samples will have a separate chain of custody record.
10. Split samples will be sealed, packed, and transported in an identical manner as that specified for other samples from the site. The difference may be their destination (different laboratories) and the extent of analytical work. The site-specific sampling plan specifies the disposition of split samples.
11. Decontaminate all equipment according. Place all disposables in the appropriate receptacles.
12. Remove personal protective clothing and equipment and place in the designated receptacles. Field sampling personnel must be contamination-free before leaving the sampling site.
13. Document activities.

5.3 Split, Duplicate, or Co-located Volatile Organic Compound Sampling of Subsurface Soils with Split-Spoons or Shelby Tubes

The following steps must be followed when sampling subsurface soils with split-spoons or Shelby tubes:

1. Determine the number and frequency of required sample splits as stated in the site-specific sampling plan.
2. Proceed with site sampling to the point of obtaining split sample(s).
3. Follow the specific media-sampling plan.

   NOTE: Most split-spoon sampling in the field is accomplished with 2-inch outside diameter (OD) split-spoons. When split, duplicate, or co-located samples are required, a 2-inch OD split-spoon will usually not collect sufficient sample volume if a number of analytes are to be sampled. In such situations, it is advisable to follow the American Society for Testing Materials (ASTM) D-1584 modified method of split-spoon sampling and a 3-inch OD split-spoon. If blow counts are not required for engineering purposes, and the site soils permit, attempts may be made to drive the 3-inch split-spoon by the 140-lb. weight. This deviation will ensure collection of enough sample volume.
4. Upon retrieval of the split-spoon, the sample should be peeled and the ends discarded. Divide the sample into four sections (A, B, C, and D). Sample A should be immediately containerized and becomes the original sample for VOC analysis. Sample B is also immediately containerized and becomes the duplicate sample for VOC analyses. Section C and D can be composited for all other non-VOC analyses.
5. Decontaminate the outside of the sample container after sealing.
6. Label split samples as specified in the site-specific sampling plan. Record all pertinent information in the field logbook.
7. Split samples will have a separate chain of custody record.
8. Split samples will be sealed, packed, and transported in an identical manner as other samples from the site. The difference may be their destination (different laboratories) and the extent of analytical work. The site-specific sampling plan specifies the disposition of split samples.

9. Decontaminate all equipment. Place all disposables in the appropriate receptacles.
10. Remove personal protective clothing and equipment and place in the designated receptacles. Field sampling personnel must be contamination-free before leaving the sampling site.
11. Document activities.

5.4 Split, Duplicate, or Co-located Non-Volatile Organic Compounds Sampling of Subsurface Soils with Split-Spoon or Shelby Tubs

The following steps must be followed when sampling subsurface soils with split-spoon or Shelby tubes:

1. Determine the number and frequency of required sample splits as stated in the site-specific sampling plan.
2. Proceed with site sampling to the point of obtaining split sample(s).
3. Follow the specific media-sampling plan.
4. Peel the sample and composite the sample.

   NOTE: Most split-spoon sampling in the field is accomplished with 2-inch outside diameter (OD) split-spoons. When split, duplicate, or co-located samples are required, a 2-inch OD split-spoon will usually not collect sufficient sample volume if a number of analytes are to be sampled. In such situations, it is advisable to follow the American Society for Testing Materials (ASTM) D-1584 modified method of split-spoon sampling and to use a 3-inch OD split-spoon. If blow counts are not required for engineering purposes, and the site soils permit, attempts may be made to drive the 3-inch split-spoon by the 140-lb. weight. This deviation will ensure collection of enough sample volume.
5. Seal sample containers and wipe outside surfaces.
6. Label split samples as specified in the site-specific sampling plan. Record all pertinent information in the field logbook.
7. Split samples will have a separate chain of custody record.
8. Split samples will be sealed, packed, and transported in an identical manner as other samples from the site. The difference may be their destination (different laboratories) and the extent of analytical work. The site-specific sampling plan specifies the disposition of split samples.
9. Decontaminate all equipment. Place all disposables in the appropriate receptacles.
10. Remove personal protective clothing and equipment and place in the designated receptacles. Field sampling personnel must be contamination-free before leaving the sampling site.
11. Document activities.

5.5 Split Samples for Surface Water and Ground Water

The following steps must be followed when collecting split samples for surface water and ground water:

1. Determine the number and frequency of required sample splits as stated in the site-specific sampling plan.
2. Proceed with site sampling to the point of obtaining split sample(s).
3. Follow the specific media-sampling plan.
4. Split samples for VOCs are not recommended. Adequate cross-laboratory checks can be obtained by splits of non-VOC samples. If QA is required for VOC samples, obtain duplicates as outlined in Section 5.1 of this SOP. All split samples for VOC analysis for the above media are grab samples taken as specified in Step (3), Section 5.1 of this SOP.

5. For non-VOC grab samples, obtain a sufficient volume to fill all required sample containers, including those required for splits.
6. Obtain VOC samples first (without mixing or compositing). Samples for VOCs must be collected and contained immediately. Agitation by mixing, stirring, or shaking will cause vaporization of the volatile fraction to a significant degree. Resample if agitation has occurred. Mix all non-VOC duplicate samples or when taking duplicates of surface water of ground water samples. Pouring a portion of the sample directly from the sampling device into the original container, and then pouring an equal portion into the duplicate container, alternating between the two until the sample containers are full will accomplish mixing.
7. Split the composited sample by placing the required volumes in the sample containers, including those for split samples.
8. Seal sample containers and wipe outside surfaces.
9. Label split samples as specified in the site-specific sampling plan. Record all pertinent information in the field logbook.
10. Split samples will have a separate chain of custody record.
11. Split samples will be sealed, packed, and transported in an identical manner as other samples from the site. The difference may be their destination (different laboratories) and the extent of analytical work. The site-specific sampling plan specifies the disposition of split samples.
12. Decontaminate all equipment. Place all disposables in the appropriate receptacles.
13. Remove personal protective clothing and equipment and place in the designated receptacles. Field sampling personnel must be contamination-free before leaving the sampling site.
14. Document activities.

6.0 REQUIRED FORMS/DOCUMENTATION

Chain of Custody Record

CALIBRATION AND MAINTENANCE OF MEASURING AND TEST EQUIPMENT

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the methods and responsibilities associated with the calibration, control, and maintenance of measuring and test equipment (M&TE). It applies to all tools, gauges, instruments, and other test equipment where the manufacturer requires or recommends equipment accuracy to be checked periodically. In the case of commercial devices such as rulers, tape measures, and levels, calibration controls will not be required.

2.0 REFERENCES

None

3.0 RESPONSIBILITIES

The Quality Assurance Officer or his/her designee is responsible for monitoring the effective implementation of this SOP and/or the M&TE manufacturer's recommendations.

The Project Technical Manager, Technical Coordinator, and Sampling Team Leader(s) are responsible for the selection of M&TE to be used in the field activity and to assure it is of the proper type, range, accuracy and tolerance required to meet project objectives. Additionally, they are responsible for storage and protection of M&TE.

The field personnel performing tests are responsible for assuring that all M&TE is properly calibrated prior to and during use, and for documenting the calibration or deficiencies of equipment.

4.0 DEFINITIONS

4.1 M&TE

Measuring and test equipment used to obtain data during the performance of tests or inspections.

4.2 Calibration

The comparison of a measurement standard or instrument of a known accuracy with another standard or instrument to detect, correlate, report, or eliminate by adjustment, any variation in the accuracy of the items being compared within allowable deviations.

4.3 Reference Standard

An item of known and verifiable value that is used to check or establish the basis for tests or inspections.

5.0 PROCEDURE

5.1 Equipment Identification and Control

M&TE that requires calibration will be uniquely identified by the manufacturer's serial number, or other suitable assigned number. If this should prove to be impractical, an identification label will be affixed using materials and methods that provide a clear and legible identification and do not detrimentally affect the function or service life of the M&TE. This identification will be replaced as needed to provide clear identification of the M&TE.

All M&TE and reference standards shall be stored between uses in a manner that will minimize damage or deterioration.

5.2 Calibration

Written and approved procedures will be used for calibration of M&TE. Calibration procedures that have been previously established and approved by the M&TE manufacturer or a nationally recognized authority (i.e., ASTM, EPA) will be used when available. If no preexisting procedure is available, procedures will be developed by qualified personnel familiar with the M&TE and approved by the Project Technical Manager and the Quality Assurance Officer. Development of procedures will take into consideration the intended use and objective of the resulting data, equipment characteristics, required accuracy and precision of data, location of examination, effects of climate or any other parameter that would adversely influence the calibration. The procedures will include, as applicable:

- Name/type of equipment to be calibrated
- Reference standards to be used
- Calibration method and sequential actions
- Acceptance criteria
- Frequency of calibrations/checks
- Data recording form/format
- Data processing methodology
- Any special instructions
- Operator training and qualification requirements.

Field M&TE will be calibrated prior to use. Calibrations of M&TE will be performed by trained and qualified personnel, approved external agencies or by the equipment manufacturer. The following types of calibrations and checks will be performed by qualified personnel:

- Periodic calibrations - are performed at prescribed intervals established for the M&TE to assure that the equipment is operating within its designed range and accuracy. These are usually performed by outside agencies or the M&TE manufacturer. A calibration certificate will be provided documenting the operational and functional acceptance of the M&TE.
- Specific calibrations - are performed for specific measurements or tests and vary from instrument to instrument and from procedure to procedure. Specific calibrations are performed prior to start of each work shift.

5.3 Calibration Frequency

M&TE will be calibrated at prescribed intervals and before each specific use. The frequency of periodic calibrations will be based on manufacturer's recommendations, national standards of practice, equipment type and characteristics, and past experience.

A scheduled calibration of M&TE does not relieve the user of the responsibility for selecting the appropriate and properly functioning equipment. In the event that the calibration has expired, the M&TE will be removed from service and tagged as “out-of-service” in order to prevent inadvertent use until it has been appropriately recalibrated.

5.4 Reference Standards and Equipment

Calibration reference standards and equipment will have known relationships to the National Institute of Standards and Technology (NIST) or other nationally recognized standards. If a national standard does not exist, the basis for calibration will be fully documented by the Project Technical Manager and approved by the Quality Assurance Officer.

Physical and chemical standards will have certifications traceable to NIST, EPA or other recognized agencies. Standards that are repackaged or split will also have traceable lot or batch numbers transferred onto the new container.

It is the responsibility of the user to select, verify and use the correct standard in accordance with an approved procedure or established practice.

5.5 Calibration Failure

Each individual user of M&TE is responsible for checking the calibration status of equipment to be used and confirming the acceptable calibration status prior to use. Equipment for which the periodic calibration period has expired, equipment that fails calibration, or equipment that becomes inoperable during use will be removed from service and tagged as out-of-service.

Out-of-service M&TE will be segregated from operational M&TE when practical. The specific reason for removal from service and the date of removal will also be stated on the out-of-service tag. The M&TE will then be repaired and/or recalibrated by the appropriate vendor or manufacturer as deemed necessary by the Project Technical Manager. M&TE that cannot be repaired will be replaced, as necessary, to provide support to the project. Any M&TE consistently found to be out-of-calibration would be replaced.

The Project Technical Manager and the Quality Assurance Officer will evaluate results of activities performed using equipment that has failed recalibration. If the activity results are adversely affected, the results of the evaluation will be documented as a nonconformance.

5.6 Calibration Documentation

Specific calibration records will be prepared and documented for each calibrated M&TE used. Periodic calibration certificates will be maintained and available for review at the field office. Calibration data will be recorded on the Field Logbook or other suitable form. The Project Technical Manager will be responsible for reviewing the calibration data for appropriateness, accuracy, readability, and completeness.

Calibration records will include, as applicable, the following information:

- Equipment identification number
- Calibration procedure used
- Date/time of calibration
- Time of calibration checks (if required)
- Identification of reference standard(s) used
- Applicable responses or readings of calibration
- Name of individual performing calibration
- Item(s) that are being tested or inspected.

5.7 Preventive Maintenance

Preventive maintenance of M&TE will be performed in accordance with the manufacturers' recommendations to maintain proper M&TE performance, minimize equipment failure and to increase measurement reliability.

6.0 REQUIRED FORMS/DOCUMENTATION

None

FIELD INSTRUMENT

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to define field requirements for quality assurance/quality control (QA/QC), for equipment and instrument calibration, inspection, and maintenance. Instruments and equipment used to gather, generate, or measure environmental data must be calibrated to ensure that accuracy and reproducibility of results are consistent with the manufacturer's specifications. Equipment, instruments, tools, gauges, and other items requiring preventive maintenance must be serviced according to the manufacturer's specifications. Raw data from the field measurements and sample collection activities must be recorded in the appropriate logbook or field form, and standard reporting units must be used for comparability and consistency.

2.0 REFERENCES

EPA, September 1987, EPA Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer has the responsibility for periodic review of procedures and documentation associated with the calibration of field instrumentation. If perceived variances occur, the Quality Assurance Officer is also responsible for issuing notices of nonconformance's and requesting corrective actions.

The Health and Safety Officer is responsible for ensuring that calibration is completed daily in accordance with this procedure, that equipment and instrument inspection and maintenance is conducted, that measurements are taken to the specified accuracy. The Health and Safety Officer is also responsible for validation of field data by:

Conducting routine checks during the processing of data (e.g. errors in identification codes);
Checking the consistency with parallel data sets obtained presumably from the same population (e.g., from the same portion of the aquifer or volume of soil).

The Sampling Team Leader(s) is responsible for calibrating, inspecting, and maintaining instruments, and for taking measurements to the specified precision.

4.0 DEFINITIONS/MATERIALS

4.1 Instruments (to be calibrated, and manufacturer's operating manual)

- pH Meter
- Conductivity meter
- Turbidity meter
- Photoionization detector
- Thermometer
- Water level measurement device

- Magnetometer
- Gas chromatographer, equipped with FID and PID (for soil sampling)

Other:

- Maintenance schedule.
- Field logbook.
- Indelible black ink pens.

5.0 PROCEDURE

5.1 Equipment and Instrument Calibration

The frequency of calibration for field instruments will be performed at the intervals specified by the manufacturer or more frequently as conditions dictate, but daily as a minimum. Field instruments will include a pH meter, thermometer, conductivity meter, organic vapor photoionization detector (PID), magnetometer, and a radioactivity meter. Calibration will be documented on the Field Logbook and will be conducted per WTS-SOP No. 4.0 unless otherwise noted..

The manufacturer's guide will be followed when calibrating the pH meter, thermometer, conductivity meter, organic vapor photoionization detector (PID), magnetometer, and radioactivity meter

To ensure comparability between sample data of similar samples and sample conditions, standard solutions and material traceable to the National Institute of Standards and Technology or EPA-published standards/protocols will be used to calibrate the field instruments.

5.2 Equipment and Instrument Inspection and Maintenance

5.2.1 Equipment and Instrument Inspection

Equipment to be used during field sampling will be examined to ensure that it is in proper operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to ensure that all maintenance requirements are being observed. Field notes for previous sampling trips will be reviewed so that the notations on any prior equipment problem are not overlooked and all necessary repairs to equipment have been carried out.

5.2.2 Equipment and Instrument Maintenance

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's recommendations.

Manufacturer's procedures identify the schedule for servicing critical items in order to minimize the downtime of the measurement system. It will be the responsibility of the operator to adhere to the maintenance schedule and to arrange prompt service as required. Service to the equipment, instruments, tools, gauges, etc. will be performed by qualified personnel. In the absence of any manufacturer's recommended maintenance criteria, the operator based upon experience and previous use of the equipment, will develop a maintenance procedure.

5.3 Field Measurement Precision

For the pH meter and the conductivity meter, precision will be tested by multiple readings in the medium of concern. Consecutive readings should agree within ±0.1 standard unit's pH and ±0.01 ohms/cm conductivity. The thermometer will be visually inspected prior to each use. The photoionization detector probe will be exposed to a volatile organic compound source prior to field use in order to determine if the instrument is working. Water level indicator readings will be precise within ±0.01 feet for duplicate measurements.

The following standard reporting units will be used during all phases of the project:

- Water levels measured in wells will be reported to the nearest 0.01-foot.
- Soil sampling depths will be reported to the nearest 0.1-foot.
- Soil gas results will be reported to two significant figures.

6.0 REQUIRED FORMS/DOCUMENTATIONS

Field Logbook

WATER LEVEL MEASUREMENTS IN MONITORING WELLS

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines for personnel to use in determining the depth to water in monitoring wells.

2.0 REFERENCES

EPA, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, OSWER-9950.1, U.S. Government Printing Office, Washington, D.C.

EPA, 1991, Environmental Compliance Branch, Standard Operating Procedures and Quality Assurance Manual, Region IV, Environmental Services Division, Athens, Georgia, U.S. Government Printing Office, Washington, D.C.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for the periodic review of documentation generated as a result of this SOP and the periodic review and audit of field personnel as they perform the work. If problems arise, the Quality Assurance Officer is also responsible for verifying implementation of corrective action(s) (i.e., retraining personnel, additional review of work plans and SOPs, variances to requirements, and issuing nonconformances) and assuring through monitoring the continued implementation of stated corrective actions.

The Sampling Team Leader(s) is responsible for ensuring that monitoring well water level measurements are properly collected and documented.

4.0 DEFINITIONS/MATERIALS

A number of devices are available for the determination of water level measurements in monitoring wells. Those most commonly used and covered in this SOP includes steel tapes, electric sounders, and petroleum product probes. The equipment must be capable of recording a measurement to the accuracy required by the project plans.

5.0 PROCEDURE

Water level measurements are commonly taken in each monitoring well immediately prior to, during, and following well development, and both before and after well purging and sampling. Water level measurements may also be taken where no development or purging is being conducted, strictly to monitor or generate water table or piezometric surfaces. When such measurements are made to monitor water table or piezometric surfaces, water levels in all wells at a given site should be measured within a 24-hour maximum period whenever possible. When measuring wells for water for water table or potentiometric surface analysis, and if the contaminant history is known for each of the wells, it is advisable to monitor water levels beginning with the least contaminated wells first and progressing to the most contaminated wells last.

5.1 Equipment Selection

Project data quality objectives and site characteristics must be taken into account when determining the water level measurement equipment to use. The total number of wells to be measured, weather, tidal influences, pumping, and construction can all affect water level measurements. The project-specific work plans will identify the specific equipment to be used.

5.2 Determining Water Level Measurements in Monitoring Wells

The standard procedure for determining depth to water is described below.

1. Calibrate all measuring devices according to the manufacturer's specifications. Measuring tapes should be checked a minimum of every six months against a surveyor's tape to determine if shrinking or stretching has occurred.
2. Prior to taking a water level measurement at each well, decontaminate the measuring device according to the procedures outlined in WTS-SOP 6.0. During decontamination, all measuring tapes should be inspected for kinks, cracks, or tears and, if present, repaired or replaced with undamaged equipment.
3. Visually inspect the well to ensure that it is undamaged, properly labeled and secured. Any damage or problems with the well head should be noted on the Field Logbook and the site superintendent notified for repair or replacement of the equipment.
4. Uncap the well and monitor the air space immediately above the open casing per the project-specific health and safety plan. Observe if any air is flowing into or out of the casing. In the event such conditions are observed, they should be noted on the Field Logbook. Lower the electric sounder or equivalent (product probe or steel tape) into the well until the water surface is encountered. If air is observed to be entering or flowing out of the casing, the sounder should not be placed inside the well until the air flow stops and pressure equalizes.
5. Measure the distance from the water surface to the permanent reference point. For aboveground “stickup” completions, the reference point is usually a groove cut into the north side of the casing. If no permanent reference point is available for an aboveground completion, measure from another permanently fixed structure or from ground level. The point of measurement should then be noted on the Field Logbook. For flush mount completions, such as street boxes, the water level measurement should be referenced to a steel rate placed across the rim of the street box and over the casing. Any aboveground completions without permanent reference points or marks should be brought to the attention of the appropriate supervisory personnel per the project-specific work plans.
6. Collect measurements until two consecutive measurements are identical or within the specified tolerance of the project-specific work plan (usually 0.01 ft). Record all appropriate information on the Field Logbook. At a minimum, the following information must be recorded:
   - project name and number;
   - unique well identification number;
   - date and time of measurement collection;
   - depth to water to the specified tolerance;
   - weather conditions; and
   - any problems encountered.
7. If product or other nonaqueous liquid is encountered, follow the procedures outlined in WTS-SOP 5.1.
8. Cap and relock the well.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

NONAQUEOUS PHASE LIQUID MEASUREMENTS IN MONITORING WELLS

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines for field personnel to use in determining the thickness of nonaqueous phase liquid in monitoring wells. The details within this SOP should also be used in conjunction with project work plans and/or related SOPs.

2.0 REFERENCES

EPA, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, OSWER-9950.1, U.S. Government Printing Office, Washington, D.C.

EPA, 1991, Environmental Compliance Branch, Standard Operating Procedures and Quality Assurance Manual, Region IV, Environmental Services Division, Athens, Georgia, U.S. Government Printing Office, Washington, D.C.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all nonaqueous phase liquid in monitoring wells is properly measured and documented in accordance with this SOP and other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for the periodic review of documentation associated with this SOP and the periodic review and audit of field personnel as they perform the work. If perceived variances occur, the Quality Assurance Officer is also responsible for issuing notices of nonconformance and requests for corrective action.

The Sampling Team Leader(s) is responsible for the proper measurement and documentation of the nonaqueous phase liquid measurement in monitoring wells.

4.0 DEFINITIONS/MATERIALS

4.1 Product

For the purposes of this procedure, product refers to liquid that is petroleum based (e.g., gasoline, diesel, or petroleum byproducts) or chlorinated hydrocarbon based (e.g., trichloroethene, tetrachloroethene, etc.).

Two types of equipment used to measure nonaqueous phase liquids (NAPLs) in monitoring wells: product probes and clear bailers. The type of equipment used will be determined on a project specific basis and identified in the Field Sampling Plan.

5.0 PROCEDURE

5.1 Equipment Selection

This procedure addresses the operation of two types of equipment used to measure nonaqueous phase liquids (NAPLs) in monitoring wells: product probes and clear bailers. Clear bailers include both single- and double-check valve bailers. Single check valve bailers can only be used for measuring light nonaqueous phase liquids (LNAPLs) or floating products. Double check valve bailers can be used for measuring both LNAPLs and dense nonaqueous phase liquids (DNAPLs) or sinking product. The equipment must be capable of recording a measurement to an accuracy of 0.01 foot.

Several problems can arise in measuring product thickness with either product probes or clear bailers. Product probes can malfunction, particularly when measuring degraded or weathered product that sticks to the probe sensors. When the thickness of the product layer in a well is greater than the length of the bailer, the product layer cannot be accurately measured with the bailer. Consequently, it is recommended that both methods be used (one to check the other) to measure product thicknesses in wells. The project work plans will identify the specific equipment to be used.

5.2 Product Probe Procedure

The product probe, sometimes called an immiscible layer probe, is a device that can detect the presence of both LNAPLs and DNAPLs (both “floating” and “sinking” layers) in water wells. The device detects the difference in conductivity or specific gravity between the aqueous and nonaqueous phases in the well. The device is generally a probe connected to a measuring tape with a reel. The device contains a receiver with an audio and/or visual signal that indicates when phase changes occur. The standard procedure for using a petroleum product probe is described below.

Check the accuracy of the measuring tape of the petroleum product probe according to the manufacturer's specifications. Measuring tapes should be checked at least every six months against a surveyor's tape to determine if shrinking or stretching has occurred.

1. Prior to taking a measurement and between wells, decontaminate the probe and tape measure according to the procedures outlined in WTS-SOP 6.0. It is extremely important to conduct thorough decontamination to prevent cross-contamination between wells. During decontamination, all measuring tapes should be inspected for kinks, cracks, or tears and, if present, repaired or replaced with undamaged equipment.
2. Visually inspect the well to ensure that it is undamaged, properly labeled and secured. Any damage or problems with the well head should be noted on the Field Activity Daily Log and notify the site superintendent per the project work plans.
3. Uncap the well and monitor the air space immediately above the open casing per the Project Health and Safety Plan. Observe if any air is flowing into or out of the casing. In the event such conditions are observed, they should be noted on the Field Logbook. If air is observed to be flowing into or out of the casing, the probe should not be placed inside the well until the airflow stops and pressure equalizes. Lower the probe into the well until the liquid surface is encountered. Continue lowering the probe, recording the depths at which any audio or visual changes in the device indicate a phase change. When measuring for DNAPL, continue lowering the probe to the bottom of the well. When measuring for LNAPL, there is no need to lower the probe further once the product/water interface is encountered and measured.
4. While lowering the probe, measure the distances to the encountered phase/phases from the permanent reference point. For aboveground “stick-up” completions, the reference point is usually a groove cut into the north side of the casing. If no permanent reference point is available for an aboveground completion, measure from another permanently fixed structure or from ground level. The point of measurement should then be noted on the Field Logbook and the appropriate form on which the water level is recorded.
5. For flush mount completions, such as street boxes, the water level measurement should be referenced to a steel rule placed across the rim of the street box and over the casing. Any aboveground completions without permanent reference points or marks should be brought to the attention of the site supervisor per the project work plans.
6. Collect measurements until two consecutive measurements are identical or within tolerances specified in the project work plans. Record all appropriate information on the field Logbook. At a minimum, the following information must be recorded:
   - project name and number;
   - well identification number;
   - date and time of measurement collection;

- depth to water to the specified tolerance;
- depth to and description of any nonaqueous phase liquid encountered;
- weather conditions; and
- comments, including any problems encountered.

7. Cap and relock the well.

5.3 Bailer Procedure

1. A single check-valve bailer is a cylindrical tube, open at the top and containing a floating ball at the bottom. Lowering the bailer into liquid allows the bottom ball to float allowing floating product or water to enter the bailer. The design of this type of bailer only allows collection of a floating product (LNAPL) sample.
2. A double check-valve bailer is an enclosed cylindrical tube containing a floating ball at both the top and the bottom. Lowering the bailer into liquid causes both balls to float allowing water or product to enter the cylinder. Raising the bailer through the water causes both balls to settle, effectively trapping a discrete section of the water so that it can be brought to the surface. Since the double check-valve bailer is capable of collecting a discrete sample at any depth within the well, it can be used on both “floating” and “sinking” nonaqueous liquids.
3. The bailers must be constructed of clear material so that any product can be visibly measured. Some are also available with graduated markings on the side to allow easier measurement. Bailers are commonly used with a thin nylon line or “chord” made of similar material. Some are supplied with a connectable measuring tape. The standard procedure for using bailers to measure nonaqueous phase liquids in monitoring wells is described below.
4. Check the accuracy of the measuring tape to be used with the bailer according to the manufacturer’s specifications. Measuring tapes should be checked a minimum of every six months against a surveyor's tape to determine if shrinking or stretching has occurred.
5. Prior to taking a measurement and between wells, decontaminate the bailer and tape measure according to the procedures outlined in WTS-SOP 6.0, Sampling Equipment and Well Material Decontamination. If a bailer line is used, it is advised to slip, cut, and dispose of any. That runs inside a previous well and then decontaminate the remaining line. Bailers used for product sampling should never be used for purging or collecting water samples.
6. If product probe measurements are to be used in conjunction with a bailer, the probe measurements should first be made, recorded, and noted by field personnel taking the measurements.
7. If bailer measurements are to be taken before or without product probe measurements, visually inspect and document wellhead conditions per Section 5.2.4 above. Uncap the well and monitor and observe the well head per Section 5.2.5 above.
8. Lower the bailer into the well until the liquid surface is encountered. Use the measuring tape if available to determine the depth to which the bailer should be lowered to recover either the LNAPL or DNAPL product.
9. If using bailer chord and attempting to recover DNAPL (“sticking”) product, a double check-valve bailer may simply be run to the bottom of the well. If attempting to recover LNAPL (“floating”) product using bailer chord, it is advisable to first note the depths to product and water made with the product probe and mark the depths on the bailer chord with a rubber band or twine. The bailer (either single or double check-valve) should then be lowered such that the bailer retrieves product layer, thereby retrieving only water.
10. If no product probe measurements are available, the person attempting to retrieve the bailer product sample will then have to “feel” for first contact with the liquid while the bailer is descending inside the well. Once the contact is felt, the bailer descent should be halted. The bailer should then be slowly lowered no more than ¾ of its total length to avoid overtopping. Retrieve the bailer and visually inspect for product. Measure the amount of product contained in the bailer with the measuring tape.

Note any appropriate conditions observed in the bailer such as:

- Color and clarity of the product
- Length of product column in bailer compared to overall length of bailer
- Evidence of any problems with the bailer valves
- Evidence of overtopping or complete run through the product column.

11. Record all appropriate information on the Field Logbook. At a minimum, the following information must be recorded:

    - project name and number;
    - well identification number;
    - date and time of measurement collection;
    - depth to water if available to the appropriate tolerance specified in the project work plans;
    - measurement and description of any nonaqueous phase liquid encountered;
    - any observations made in 5.2.5 above; and
    - comments, including any problems encountered.

12. Cap and relock the well.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

FIELD EQUIPMENT DECONTAMINATION

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures required for decontamination of field equipment. Decontamination of field equipment is necessary to ensure the quality of samples by preventing cross-contamination. Further, decontamination reduces health hazards and prevents the spread of contaminants off site.

2.0 REFERENCES

EPA, September 1987, EPA Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Project Chemist is responsible for ensuring that field personnel are trained in the use of this procedure and that decontamination is conducted in accordance with this procedure.

The Quality Assurance Officer has the responsibility for periodic review of procedures and documentation associated with the decontamination of drilling and heavy equipment. If perceived variances occur, the Quality Assurance Officer is also responsible for issuing notices of nonconformances and requesting corrective actions. Additionally, he/she will perform the three phases of inspections and continuous monitoring of the decontamination activities.

The Sampling Team Leader(s) is responsible for verifying that this procedure is correctly implemented. The Sampling Team Leader may also be required to collect and document rinsate samples to provide quantitative verification that these procedures have been correctly implemented. This SOP and the project work plans should be reviewed before implementing decontamination procedures at the project field area.

4.0 DEFINITIONS/MATERIALS

4.1 Deionized Analyte-Free Water

Ion-free, analyte-free water produced on site or purchased from a supplier with a deionization chamber equipped with a carbon filter.

4.2 Potable Water

Treated municipal water.

4.3 Laboratory Grade Detergent

A standard brand of laboratory-grade detergent, such as “Liquinox.”

4.4 Methanol

Laboratory-grade methanol alcohol, CAS #67-56-1

4.5 Hexane

Laboratory-grade hexane, CAS #110-54-3

4.6 HPLC Water

High purity laboratory-grade water.

4.7 Non-sampling Equipment

Non-sampling equipment includes:

- Field logbook.
- Drilling rigs, backhoes, augers, drill pipe, bits, casing, and screen.
- High-pressure pump soap dispenser or steam-spray unit.
- 2- to 5-gal manual-pump sprayer (pump sprayer material must be compatible with the solution used).
- Stiff-bristle brushes.
- Gloves, goggles, boots, and other protective clothing as specified in the site-specific health and safety plan.

4.8 Small Equipment

Small equipment includes:

- Split spoons, bailers, bowls, and filtration equipment
- 5-gal plastic buckets
- Laboratory-grade detergent (phosphate free)
- Stiff-bristle brushes
- Nalgene or Teflon, sprayers or wash bottles or 2- to 5-gal manual-pump sprayer (pump sprayer material must be compatible with the solution used)
- Plastic sheeting
- Disposable wipes or rags
- Potable water
- Appropriate decontamination solutions
- Gloves, goggles, and other protective clothing as specified in the site-specific health and safety plan

4.9 Pumps and Pump Assemblies

The required pumps and pump assemblies include:

- Three or more empty 30-40 gallon containers
- Plastic sheeting
- 5-gal (or larger) containers of potable water and other required decontamination solutions
- Disposable wipes or rags
- Gloves, goggles, and other protective clothing as specified in the site-specific health and safety plan.

5.0 PROCEDURES

This section contains responsibilities, requirements, and procedures for sampling equipment and well material decontamination. The decontamination is required in order to maintain proper quality and integrity of collected samples.

The details within this SOP should be used in conjunction with the project work plans. The project work plans will provide the following information:

- Types of equipment requiring decontamination under this SOP;
- Specific materials to be used for the decontamination; and
- Additional decontamination requirements and procedures beyond those covered in this SOP, as necessary.

All field personnel associated with decontamination of sampling equipment or well materials must read both this SOP and the project work plans prior to implementation of related decontamination activities. Information and requirements for the decontamination of any and all drilling and heavy equipment is provided in MSOP No. 6.1.

5.1 Decontamination Facility

If possible, sampling equipment decontamination will take place in an area designed exclusively for decontamination. This area will ideally be located within the contamination reduction zone on the project site. Well materials may be decontaminated at the facility set up for decontamination of drilling and heavy equipment (see MSOP No. 6.1).

Each decontamination facility will be constructed so that the equipment, as well as all wastes generated during decontamination (e.g.: soil, rinsate, liquid spray, debris, etc.), is fully contained. In addition, chemical products used in the decontamination process must be properly containerized and labeled.

5.2 Decontamination of Non-dedicated Sampling Equipment

Each piece of reusable, small or non-dedicated sampling equipment will be decontaminated before mobilization to each site and before each sampling event. The standard procedure will be performed as described below.

1. All personnel involved with the task must wear suitable personal protective equipment to reduce personal exposure (specified by the project work plans).

2. Heavily caked soil and/or other material will be scraped or brushed from equipment. The scrapings will be placed into an appropriate container for disposal. Steam cleaning of equipment may be required to remove material from samplers.

3. Equipment that will not be damaged by water should be placed into a wash tub containing a laboratory-grade detergent solution and scrubbed with a brush or clean cloth. Rinsing will then be conducted with fresh, potable water, followed by deionized water.

4. Methanol, hexane, and HPLC water rinses may then follow for some sampler components when specified by the project work plans.

5. Any equipment that may be damaged by submersion into water will be wiped clean using a sponge and detergent solution. Wiping the equipment with deionized water will follow cleaning.

6. Air-dry the rinsed equipment. Soil organic vapor sampling equipment should be flushed dry with bottled air of known quality and/or as per the project work plans.

7. Place decontaminated equipment on clean plastic sheeting to prevent contact with contaminated soil. If equipment is not used immediately, cover or wrap the equipment in clean plastic sheeting to minimize airborne contamination.

8. Decontamination activities shall be documented on the Field Logbook.

5.3 Decontamination of Dedicated Sampling Equipment

Dedicated sampling equipment, such as submersible pumps, will be decontaminated prior to installation inside monitoring wells. At a minimum, the procedure outlined below must be performed. If factory-cleaned, hermetically sealed materials are used, no decontamination will be necessary provided that laboratory certification of decontamination is submitted with the equipment.

1. All personnel involved in the task will wear suitable personal protective equipment in accordance with the project work plans.

2. Foot vale and pumping lines will be washed with a laboratory-grade detergent solution.

3. The equipment will then be rinsed twice with tap water, followed by a rinse with deionized water.

4. Air dry.

5. Place decontaminated equipment on clean plastic sheeting to prevent contact with contaminated soil. If equipment is not used immediately, cover or wrap the equipment in clean plastic sheeting to minimize airborne contamination.

6. Decontamination activities will be documented on the Field Logbook.

5.4 Decontamination of Well Materials

Well materials including well casing, well screens, centralizers, and end caps will be decontaminated prior to use in constructing monitoring wells. (If factory-cleaned, hermetically sealed materials are used, no decontamination will be necessary provided that laboratory decontamination certification is submitted with the equipment.) The standard procedure outlined below must be performed when decontaminating well materials.

1. All personnel involved in the task will wear appropriate personal protective equipment in accordance with the project work plans.

2. Materials will be thoroughly sprayed and washed with water using a high-pressure steam cleaner.

3. Air dry.

4. Decontaminated materials will be placed on clean metal racks or clean plastic sheeting. If equipment is not used immediately, cover or wrap the equipment in clean plastic sheeting to minimize airborne contamination.

5. Decontamination activities will be documented on the Facility Logbook.

5.5 Pump Decontamination

The following steps must be followed when decontaminating pumps:

1. Set up decontamination area and separate clean storage area using plastic sheeting to cover the ground, tables, and other porous surfaces. Set up three 30-40 gallon containers in a triangle. The two containers at the base of the triangle will be used to contain dilute (non-foaming) soapy

water and potable water. The drum at the apex will receive wastewater. Place 5-gal cans of potable water adjacent to the water container on the same side as the potable water container.

2. Pump should be set up in the same configuration as for sampling. Submerge pump intake (or pump if submersible) and all downhole wetted parts (tubing, piping, foot valve) in soapy water of the first container. Place the discharge outlet in the waste container above the level of wastewater.

3. Pump soapy water through the pump assembly until it discharges to the waste container.

4. Move pump assembly to the potable water container while leaving discharge outlet in the waste container. All downhole-wetted parts must be immersed in the potable water rinse. Pump potable water through the pump assembly until it runs clear.

5. Decontaminate the discharge outlet by hand following the steps outlined in Section 5.2. Part 2 of this SOP.

6. Remove the decontaminated pump assembly to the clean area and allow to air dry. Intake and outlet orifices should be covered with aluminum foil to prevent the entry of airborne contaminants and particles.

7. Record the equipment type and identification, and the date, time, and method of decontamination in the appropriate logbook.

5.6 Waste Disposal

The following steps must be followed when disposing of wastes:

1. All wash water and rinse water that have come in contact with contaminated equipment are to be handled, packaged, labeled, marked, stored, and disposed of as investigation-derived waste unless other arrangements are approved in advance. Waste disposal will be in accordance with the project-specific Investigation-Derived Waste Management Plan.

2. Small quantities of decontamination solutions may be allowed to evaporate to dryness.

3. If large quantities of used decontamination solutions are generated, segregate each type of waste in separate containers. This may permit the disposal of wash water and rinse water in a sanitary sewage treatment plant rather than as a hazardous waste.

4. Unless required, plastic sheeting and disposable protective clothing may be treated as a solid non-hazardous waste.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

DRILLING, DEVELOPMENT, AND HEAVY EQUIPMENT DECONTAMINATION

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines for use by field personnel in the decontamination of drilling, development, and heavy equipment. The details within this SOP are applicable as general requirements for drilling and heavy equipment decontamination, and should also be used in conjunction with project work plans and/or related SOPs.

2.0 REFERENCES

EPA, September 1987, EPA Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator have the responsibility for ensuring that the decontamination of drilling and heavy equipment is properly performed through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer has the responsibility for periodic review of procedures and documentation associated with the decontamination of drilling and heavy equipment. If perceived variances occur, the Quality Assurance Officer is also responsible for issuing notices of nonconformances and requesting corrective actions. Additionally, he/she will perform the three phases of inspections and continuous monitoring of the decontamination activities.

The Sampling Team Leader(s) assigned to drilling, development, trenching, or construction activities are responsible for ensuring that subcontractors or equipment operators properly decontaminate the drilling, development, and heavy equipment associated with those tasks. The project staff is also responsible for documenting the decontamination activities on the Field Logbook.

This SOP and the project work plans should be reviewed before implementing decontamination procedures at the project field area.

4.0 DEFINITIONS/MATERIALS

4.1 Laboratory Grade Detergent

A standard brand of laboratory-grade detergent, such as “Liquinox”.

4.2 Potable Water

Water dispensed from a municipal water system.

5.0 PROCEDURE

5.1 General

This section provides requirements for the set up of a decontamination facility for drilling, development, and heavy equipment and the decontamination procedures to be followed. The project work plans will provide specific information regarding:

- Types of equipment requiring decontamination under this SOP;
- Location of the decontamination station;
- Types and/or specifications on materials to be used in the fabrication of the decontamination station; and
- Types of materials and additional details on the procedures to be used in the decontamination process.

All field personnel associated with either the fabrication of the decontamination station or the decontamination of drilling or heavy equipment must read both this SOP and the project work plans prior to implementation of related decontamination activities. Information and requirements for the decontamination of any and all equipment used specifically for sampling is presented in WTS-SOP 6.0.

5.2 Decontamination Facility

A decontamination station will be set up in an area exclusively for decontamination of drilling, well development, and/or heavy equipment. The location of the decontamination station will be specified in the project work plans. All decontamination of drilling, development, and heavy equipment will be conducted within the station.

At a minimum, the station will be constructed such that all rinsates, liquid spray, soil, debris, and other decontamination wastes are fully contained and may be collected for appropriate waste management and disposal. The station may be as simple as a bermed, impermeable polyethylene sheeting, of sufficient thickness, with an impermeable sump for collecting rinse water. More sophisticated designs involving self-contained metal decontamination pads in combination with bermed polyethylene sheeting may also be used, depending on project-specific requirements. These requirements along with specific equipment and construction specifications for the decontamination station will be provided in the project work plans.

5.3 Decontamination of Downhole Equipment

All downhole drilling and development equipment (including but not limited to drill pipe, drive casing, drill rods, bits, tools, bailers, etc.) will be thoroughly decontaminated before mobilization onto each site and between borings or wells at each site or as required in the project work plans. The standard procedure will be performed as described below. Decontamination will be performed in accordance with this SOP and the project work plans.

1. All personnel involved with the task must wear appropriate personal protective equipment to limit personal exposure (as specified in the project work plans).
2. Equipment caked with drill cuttings, soil, or other material will initially be scraped or brushed. The scrapings will be containerized and appropriately disposed.
3. Equipment will then be sprayed with potable water using a hot water, high-pressure washer.
4. Washed equipment will then be rinsed with potable water.
5. Decontaminated downhole equipment (such as drill pipe, drive casing, bits, tools, bailers, etc.) will be placed on clean plastic sheeting to prevent contact with contaminated soil and allowed to air dry. If equipment is not used immediately, it will be covered or wrapped in plastic sheeting to minimize airborne contamination.
6. Decontamination activities will be documented by the Sampling Team Leader, lead geologist, or lead engineer on the Field Logbook.

5.4 Decontamination of Heavy Equipment

Heavy equipment (e.g., drill rigs, development rigs, backhoes, and other earthmoving equipment) will be decontaminated between drilling sites or inside the contaminant reduction area prior to entering and leaving an exclusion zone. Decontamination will be performed in accordance with the project work plans.

The standard procedure will be performed as described below.

1. All personnel involved in the task will wear appropriate personal protective equipment in order to limit personal exposure (as specified in the project work plans).
2. Equipment caked with drill cuttings, soil, or other material will be initially scraped or brushed. The scrapings will be containerized and appropriately disposed.
3. Equipment will then be sprayed with potable water using a hot water, high-pressure washer.
4. Clean equipment will then be rinsed with potable water.
5. During the decontamination effort, fluid systems should be inspected for any leaks or problems that might potentially result in an inadvertent release at the site, thereby contributing to the volume of waste or contamination. Any identified problems should be immediately repaired and documented on the Facility Activity Daily Log. Decontamination should then be completed before moving the equipment onto the site or exclusion zone.
6. The Sampling Team Leader, lead geologist, or lead engineer will document decontamination activities on the Field Logbook.
7. Between boreholes at the same site, the back-end of the drilling rigs will be washed with potable water until surfaces are visibly free of soil buildup.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook.

SURFACE AND SUBSURFACE GEOPHYSICS

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for acquiring surface geophysical data. This includes the direct use of surface geophysical equipment by subcontractors conducting surface geophysical surveys. Additional specific surface geophysical procedures and requirements will be provided in the project work plans and/or related SOPs.

Surface geophysical surveys image into the subsurface using measuring equipment that is placed or located upon or above the ground surface. Common applications of surface geophysics for environmental projects include utility clearance, buried waste delineation, plume delineation, and geologic or hydrologic characterization. The most common surface geophysical techniques used for environmental applications and therefore, covered in this SOP; include electrical resistivity, seismic refraction, electromagnetics (EM), ground penetrating radar (GPR), metal detectors, and magnetometry.

2.0 REFERENCES

Manufacturer's instructions for the specific instrument utilized shall be consulted for proper operation and preventive maintenance requirements.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all surface geophysical activities are conducted and documented in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retaining personnel, additional review of work plans and SOPs, variances to surface geophysics requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to surface geophysical activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from the procedures to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Electromagnetic Induction (EM or EMI)

A method of sending electromagnetic waves into the ground and measuring the responding secondary electromagnetic wave. The secondary wave is generated in the proportion to the conductivity of the earth or objects therein. EM may be used to reveal utility lines, buried waste dumps, former excavations, and in some specific cases, changes in groundwater conductivity.

4.2 Ground Penetrating Radar

A method utilizing radar waves generated and propagated into the ground surface. The reflected (backscattered) waves are received back as data. GPR is typically used to reveal buried manmade objects, such as tanks, pipes, drums, etc. It may also at times be used to delineate backfilled excavations and waste cells.

4.3 Magnetic Survey

The process of accurately measuring the earth's magnetic field (on the order of 10/50,000 of the total field). The survey reveals magnetic anomalies that may result from buried metal objects or rock-type differences.

4.4 Metal Detector

An EM tool with a specialized sensor to detect metallic objects.

4.5 Resistivity Survey

A geophysical method of determining the resistivity of the earth's layers. The survey is conducted by inducing electrical currents of into the subsurface and measuring electrical potential differences at points of secondary electrical fields generated in the earth in response to the input of electrical current. Resistivity surveys are typically used to provide information on subsurface lithologies and, in certain instances, plume distributions.

4.6 Seismic Methods

Seismic surveys are conducted by inducing seismic (acoustic) waves into the around and recording the arrival times at varying distances of the refracted waves. They are typically used to reveal buried geologic structures and contacts between rock units.

4.7 Materials

Any of listed surface geophysical instruments or data collection devices – EM, GPR, magnetometer, earth resistivity, seismic.

- Field logbook
- Indelible black ink pens and markers
- Survey measurement documentation forms or data sheets
- Personal protective equipment and gear
- Appropriate surveying equipment for obtaining field measurements as specified in site-specific sampling plans
- Survey stakes

5.0 PROCEDURE

This section contains responsibilities, requirements and procedures for conducting surface geophysical surveys. Selection and design of the geophysical surveys to be used on a site must be based upon several factors. These include but are not limited to the following:

- Specific objectives or anticipated use of the survey (e.g., surface clearance, buried object identification, waste cell delineation, etc.)
- Known or expected site-specific conditions
- Targeted parameters and overall surface areas to be evaluated
- Potential site-induced effects that may limit specific survey methods
- Applicability of specific survey methods in meeting above objectives given the site-induced effects.

Consequently these factors must be considered and the tests designed well before generation of the project work plans and implementation in the field. The project work plans will specify all necessary details to complete the geophysical surveys at a particular site. Surface geophysical survey information and specifications to be included in the project work plans will include at a minimum the following:

- Objectives of the surveys
- Type(s) of surveys to be conducted
- Equipment to be used
- Lay-outs of survey grids at each site or location, including sample point spacing
- Type, duration and frequency of measurements to be made
- Additional procedures or requirements beyond those covered in this SOP

Subcontracted geophysical surveys will also be directed by specifications defined in Statements of Work for sub-contractor services, as well as the project work plans.

5.1 General Requirements

The following requirements apply to all surface geophysical surveys and should be performed as required by the project work plans and the conditions present at each survey site.

1. Inspect all equipment and supplies to ensure that they are in proper working order, using the equipment manuals provided by the equipment manufacturer.
2. Assure that annual calibration/service by the manufacturer has been conducted as recommended by the manufacturer. Calibration/service records should be maintained in the office where the instrument is stored between investigations. A copy of the calibration records should be kept with the equipment at all times. More frequent calibration/services may be necessary if field measurements indicate possible instrument malfunction.
3. Prior to mobilization to the site, conduct appropriate decontamination as and if required by the project work plans.
4. Perform field calibration checks where required by instrument manufacturer or the project work plans. Perform calibration (accuracy and reproducibility) checks in the field by reoccupying base stations at periodic time intervals. Perform the calibration checks in accordance with manufacturer's specifications or the project work plans.
5. The calibration checks should be entered on a Field Logbook. At a minimum, this document should contain the following information:
   - Make and model number of the geophysical instrument.
   - Serial number of the instrument.
   - The date and time of calibration or instrument check.
   - All calibration or instrument-check measurements.
   - The name and signature of the person conducting the calibration or instrument check
6. Establish grid and stake locations or set up traverses for locations of sampling stations.
7. Make sure all survey and sampling locations are properly staked and the location ID is readily visible on the location stake.
8. Include a diagram of the measurement locations with the data records on a daily basis. The diagram should include grid alignment, station numbering (if used), and base station location(s).
9. At the termination of each survey ensure that all equipment is accounted for, and decontaminated as required by project work plans.
10. Any unusual conditions or problems encountered during the survey must be recorded on the Field Logbook and brought to the attention of the Site Superintendent.
11. When the activity is completed, or at the end of the day, return the instrument(s) to a secure area. Equipment requiring electrical charging should be placed on charge.

It is recommended that Surface geophysical survey data be stored on diskette for retrieval and management. The following information should be included for each stored data field:

- Site Location
- Location ID (or station)
- Date
- Time

Base station values and calibration measurements do not necessarily need to be recorded on the diskette. However, they must accompany the diskette record in paper copy.

5.2 Surface Geophysical Surveying

5.3 Electrical Resistivity

The electrical resistivity method uses an instrument to measure the apparent electrical resistivity of the subsurface. This includes the underlying soil, rock, and groundwater. An electrical current is introduced into the ground through surface electrodes. The resulting potential field (voltage) is measured at the surface between a second pair of electrodes. The procedure below requires the following below in addition to the general requirements listed in Section 4.2.

1. Set up and operate the geophysical electrical resistivity instrument according to manufacturers operating instructions.
2. Record the readings and other pertinent information on the appropriate forms per the project work plans.
3. Calculate apparent resistivities and review plots in the field as a means of quality control. Sounding curves should be relatively smooth. Abrupt changes commonly occur in sounding and profiling data. Near-surface inhomogeneities, electrode contact problems, or changes in hydrogeology may cause unwanted noise. Any changes or noise should be identified. Corrective actions may be taken and the survey re-run if significant improvement to the survey may be attained.
4. Any identified noise problems, corrective actions taken, and re-runs should be noted in the Field Logbook.

5.4 Seismic Refraction

Seismic refraction techniques use instruments to determine the travel time or velocity of seismic waves within layers and interpret the thickness and depth of geologic units and other subsurface features. Other potential applications include the location of the water table and definition of burial pits and trenches. The procedure requires the following elements below in addition to the general requirements listed in Section 4.2.

1. Verify that factory maintenance and calibration has been conducted as recommended by the equipment manufacturer. Manufacturer maintenance should include the electronic calibration of the seismograph timing circuits.
2. Check the seismic signal and noise conditions on the instrument display to verify the proper functioning of the source geophones and trigger cables.
3. If possible, obtain or install boring logs before the survey in order to detect hidden layers or velocity inversions.
4. Set up and operate the geophysical seismic refraction instrument according to operating instructions supplied by the manufacturer.
5. Record the readings and other pertinent information on the appropriate forms.

6. Where possible collect seismic data where known geologic information is available to establish background responses. This information is useful for evaluating complex site conditions.
7. Make a hard copy of the data if the data output is on paper records.
8. In cases where paper records are not produced, plot arrival time picks made from the electronic display on a time/distance graph in the field. Problems with improper picks are often discovered through an early inspection of these plots.
9. Review all output and records of the survey, identifying any potential problems requiring corrective actions.
10. Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
11. Any identified problems, corrective actions taken, and re-runs should be noted in the Field Logbook.

5.5 Electromagnetics

The EM survey detects lateral and vertical variations of electrical conductivity in the subsurface environment. EM is used for the assessment of hydrogeologic conditions, and identification and mapping of contaminant plumes, trench boundaries, buried conductive wastes, steel drums, and metallic utility lines. The procedure requires the following elements in addition to the general requirements listed in Section 4.2.

1. Establish a local standard site in the field. This will provide a reference base station to check the instrument's performance and allow correlation between instruments.
2. Check the signal and noise conditions on the instrument display to verify proper functioning and assure the correct setting of the instrument.
3. Before conducting the survey, select a temporary site on location for daily base station measurements and calibration checks. Calibration checks should be made twice daily, before and after conducting daily survey operations. Readings will repeat within approximately 10 percent.

NOTE: Do not make calibration checks in the presence of sources of cultural interference like power lines or buried utilities. Make them on a relatively flat surface outside of topographic lows and away from areas that may include subsurface waste materials.

4. Operate the EM instrument according to operating instructions supplied by the manufacturer.
5. Record instrument sensitivity settings, readings and all other pertinent information on the appropriate forms.
6. When using an automatic recording device, enter the readings from the first and last stations of each traverse. Compare these data to data from the automatic recorder at the end of each day. Recorded data and field-transcribed data must agree to within ±5 percent to meet acceptability requirements.
7. The field operating party should check instrument stability when there is local or distant thunderstorm activity. Electromagnetic radiation from thunderstorms can generate noise in the EM system. Operations may have to be postponed during thunderstorms.
8. Review all output and records of the survey, identifying any potential problems requiring corrective actions.
9. Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
10. Any identified problems, corrective actions taken, and re-runs should be noted in the Field Logbook.

5.6 Ground Penetrating Radar

GPR uses high frequency radio waves to acquire subsurface information. The method produces a continuous cross-sectional image or profile of shallow subsurface conditions. The procedure below requires the following elements in addition to the general requirements listed in Section 4.2. Calibration and calibration checks of the radar system require the process described below:

1. Accurately determine the total time window (range) set by the operator.
2. Determine or estimate the electromagnetic velocity (or travel time) of the local soil/rock condition.
3. Calibrate the time window picked for the survey by using a signal calibrator in the field. This device is used to produce a series of time marks on the graphic display measured in nanoseconds. These pulses are counted to determine the total time of the radar unit. A calibration curve can be designed for each radar system.
4. If possible, use known trenches, buried pipes, and road culverts to provide a radar target of known depth. The depth of a known target, a radar record taken over the known target, and a time scale provided by the signal calibrator will provide a basic calibration record. From these data, a velocity can be accurately determined at the given target location from the following equation:

   $$V = 2d/t$$

   The average dielectric constant of the soil is then calculated using

   $$Er = c\ 2\ /v\ 2 = 1/v$$

   Where:

   v_1 = Average electromagnetic wave velocity, feet/nanosecond
   t = Two-way travel time, nanoseconds
   d = Distance of antenna to the buried object, feet
   Er = Average relative dielectric constant of the soil (unitless)
   c = Velocity of light in air equal to 1 foot/nanosecond
   v_2 = Average electromagnetic wave velocity of the soil, feet/nanosecond

   Note: The above assumes a soil with a relative magnetic permeability of 1 (unitless). If significant changes in soil type or moisture content occur with depth, velocity will not be the same throughout the vertical radar profile. Therefore, the vertical radar depth scale will be nonlinear.

   This approach will provide calibration at a specific site; however, this assumes that conditions in other areas are the same as the calibration area. Calibration should be repeated at each new site.
5. Repeat a short GPR traverse twice daily over a known feature before and after conducting daily operations to insure those changing soil conditions, rather than the electronics causes readings.
6. Conduct the GPR traverse at the sites or locations specified in the project work plans.
7. Record calibration, instrument settings, measurements and all other pertinent information on the appropriate forms.
8. Print out and review all hardcopies and records of the survey, identifying any potential problems requiring corrective actions.
9. Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
10. Any identified problems, corrective actions taken, and re-runs should be noted in the Field Logbook.

5.7 Metal Detection

Metal detectors are electromagnetic devices designed to locate metallic objects buried near the surface. In hazardous waste site investigations, metal detectors are invaluable for detecting utility lines, survey markers, steel drums buried at shallow depths, and delineating areas that may potentially include metallic waste materials.

Metal detectors respond to nearby metallic objects in a relative way. For instance, closer or large metallic objects create a greater output level than more distant or smaller ones. An experienced operator can usually make a reasonably accurate estimate of target size and depth. Metal detection survey requirements at a minimum include:

1. Set up and operate the metal detector according to operating instructions supplied by the manufacturer.
2. Record the readings and all other pertinent information on the appropriate forms as outlined in the project work plans.
3. Review all data and records of the survey, identifying any potential problems requiring corrective actions.
4. Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
5. Any identified problems, corrective actions taken, and re-runs should be noted in the Field Logbook.

5.8 Magnetometer

Magnetometer surveys are used to locate metallic objects buried near the surface such as well casings, utility lines, steel drums, and tanks. They may also be used to delineate trenches and landfills. Ferrous metal objects carried by the operator will have a detrimental effect on the accuracy of the magnetometer data. Therefore, the survey team should not wear metal items like rings, watches, belt buckles, coins, and steel-toed boots.

Total field and vertical field measurements may be corrected for the diurnal variation of the earth's magnetic field by employing a reference base station magnetometer. Changes in the earth's field are removed by adding or subtracting variations of fixed base station readings from the moving survey data. Gradiometers do not require the use of a base station because they inherently eliminate time variation in the data. Requirements are as follows:

1. Conduct a swing sensor test with the proton precision magnetometer before initiating operations at a site and at least once more during the day.
2. Four readings with the sensor oriented 90° to the other readings should be taken with the operator moving with the sensor. Variations greater than one gamma should not be observed.
3. Correct any directional bias by washing the sensor with ordinary soap and water and maintaining an adequate distance between the sensors and battery pack.
4. Obtain a daily background reading in the immediate vicinity of the site to be surveyed. This reading should be outside the influence of all possible sources of cultural magnetic fields (e.g., power lines or pipelines). This daily background reading should repeat to within reasonable diurnal variations in the earth's magnetic field.
5. Take base station readings to remove the effects of the diurnal variation of the earth's magnetic field from the data.
6. Periods of rapid variation may be documented at a permanent base station, set up at the site, where continuous readings are automatically recorded approximately every 10 to 15 minutes. Alternatively, a base station(s) may be reoccupied during the survey at intervals of 45 to 60 minutes.

7. Collect survey data and record on the appropriate form per the project work plans.
8. Take readings within 10 seconds of each other.
9. Site locations influenced by cultural magnetic fields should be recorded in the logbook.
10. Take three to four sequential readings and record time when recording data manually. In the absence of magnetic storms, the readings should compare within several tenths of a gamma. Repeatability during magnetic storms may degrade to one gamma or more.
11. The use of automatic recording magnetometers requires recording the magnetometer readings for the first and last station of each traverse in a logbook.
12. Compare the data recorded in the logbook with data from the automatic recording device. Data recorded in the logbook should be within one gamma of the values derived from the recording device.
13. During cold weather, maintain the battery pack for a fluxgate magnetometer at a relatively warm temperature. This is most easily accomplished by surveying with the battery pack beneath the operator's coat or jacket.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

MONITORING WELL INSTALLATION

1.0 PURPOSE

This Standard Operating Procedure (SOP) provides procedures and requirements for the installation of monitoring wells using rotary, dual-tube percussion, or hollow-stem auger drilling techniques. Monitoring wells are installed to provide access to groundwater for collecting samples, as well as for obtaining water level and other data. Because monitoring wells are used to collect samples, it is important that construction materials not interfere with sample quality either by contributing contaminants or by sorbing contaminants already present. Further, construction materials must be compatible with (i.e., not degraded by) contaminants present in soils or groundwater.

Monitoring wells are potential contaminant migration routes between aquifers or from the surface to the subsurface. Construction procedures and standards must ensure that neither passive nor active introduction of contaminants can occur. Properly installed hydraulic seals and locking well covers reduce the potential for cross-contamination of monitoring wells. The details within this SOP should be used in conjunction with specific project work plans and/or related SOPs.

2.0 REFERENCES

U.S. Environmental Protection Agency (EPA), Manual of Water Well Construction Practices, U.S. Environmental Protection Agency, Office of Water Supply, U.S. Government Printing Office, Washington D.C.

U.S. Environmental Protection Agency (EPA), 1986, Resource Conservation and Recovery Act (RCRA) Ground Monitoring Technical Enforcement Guidance Document, OSWER-9950.1, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington D.C.

U.S. Environmental Protection Agency (EPA), 1987, A Compendium of Superfund Field Operations Methods, EPA-500/P-87/001, U.S. Government Printing Office, Washington D.C.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all monitoring well installation activities are conducted and documented in accordance with this and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by quality assurance/quality control (QA/QC) monitoring activities.

The Quality Assurance Officer is responsible for periodic review of well installation activities to assure implementation of this SOP. The Quality Assurance Officer is also responsible for the review and approval of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to monitoring well installation requirements, issuing nonconformances, etc.) identified during the performance of these activities.

The Sampling Team Leader(s) assigned to monitoring well installation activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from the procedures to the Project Technical Manager or Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Cuttings

Pieces of soil, sediment, or rock cut by a bit in the process of drilling borings.

4.2 Borehole

Any hole drilled into the subsurface for the purpose of identifying lithology, collecting soil samples, and/or installing groundwater wells.

4.3 Grout

For the purposes of this SOP, the term “grout” consists of a neat cement grout generally containing three to five percent bentonite powder to water by weight. The grout is emplaced as a slurry, and once properly set and cured, is capable of restricting movement of water.

4.4 Hollow-Stem Auger Drilling

A drilling method using augers with open centers. The augers are advanced with a screwing or rotating motion into the ground. Cuttings are brought to the surface by the rotating action of the augers, thereby clearing the borehole.

4.5 Air Rotary Casing Hammer Drilling

A drilling method using a non-rotating drive casing that is advanced simultaneously with a slightly smaller diameter rotary bit attached to a string of drill pipe. The drive casing is a heavy-walled, threaded pipe that allows for pass-through of the rotary drill bit inside the center of the casing. Air is forced down through the center drill pipe to the bit, and then upward through the space between the drive casing and the drill pipe. The upward return stream removes cuttings from the bottom of the borehole.

4.6 Mud Rotary Drilling

For the purposes of this monitoring well installation SOP, the term "mud rotary drilling" refers to direct circulation (as opposed to reverse circulation) mud rotary drilling. Mud rotary drilling uses a rotating drill bit that is attached to the lower end of a string of drill pipe. Drilling mud is pumped down through the inside of the drill pipe and out through the bit. The mud then flows upward in the annular space between the borehole and the drill pipe, carrying the cuttings in suspension to the surface.

4.7 Dual-tube Percussion Drilling

A drilling method using non-rotating drive casing with a bit on the bottom of the casing string. A smaller diameter tube or drill pipe is positioned inside the drive casing. The drive casing is advanced by the use of a percussion hammer, thereby causing the bit to cut or break up the sediment or soil at the bottom of the boring. Air is forced down the annular space between the drive casing and inner drill pipe and cuttings are forced up the center of the inner drill pipe.

4.8 Monitoring Well

A well that provides for the collection of representative groundwater samples, the detection and collection of representative light and dense nonaqueous phase organic liquids, and the measurement of fluid levels.

4.9 Annular Space

The space between:

- Concentric drill pipes;
- An inner drill pipe and outer drive casing;
- Drill pipe or drive casing and the borehole wall; or
- Well screen or casing and the borehole wall.

4.10 Filter Pack

Granular filter material (sand, gravel, etc.) placed in the annular space between the well screen and the borehole to increase the effective diameter of the well and prevent fine-grained material from entering the well.

4.11 Well Screen

A perforated, wire wound, continuous wrap or slotted casing segment used in a well to maximize the entry of water from the producing zone and to minimize the entrance of sand.

4.12 Tremie

A tubular device or pipe used to place grout, bentonite, or filter pack in the annular space.

5.0 PROCEDURES

5.1 Well Installation Procedures

This section contains the procedures for monitoring well installation activities. The procedures described herein are applicable as requirements for monitoring well installations using mud rotary, air rotary, air rotary casing hammer, dual tube percussion, or hollow-stem auger drilling techniques. Site-specific factors need to be considered in the selection of well construction and completion materials, specification of well designs, and choosing well drilling methods. These factors will be incorporated in project planning activities and the compilation of specific project work plans. The project work plans will contain the following information related to monitoring well installation:

- Objectives of the monitoring well
- Specific location of the well to be installed
- Zone or depth well is to be installed
- Drilling method(s) to be used
- Well construction materials to be used
- Specification of well design(s) including Well Construction Diagrams.
- Additional procedures or requirements beyond this SOP.

1. Before mobilization of a rig to the well site, ensure that the monitoring well location has been appropriately cleared of all underground utilities, buried objects, and that drill permits have been issued per the project work plans.
2. Review all forms and diagrams documenting the location of the cleared monitoring well site and the location of any identified underground utility lines or other buried objects.
3. Decontaminate all downhole equipment and well construction materials before monitoring well installation, as described in WTS-SOP 6.0.
4. Decontaminate the drilling rig and all drilling equipment before monitoring well installation per WTS-SOP 6.1.
5. Clear the work site of all brush and minor obstructions and then mobilize the rig to the monitoring well location.
6. The rig geologist or engineer should then review with the driller the proposed well design and details of the well installation including any anticipated potential drilling or completion problems.
7. Calibrate health and safety monitoring equipment according to the instrument manufacturer's specifications.
8. Document the calibration results on the appropriate form(s). Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.

9. Workers will be provided with, and don, the appropriate personal protective equipment as specified by the project work plans. Typically, the minimum personal protection will include a hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.
10. Commence drilling and advance the borehole while conducting health and safety monitoring according to the project work plans.
11. Perform readings as often as necessary to ensure the safety of workers.
12. Record all measurements on the Field Logbook.
13. Record all other pertinent information (date, site, well or boring number, and location) on the Field Logbook. Also note and record observed field conditions, any unusual circumstances, and weather conditions.
14. Drilling of the borehole should be conducted in conformance with applicable SOPs, as appropriate.
15. During drilling, collect representative cutting and soil samples as required by the project work plans.
16. Compile a boring or lithologic log from the cuttings and samples per WTS-SOP 10.0.
17. At total depth, remove soil cuttings through circulation or rapidly spinning the augers prior to constructing the well.
18. Review logs and notes with the driller for any zones or depths exhibiting drilling problems that may affect the well installation.
19. Condition the hole or take other actions mutually agreed upon by the rig geologist (or engineer), lead technical personnel, and the driller to ensure or aid in the well development.
20. Remove the drill pipe and bit if using rotary techniques, or remove the center bit boring if using the hollow-stem auger technique. The well construction materials will then be installed inside the open borehole or through the center of the drive casing or augers.
21. Measure the total depth of the completed boring using a weighted sounding line. The borehole depth is checked to assure that formation material has not heaved to fill the borehole. If heaving has taken place, options for cleaning, re-drilling, or installation in the open section of the boring should be discussed with lead technical personnel.
22. In the event that the hole was over-drilled, grout, bentonite pellets, or bentonite chips (as specified in the project work plans) may be added to the bottom of the boring to raise the bottom of the hole to the desired depth. The grout should be pumped through a tremie pipe and fill from the bottom of the boring upward. During grouting, the tremie pipe should be submerged below the top of the grout column in the borehole to prevent free-fall and bridging. If bentonite is used, it should be added gradually to prevent bridging. Grout or bentonite addition will stop when its level has reached approximately one foot below the desired base of the well string (casing, screen, end plug or sump, etc.). The bentonite plug will be hydrated for at least one hour before installation of a filter pack.
23. Calculate volumes of filter pack, bentonite pellets/slurry, and grout required, based on borehole and well casing dimensions. If required by the project work plans, determine the filter pack and well screen slot size for the monitoring well.
24. Place a layer of filter pack (one to two feet, unless otherwise specified in the project-specific work plans) at the bottom of the borehole. The filter pack will be installed through the center of the drive casing/augers. Filter pack will be added slowly while withdrawing the drive casing/augers.
25. Inspect the casing, screen, and any other well construction materials prior to installation to assure that no damage has occurred during shipment and decontamination activities.
26. Connect and carefully lower the well string through the open borehole, drive casing, or inside of the augers until the well string is at the desired depth. The well string should be suspended by the installation rig and should not rest on the bottom of the boring. In the event the well string was dropped, lowered abruptly, or for any other reason suspected of being damaged during placement,

the string should be removed from the boring and inspected. In certain instances, the well string may rise after being placed in the borehole due to heaving sands. If this occurs, the driller must not place any drilling equipment (drill pipe, hammers, etc.) to prevent the casing from rising. The rig geologist or engineer shall note the amount of rise and then shall consult the lead technical personnel for an appropriate course of action.

27. Record the following information on the As-Built Well Completion Form and/or other appropriate forms per the project work plans:
    - Length of well screen
    - Total depth of well boring
    - Depth from ground surface to top of grout or bentonite plug in bottom of borehole (if present)
    - Depth to base of well string
    - Depth to top and bottom of well screen.

28. When using the mud rotary drilling technique, tremie the filter pack into the annular space around the screen. Clean, potable water may be used to assist with the filter pack tremie operation. For all other drilling techniques, the filter pack may be allowed to free-fall or be tremied per the project work plans. If using drive casing or augers, the drive casing or augers should be pulled slowly during filter pack installation in increments no greater than five feet.

29. Filter pack settlement should be monitored by initially measuring the sand level (before beginning to withdraw the drive casing/augers). In addition, depth soundings using a weighted tape shall be taken repeatedly to continually monitor the level of the sand. The top of the well casing shall also be monitored to detect any movement due to settlement or from drive casing/auger removal. If the top of the well casing moves upwards at any time during the well installation process, the driller should not be allowed to set drilling equipment (downhole hammers, drill pipe, etc.) on the top of the casing to prevent further movement.

30. Filter pack should be added until its height is approximately two feet above the top of the screen (unless otherwise specified in the project work plans), and verification of its placement (by sounding) should be conducted. The filter pack should then be gently surged using a surge block or swab in order to settle the pack material and reduce the possibility of bridging.

31. The height of the filter pack will then be re-sounded and additional filter pack placed as necessary. Once the placement of the filter pack is completed, the depth to the top of the pack is measured and recorded on the As-Built Well Completion Form or other appropriate forms per the project work plans.

32. A three-foot thick (unless otherwise specified in the project work plans) bentonite seal is then installed on top of the filter pack. If pellets or chips are used, they should be added gradually to avoid bridging. Repeated depth soundings will be taken using a weighted tape to ascertain the top of the bentonite seal. The seal should be allowed to hydrate for at least one hour before proceeding with the grouting operation.

33. After hydration of the bentonite seal, grout is then pumped through a tremie pipe and filled from the top of the bentonite seal upward. The bottom of the tremie pipe should be maintained below the top of the grout to prevent free fall and bridging. When using drive casing or hollow-stem auger techniques, the drive casing/augers should be raised in incremental intervals, keeping the bottom of the drive casing/augers below the top of the grout. Grouting will cease when the grout level has risen to within approximately one to two feet of the ground surface, depending on the surface completion type (flush mount versus aboveground). Grout levels should be monitored to assure that grout taken into the formation is replaced by additional grout. If settling of the grout occurs, additional topping off of the grout may be necessary.

34. For aboveground completions, the protective steel casing will be centered on the well casing and inserted into the grouted annulus. Prior to installation, a 2-inch deep temporary spacer shall be placed between the PVC well cap and the bottom of the protective casing cover to keep the protective casing from settling onto the well cap.

35. After the protective casing has set, a drainage hole may be drilled into the protective casing if required by the project work plans. The drainage hole is positioned approximately two inches above ground surface. The protective casing will be painted with a rust-preventive colored paint.

36. The well head will be labeled to identify, at a minimum, the well number.

37. A minimum of 24 hours after grouting should elapse before installation of the concrete pad and steel guard posts for aboveground completions, or street boxes or vaults for flush mount completions.

    - For aboveground completions, a concrete pad, usually 3-foot by 3-foot by 4-inch thick, is constructed at ground surface around the protective steel casing. The concrete is sloped away from the protective casing to promote surface drainage from the well.

    - For aboveground completions, where traffic conditions warrant extra protection, three steel bucking posts will be embedded to a depth approximately 1.5 feet below the top of the concrete pad. The posts will be installed in concrete filled postholes spaced equally around the well at a distance of approximately 1.5 feet from the protective steel casing. Where removal of bucking posts is required for well access, mounting sleeves should be imbedded into the concrete.

    - For flush mount (or subgrade) completions, a street box or vault is set and cemented in position. The top of the street box or vault will be raised slightly above grade and the cement sloped to grade to promote surface drainage away from the well.

    - Following well completion and demobilization of the rig, the well site should be cleared of all debris and trash and restored to a neat and clean appearance per the project work plans. All investigation-derived waste generated at the well site should be appropriately contained and managed per the project work plans.

6.0 REQUIRED FORMS/DOCUMENTATION

Well Construction Diagram

Field Logbook

Lithologic/Soil Boring Log

As-Built Well Completion Form

MONITORING WELL DEVELOPMENT

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines for specifying, assessing and documenting the well development process. Additional specific well development procedures and requirements will be provided in the project work plans and/or related SOPs. Monitoring wells are developed to remove skin (i.e., near-well-bore formation damage), well drilling fluids, sediments, and to settle and remove fines from the filter pack. Wells should not be developed for 48 hours after completion when a cement bentonite grout is used to seal the annular space, or after 7 calendar days beyond internal mortar collar placement.

2.0 REFERENCES

U.S. Environmental Protection Agency (EPA), August 1988, *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA,* Interim Final OSWER Directive 9355.3-01.

U.S. Environmental Protection Agency (EPA), 1987, *A Compendium of Superfund Field Operations Methods,* EPA-540/P-87/001a, U.S. Government Printing Office, Washington D.C.

ASTM, 1988, *Standards Technology Training Program - Groundwater and Vadose Zone Monitoring*, Nielsen, et al.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that monitoring wells are properly developed and that the development process is properly documented. This will be accomplished by staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with well development. If deviations from project requirements occur, the Quality Assurance Officer is also responsible for issuing notices of nonconformances and requests for corrective action.

The Sampling Team Leader(s) is responsible for conducting monitoring well development and documentation in accordance with the specifications outlined in this SOP and by the project work plans.

4.0 DEFINITIONS/MATERIALS

4.1 Well Development

The act of removing fine grained sediment and drilling fluids from the sand pack and formation in the immediate vicinity of the well, thus increasing the porosity and permeability of the materials surrounding the intake portion of the well.

4.2 Eductor Pipe

The pipe used to transport well discharge water to the surface.

4.3 Materials

- Submersible pump or bailer.
- Power source (e.g., generator), if required.
- Electronic water level indicator and/or oil/water interface probe.
- Temperature, conductivity, pH, and turbidity meters.
- Personal protective equipment as specified in the project health and safety plan.

- Organic vapor meter (MicroTip, OVM, HNU, etc.).
- Teflon-coated stainless steel cable or acceptable material.
- Well development logs.

5.0 PROCEDURE

5.1 General

The most common methods used to develop monitoring wells consist of surging and bailing, surging and pumping, or combinations of all these.

The project work plans will identify the specific well development procedure to be followed. The standard procedure for field personnel to use in assessing and documenting well development is described below and is intended only for development methods listed above.

5.2 Well Development

Decontaminate the rig and development equipment in accordance with WTS-SOPs 6.0 and 6.1, respectively.

Calibrate all field analytical test equipment (pH, temperature, conductivity, and turbidity) according to the instrument manufacturer's specifications and WTS-SOP No. 4.0. Specific test equipment to be used should be identified in the project-specific work plans. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service, tagged with an out of calibration label, and segregated (when possible) from the calibrated equipment area. An exception to the daily calibration requirements will be made in the case of the water level meters. The tape of these instruments will be checked prior to the beginning of the project and each succeeding six months using a steel surveyor's tape.

Visually inspect the well to ensure that it is undamaged, properly labeled and secured. Any observed problems with the well head should be noted in the Field Activity Daily Log and reported to the Sampling Team Leader(s). Unlock the well and obtain a depth to water level measurement according to the procedures outlined in WTS-SOP No. 5.0. Calculate the volume of water in the well (cased well volume) as follows:

$$\pi \times (d/2)^2 \times (h_1 - h_2) \times 7.48 = \text{cased well volume (in gallons)}$$

Where

d = inside diameter of well casing (in feet)
h_1 = depth of well from top of casing (in feet)
h_2 = depth to water from top of casing (in feet)

The depth to the bottom of the well should be sounded and then compared to the completion form or diagram for the well. If sand or sediment is present inside the well, it should first be removed by bailing. Do not insert bailers, pumps, or surge blocks into the well if obstructions, parting of the casing, or other damage to the well is suspected. Instead report the conditions to the Site Superintendent and obtain approval to continue or cease well development activities.

Begin development by first gently surging followed by bailing or pumping. This is then continued with alternate surging and bailing or pumping. At no time should the surge block be forced down the well if excessive resistance is encountered. During development, the bailer should not be allowed to free-fall or descend rapidly such that it becomes lodged in the casing or damages the end cap or sediment trap at the bottom of the well.

While developing, take periodic water level measurements (at least one every five minutes) to determine if drawdown is occurring and record the measurements on the Well Development Record.

While developing, calculate the rate at which water is being removed from the well. Record the volume on the Well Development Record.

While developing, water is also periodically collected directly from the eductor pipe or bailer discharge and readings taken of the indicator parameters: pH, specific conductance, and temperature. Development is considered complete when the indicator parameters have stabilized (i.e., three consecutive pH, specific conductance, and temperature readings are within tolerances specified in the project work plans) and a minimum of three well volumes of water have been removed. In certain instances, for slow recharging wells, the parameters may not stabilize. In this case, well development is considered complete upon removal of the minimum of three well volumes. In some cases, the project work plans may also specify a maximum turbidity requirement for completion of development.

Obtain a water level and turbidity measurement at the completion of development.

Complete documentation of the well development event on the Well Development Record form. At a minimum this record must contain:

- Project name and number
- Well identification number
- Well depth, casing size, and completion date
- Method of development
- Volume of water removed
- Water levels (including the time of measurement)
- Physical description of the water (e.g., discoloration, turbidity, odor, etc.) and solids removed from the well
- Test equipment readings for pH, conductivity, temperature and turbidity (including the time of collection)
- Signature of the well development observer.

Collect and appropriately transport and dispose of water removed from the well in accordance with criteria listed in the project-specific work plans and regulatory requirements.

Allow the well to recover for at least 24 hours prior to sampling.

6.0 REQUIRED FORMS/DOCUMENTATION

Well Development Record Form

GROUND WATER SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for use by field personnel in the collection and documentation of ground water samples for chemical analysis. Proper collection procedures are necessary to assure the quality and integrity of all ground water samples. Additional specific procedures and requirements will be provided in the project work plans, as necessary and/or related SOPs. Work plans may range in complexity and formality from fully published, reviewed, and approved plans (typically provided for single events) down to WAO responses with notes (typically provided for routine, ongoing monitoring programs).

2.0 REFERENCES

EPA, September 1987, *Compendium of Superfund Field Operations Methods*, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, *EPA Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA*, Interim Final OSWER Directive 9355.3-01.

ASTM, 1988, *Standards Technology Training Program - Groundwater and Vadose Zone Monitoring*, Nielsen, et al.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QC/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to ground water sampling activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from procedures to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Bladder Pump

A bladder pump is an enclosed cylindrical tube containing a flexible membrane bladder. Well water enters the bladder through a one-way check-valve at the bottom. Gas is forced into the annular space (positive displacement) surrounding the bladder through a gas supply line. The gas displaces the well water through a one-way check-value at the top. The water is brought to the surface through a water discharge line. Compressors or cylinders provide gas (air or nitrogen).

4.2 Peristaltic Pump

A peristaltic pump is a self-priming, low volume pump consisting of a rotor and a ball bearing roller. The rotor squeezes tubing placed around the rotor as they revolve. The squeezing produces a wavelike contractual movement that causes water to be drawn through the tubing. The peristaltic pump is limited to sampling at depths of less than 25 feet.

4.3 Electric Submersible Pump

An electric submersible pump is an enclosed cylindrical tube containing a motor with rotary attachments. Well water enters the cylinder through a one-way check valve. Electrical power to the motor causes rotors or impellers to turn and displace the groundwater.

4.4 Bailer

A bailer is an enclosed cylindrical tube containing a floating ball check-valve at the bottom. Lowering the bailer into water causes the ball to float allowing water to enter the cylinder. Raising the bailer through the water causes the ball to settle, creating a seal to trap the water so that it can be brought to the surface.

4.5 Dedicated Ground Water Monitoring Equipment

Dedicated ground water monitoring equipment is used to purge and sample only one well. The equipment is installed and remains in the well for the duration of the monitoring program. Dedicated equipment does not need to be decontaminated between sampling events.

4.6 Materials:

- Clean rope or wire line of sufficient length for conditions.
- Appropriate sample containers with labels and preservatives, as required.
- Hard plastic or steel cooler with cold packs (or ice) for samples.
- Temperature, pH, conductivity, and turbidity meters.
- Equipment calibration standards.
- Electronic water level indicator.
- Organic vapor meters.
- Plastic sheeting, if needed.
- 55-gallon drums for purge water.
- Decontamination supplies, as required.
- Personal protective clothing and equipment, if required by the project health and safety plan.
- Field logbook and monitoring well purge and sample forms

5.0 PROCEDURE

This section contains the procedures involved with groundwater sampling. Proper ground water sampling procedures are necessary to insure the quality and integrity of the samples. The details within this SOP should be used in conjunction with project work plans. The project work plans will generally provide the following information:

- Sample collection objectives
- Locations of ground water samples to be collected
- Numbers and volumes of samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling required
- Any additional groundwater sampling requirements or procedures beyond those covered in this SOP, as necessary.

At a minimum, the procedures outlined in this SOP for ground water sampling will be followed.

5.1 Ground Water Sampling Requirements – Equipment Selection and Sampling Considerations

Purging and sampling equipment is constructed from a variety of materials. The most inert material (e.g., Teflon, stainless steel), with respect to known or anticipated contaminants in the well(s), should be used whenever possible. The project work plans will describe the type of equipment to be used.

If non-dedicated sampling is to be used and the contaminant histories of the wells are known, it is advisable to establish a sampling order starting with the least contaminated well and progressing to the most contaminated last.

5.2 Ground Water Purging and Sampling

Pre-sample purging and sampling should be conducted in accordance with the project work plans. The standard procedure for purging and sampling will be conducted as described below.

1. Inspect the equipment to ensure that it is in good working order.

2. Calibrate all field analytical test equipment (e.g., pH, temperature, and conductivity) according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate form(s) as specified by the project work plans. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.

   NOTE: An exception to the daily calibration requirements will be made in the case of the water level meters. These instruments will be calibrated at the beginning of the project and then every six months using a steel surveyors tape.

3. If non-dedicated equipment is being used, decontaminate according to WTS-SOP No. 6.0. During decontamination, the equipment should again be inspected for damage and, if present, repaired or replaced with undamaged equipment.

4. Visually inspect the well to ensure that it is undamaged, properly labeled and secured. Damage or other conditions that may affect the integrity of the well will be recorded on the Field Activity Daily Log and brought to the attention of the Sampling Team Leader.

5. Uncap the well and monitor the air space immediately above the open casing per the health and safety plan. Observe if any air is flowing into or out of the casing. In the event such conditions are observed, they should be noted on the Sampling Information Form.

6. Obtain a depth to water level measurement according to the procedures outlined in WTS-SOP 5.0. Calculate the volume of water in the well (cased well volume) as follows:

   $$\pi \times (d/2)^2 \times (h_1 - _ h_2) \times 7.48 = \text{cased well volume (in gallons)}$$

   Where

   d = inside diameter of well casing (in feet)
   h_1 = depth of well from top of casing (in feet)
   h_2 = depth to water from top of casing (in feet)

   Record static water level measurement and calculations on the Field Logbook.

5.3 Purging with various devices

If using non-dedicated equipment, lower the pump and associated tubing and/or lines into the well.

For a bladder pump, attach the compressor or cylinder to the controller and the controller to the gas supply line, making sure that the compressor is downwind of the monitoring well. Attach the sampling tube to the discharge supply line. Adjust the pressure/discharge cycle on the controller.

For a peristaltic pump, conduct equipment decontamination as described in Section 5.2.3. However, the old Tygon™ tubing should not be decontaminated. New tubing should be used for each well. Connect new Tygon™ tubing to the rotor head of the pump motor and tighten until snug. Run a short section of the tubing from the discharge side of the pump head to a collection vessel. Insert the free end of the influent tubing into the well and lower it to the middle of the well screen.

For an electric submersible pump, place the generator downwind of the well. Start the generator and then plug the pump into the generator.

For a bailer, Secure the bailer to a five foot length of Teflon™ coated stainless bailer wire with a bowline knot or clip. Attach the bailer wire to bailing line or chain. Begin purging by slowly lowering the bailer into the groundwater. Allow the floating ball valve to seat, and slowly retrieve the bailer. Repeat this procedure to purge the well. During purging, the descent of the bailer should be controlled to prevent free fall inside the well. In the event the bailer encounters an obstruction inside the well, no attempts may be made to push the bailer beyond the obstruction. If the bailer becomes lodged in the well, the line should not be pulled with such force that it would part from the bailer. Such conditions should also be noted in the Field Logbook and brought to the immediate attention of the field geologist or engineer.

Begin purging. Collect, transport, and dispose of purge water in accordance with the criteria specified by the project work plans.

Physical parameters (pH, specific conductance, and temperature) of the purge water will be measured when purging begins and then periodically throughout the purging procedure. These measurements will be recorded on Sampling Information Form. Purging is considered complete when a minimum of three casing volumes have been removed and pH, specific conductivity, and temperature measurements have stabilized (i.e., three consecutive pH, specific conductance, and temperature readings are within tolerances specified in the project work plans). Standard tolerances for successive readings are as follows:

- pH within 0.1 standard unit;
- Specific conductance within 10%;
- Temperature within 0.5^{o} C; and
- No trends among the successive readings.

If stability is not reached within the removal of three well volumes then purging is continued until a maximum of five cased well volumes have been removed. If stability is not reached within removal of five well volumes, the Sampling Team Leader will, at their discretion, elect to collect the sample or discontinue the effort.

For slowly recharging wells (i.e., wells that are purged to dryness at the lowest practicable purge rate), the well will be purged to dryness, allowed to recover, and sampled without further purging. Allow the well to recover to at least 80 percent of the initial cased well volume prior to sampling.

Inspect the sampling bottles (obtained from the analytical laboratory prior to the sampling event) to be used to ensure that they are appropriate for the samples being collected, are undamaged, and have had the appropriate types and volumes of preservatives added. The types of sample containers to be used and sample preservation requirements will be provided in the project work plans.

5.4 Sampling with various devices

For a bladder pump, turn on the pump and adjust the pressure/discharge cycle on the pump controller so that the water will flow smoothly and without agitation into the sample containers.

For a peristaltic pump, turn on and adjust the rotor speed of the pump so that the water will flow smoothly and without agitation into the sample bottles.
For an electric submersible pump, turn on and adjust the flow rate of the pump by using the check-valve on the discharge line so that the water will flow smoothly and without agitation into the sample bottles.

For a bailer, lower the sample collection bailer and submerge into the water column as above. Retrieve the bailer and insert a bottom-emptying device into the bailer so that the water will flow smoothly and without agitation into the sample bottles.

Collect the sample directly into the provided sample bottle (container), allowing the discharge to flow gently down the inside of the bottle, minimizing aeration of the sample. Completely fill the bottle. Samples collected for metals and general water chemistry analysis should be filled to the base of the bottleneck.

The samples should be collected in the order of volatility, collecting the most volatile samples first, followed by the least volatile samples. The volatile samples should be collected during one full discharge cycle. Do not partially fill a volatile sample during one cycle and complete the filling during the next cycle. VOC samples should not be collected with a peristaltic pump.

Samples that require filtering should be collected last. The samples should preferably be filtered using a disposable vacuum filterization unit. The required filter mesh should be stipulated in the project work plans. The standard filter size is 0.45 microns.

Cap the bottle and attach custody tape across the cap so that any attempt to remove the sample or open the sample bottle will be evident. Fill out and attach the sample label to the bottle per WTS-SOP No. 2.1. The sample will be assigned a sample number per WTS-SOP No. 2.2.

Document the sampling event on the Field Logbook.

As soon as possible after sample collection, place the sample in a separate, appropriately sized, airtight, seam sealing, polyethylene bag (i.e., Ziplock™ or equivalent). Seal the bag, removing any excess air. Place the bagged sample inside the shipping container.

Handle and ship the sample according to the procedures outlined in WTS-SOP No. 2.1, following appropriate custody procedures described in WTS-SOP No. 1.1. Samples stored temporarily on site will be maintained per WTS-SOP No. 2.3.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

CONE PENETRATION TESTING (CPT) AND HYDROPUNCH® GROUND WATER SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines for conducting cone penetration testing (CPT), soil sampling using a CPT rig, and Hydropunch® groundwater sampling. The details within this SOP should also be used in conjunction with project work plans and/or related SOPs.

2.0 REFERENCES

ASTM, 1988, Standard Method for Deep, Quasi-Static, Cone and Friction-Cone Penetration Tests of Soil, Designation: D 3441-86, Volume 4.08 Soil and Rock, Building Stones: Geotextiles, pp.409-414.

Manchon, B., 1992, Introduction to Cone Penetrometer Testing and Groundwater Samplers, Sixth National Outdoor Action Conference on Aquifer Restoration, Groundwater Monitoring and Geophysical Methods, May 1992.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are representative is responsible for ensuring that all CPT, soil sampling, and Hydropunch® activities are conducted and documented in accordance with this and any other appropriate procedures or related SOPs. This will be accomplished by staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field activities and documentation associated with this SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, generation of variances to CPT and sampling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) and sampling personnel assigned to CPT, soil sampling, and Hydropunch® activities are responsible for completing their tasks according to this and other appropriate procedures. All staff members are responsible for reporting deviations from the procedure to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Cone

The cone-shaped point of the penetrometer tip, upon which the end-bearing resistance develops.

4.2 Cone penetrometer

An instrument in the form of a cylindrical rod with a conical point, designed for penetrating soil and soft rock and for measuring the end-bearing component of penetration resistance.

4.3 Cone resistance or end-bearing resistance

The resistance to penetration developed by the cone, equal to the vertical force applied to the cone divided by its horizontally projected area.

4.4 Hydropunch®

A device used to collect groundwater samples using CPT or drill rig technology. Various forms of the Hydropunch® exist; they vary in the method used for sample collection. Hydropunch® I uses the body of the hydropunch to collect and retrieve the sample. Hydropunch® II allows for the collection of water samples using a bailer lowered within the CPT rods or drill stem.

4.5 Sounding

The entire series of penetration tests performed at one location.

4.6 Friction Ratio

The ratio of friction resistance to cone resistance, expressed in percent.

4.7 Friction Resistance

The resistance to penetration developed by the friction sleeve, equal to the vertical force applied to the sleeve divided by its surface area. This resistance consists of the sum of friction and adhesion.

4.8 Differential Pore Pressure Ratio

A calculated parameter equal to the excess pore pressure measured behind the tip divided by the sum of the tip resistance (corrected for pore pressure effects and the total overburden stress). Used in combination with the end-bearing resistance to infer lithology.

4.9 Pore Pressure

Water pressure in the formation.

4.10 Push Rods

The thick-walled tubes, or other suitable rods, used for advancing the penetrometer tip or Hydropunch® to the required test depth.

5.0 PROCEDURE

Depending on the sampling activities to be performed, CPT/Hydropunch® testing may require multiple runs to complete the desired tests. The first run is generally conducted to generate stratigraphic or hydrogeologic information. The stratigraphic or hydrogeologic data is then evaluated to determine optimum depth intervals to obtain soil and ground water samples that will be collected in subsequent runs.

An experienced contractor under the contract of the prime contractor or their subcontractors will perform CPT soundings, and soil and groundwater sampling. All CPT, soil sampling, and Hydropunch® techniques covered in this SOP will be performed in accordance with the project work plans. The project work plans will identify the following:

- Testing and sampling objectives
- Locations and depths of CPT and sampling points
- Numbers and volumes of soil or groundwater samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling required
- Specific procedures to be performed in addition to those covered in this SOP.

At a minimum, the procedures outlined below for CPT, soil sampling, and Hydropunch® groundwater sampling will be followed.

5.1 Preparation Procedures

Prior to commencement of CPT activities ensure that all CPT, soil sampling, and Hydropunch® locations have been appropriately cleared of all underground utilities and buried objects per the project work plans. Review all forms and diagrams documenting the location of the cleared sampling and CPT locations, as well as that of any underground utility lines or other buried objects.

Perform a specific calibration of air monitoring equipment required for air space monitoring according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate form(s), as specified in the project work plans. Instruments that can not be calibrated according to the manufacturer's specifications will be removed from service and tagged.

Don the appropriate personal protection equipment specified in the project-specific work plans.

5.2 Cone Penetration Testing

In general, the CPT is the first run to be conducted. The CPT rig is normally truck-mounted and contains a hydraulic push system (20 ton is typical). The depth of investigation will typically be less than 100 feet below ground surface (bgs). Lighter weight rigs can be utilized for shallow surveys up to approximately 15 feet bgs.

Some CPT rigs are equipped with an automatic decontamination system featuring an enclosed chamber that may be mounted beneath the CPT rig (project-specific decontamination requirements are specified in the project work plans). This chamber contains scrubbers and spray nozzles for pressure washing of the CPT probe as it is retrieved from the ground. In this type of system, all activities are conducted within the enclosed CPT rig.

The standard procedure for conducting stratigraphic and hydrogeologic investigations is described below.

1. Obtain specifications on the type and dimensions of the probes and equipment, along with the results of current shop calibrations from the CPT subcontractor.
2. With the CPT subcontractor, inspect all equipment to ensure that it is in proper working order.
3. Examine data from adjacent soil borings, if available. Initial correlation of the CPT data with site lithologies will be accomplished by comparison with existing boring logs, geophysical logs, and CPT logs.
4. Before moving onto the site, decontaminate the outside of the rig per WTS-SOP No. 6.1 and the project work plans. For those rigs that do not have an automatic decontamination system, the CPT probe and rods should also be decontaminated per WTS-SOP No. 6.1.
5. Calibrate the CPT cones at zero load reading in air and water, shielding the cone from direct sunlight before commencement of testing at each location.
6. Commence the test and advance the CPT probe into the subsurface at a consistent, controlled rate of 0.03 to 0.07 feet per second (1 to 2 centimeter per second), unless conditions prevent that rate.
7. Record real-time field plots consisting of depth, cone tip resistance, sleeve friction resistance, and friction ratio. Pore pressure and differential pore pressure ratio may be included in some cases.
8. Pore pressure dissipation tests may be conducted to determine relative flow rates at specific depths. The CPT probe is held stationary at a given depth and data are recorded for a set time interval. The time interval is dependent on the lithology of the zone being tested.
9. Once the CPT is pushed to the maximum desired depth, data collection is terminated. The CPT is retracted from the hole and the tip and rods are wiped down during extraction.

10. Upon completion of a test, calibrate the piezocone again to zero load reading and compare this to the initial reading.
11. Abandon the hole in accordance with the project work plans.
12. The rig geologist or engineer will record all pertinent information observed during the investigations. Information will be recorded on the Field Logbook. Any and all problems or unusual conditions encountered should also be noted on the above forms and brought to the attention of the site superintendent.

5.3 Soil Samples

If required, soil sampling will follow the CPT analysis run. Soil sampling locations will be placed updip relative to the location of the previous CPT testing run. The standard procedure is described below.

1. Assemble and check the necessary sampling equipment before soil sampling. Decontaminate all downhole sampling equipment before sampling, as described in WTS-SOP 6.0. The rig should also be decontaminated per WTS-SOP No. 6.1.

2. Deploy and advance the soil sampling probes with the CPT rods to collect soil samples at the sample intervals specified in the project work plans. The sample intervals may be identified from the adjacent CPT data and any other subsurface data available. The sampling device contains removable liners that fit inside the drive tip mechanism.

3. Retrieve the sampler and remove the liners containing the soil. Cover the ends of each liner to be submitted for chemical analysis with Teflon™ film and then cap with plastic end caps.

4. Each liner to be submitted for analysis will be appropriately labeled. The label will be filled out using waterproof ink and will contain, at a minimum, the following information:

   - Project number
   - Sample point (or boring) number
   - Bottom depth of liner
   - Date and time of sample collection
   - Parameters for analysis
   - Sampler's initials.

5. As soon as possible after sample collection, place the sample in an appropriately sized, airtight, seam-sealing polyethylene bag (e.g., Ziploc ™ or equivalent). Seal the bag, removing any excess air, and tape the bag with custody tape so that any attempt to remove the sample will cause the tape to be broken.

6. Document the sampling event on the Field Logbook.

7. Handle the sample according to the procedures outlined in WTS-SOP No. 2.1. For samples submitted to a laboratory for analysis, a task-specific Analyte List and Chain-of-Custody Record shall be completed and maintained per WTS-SOP No. 1.1 and the project work plans.

8. Abandon the hole following the procedure outlined in the project work plans.

5.4 Hydropunch® Ground Water Samples

The Hydropunch® sample locations, if conducted in conjunction with CPT data collection, will be located a few feet in the estimated up gradient direction from the previous CPT location. Hydropunch® sampling will be conducted in accordance with the project work plans. The standard procedure for Hydropunch® sampling is described below.

Decontaminate the Hydropunch® probe and push/drive rods in accordance with WTS-SOP No. 6.0. If the Hydropunch® model is being used with a small diameter bailer, the bailer and associated equipment must also be decontaminated in accordance with WTS-SOP No. 6.0.

Advance the probe to the target depth, which will commonly be a permeable layer as defined from the adjacent CPT or other stratigraphic information. Depth control is maintained by counting the number of whole and partial push or drive rods used. The Hydropunch® is measured at the tip of the tool and zeroed at the ground surface.

To obtain a ground water sample, retract the outer jacket of the Hydropunch® probe to allow ground water inflow into the sample chamber. An optional technique, used to determine when the sample chamber is full as follows:

1. Place a surgical glove over the end of the push rod before the outer jacket of the sampler is retracted.
2. As water enters the sample chamber and displaces air, the glove will inflate.
3. Once the glove stops inflating, water has ceased flowing into the chamber and the sample may be retrieved.
4. The length of time required for the sample chamber to fill is a function of the relative permeability of the formation and the presence or absence of materials that may clog the filter screen, thereby inhibiting the flow of water.
5. Retract the probe from the hole, disconnect the push rods from the Hydropunch®, and remove the upper valve. Replace the upper valve with a Teflon ™ stopcock valve and a disposable tube (Hydropunch® I). Turn the sampler upside down, open the cock valve and decant the sample into the sample container.
6. If using the Hydropunch® II model with a small diameter bailer, the water sample is retrieved by lowering the bailer through the inside of the push rod into the sample chamber. The water recovered in the bailer is then decanted directly into the appropriate sample containers.
7. If collecting samples for analysis of volatile organic compounds (VOCs) first completely fill the VOC sample vials. Each filled, capped vial will be inverted to ensure no air bubbles are present. If an air bubble is present, the vial will be opened and refilled with an additional sample. The vial will be immediately capped and checked again for bubbles. If air bubbles are still present, the VOC sample vial will be discarded and a new vial used. The VOC sample vial filling procedure is then repeated until no air bubbles are present.
8. If other sample analyses are required, fill the other sample containers after the VOC sample vials are filled. Samples collected for metals and general minerals analysis will be filled to the base of the bottleneck. Care will be taken not to aerate the sample during transfer from the bailer to the sample bottles and not to overfill bottles containing preservatives. All samples shall be appropriately preserved per the project work plans.
9. Each sample container to be submitted for analysis will be appropriately labeled. The label will be filled out using waterproof ink and will contain, at a minimum, the following information:
   - date and time sample was collected
   - sample location
   - the initials of the individual conducting the sampling
   - any additional required information.
10. Document the sampling event on the Field Logbook.
11. Place the labeled vials in seam-sealing plastic bags (i.e., Ziplock or equivalent). Seal the bag, removing any excess air, and tape the bag with custody tape so that removal of the sample will cause the tape to be broken.

12. Conduct a visual inspection of the turbidity of samples and record on the Field Logbook to provide a qualitative record of results.
13. Handle the samples according to procedures outlined in WTS-SOP No. 2.1. For samples submitted to a laboratory for analysis, a task-specific Analyte List and Chain-of-Custody Record shall be completed and maintained per WTS-SOP No. 1.1 and the project work plans.
14. After samples are collected, water levels may be measured. For water level measurements using the Hydropunch®, allow enough time for ground water to fill the sample chamber and the push rods. After static water level conditions are achieved, an electric tape is lowered through the push rods and the water level is measured. Document results on the appropriate form, as specified by the project-specific work plans.
15. Abandon the hole following the procedure outlined in the project work plans.

5.5 Reporting

The CPT contractor should provide a field survey report of the test data before demobilizing from each location. The CPT contractor should record on the survey report the operator's name, date of the survey, and the CPT location number. The report should include the following:

- descriptions of the various probes and equipment, and the results of calibrations performed;
- profiles of cone tip resistance, sleeve friction resistance, friction ratio, inclination, pore pressures, and differential pore pressure ratio versus depth; and
- a list of the derived geotechnical parameters related to the subsurface conditions, including soil types, standard penetration test blow counts, relative density, and shear strengths.

The report should then be reviewed, approved, and signed by the Project Geologist as identified in the project work plans.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

Task-Specific Analyte List

Chain-of-Custody Record

SURFACE WATER SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for use by field personnel in the collection and documentation of surface water samples for chemical analysis. Proper collection procedures are necessary to assure the quality and integrity of all surface water samples. Additional specific procedures and requirements will be provided in the project work plans, as necessary and/or related SOPs.

2.0 REFERENCES

EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA, Interim Final OSWER Directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QC/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to surface water sampling activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from procedures to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

Materials:

- Appropriate sample containers with labels and preservatives, as required.
- Hard plastic or steel cooler with cold packs (or ice) for samples.
- Temperature, pH, conductivity, and turbidity meters.
- Equipment calibration standards.
- Organic vapor meters.
- Plastic sheeting, if needed.
- Decontamination supplies, as required.
- Personal protective clothing and equipment, if required by the project health and safety plan.
- Field logbook and sample forms

5.0 PROCEDURE

This section contains the procedures involved with surface water sampling. Proper sampling procedures are necessary to insure the quality and integrity of the samples. The details within this SOP should be used in conjunction with project work plans. The project work plans will generally provide the following information:

- Sample collection objectives
- Locations of samples to be collected
- Numbers and volumes of samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling required
- Any additional sampling requirements or procedures beyond those covered in this SOP, as necessary.

At a minimum, the procedures outlined in this SOP for surface water sampling will be followed.

5.1 Surface Water Sampling Requirements

5.1.1 Equipment Selection and Sampling Considerations

Sampling equipment is constructed from a variety of materials. The most inert material (e.g., Teflon, stainless steel), with respect to known or anticipated contaminants, should be used whenever possible. The project work plans will describe the type of equipment to be used.

If non-dedicated sampling is to be used and the contaminant histories of the sites are known, it is advisable to establish a sampling order starting with the least contaminated site and progressing to the most contaminated last.

5.1.2 Sampling with a Bailer or Dipper

Sampling should be conducted in accordance with the project work plans. The standard procedure for sampling using a bailer or dipper will be conducted as described below.

5.1.3 Inspect the equipment to ensure that it is in good working order.

1. Calibrate all field analytical test equipment (e.g., pH, temperature, and conductivity) according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate form(s) as specified by the project work plans. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.

2. If non-dedicated equipment is being used, decontaminate according to WTS-SOP No. 6.0. During decontamination, the equipment should again be inspected for damage and, if damage is present, the equipment should be repaired or replaced with undamaged equipment.

3. Inspect the sampling bottles (obtained from the analytical laboratory prior to the sampling event) to be used to ensure that they are appropriate for the samples being collected, are undamaged, and have had the appropriate types and volumes of preservatives added. The types of sample containers to be used and sample preservation requirements will be provided in the project work plans.

4. Using the bailer or dipper, collect water directly from the surface water body being monitored. Care should be taken to avoid disturbing the sample surroundings, e.g., stirring up sediment form the bottom of a stream or pond.

5. Collect the sample directly into the provided sample bottle (container), minimizing aeration of the sample. Completely fill the bottle. Samples collected for metals and general water chemistry analysis should be filled to the base of the bottle neck.

6. The samples should be collected in the order of volatility, collecting the most volatile samples first, followed by the least volatile samples.

7. Samples that require filtering should be collected last. The samples should preferably be filtered using a disposable vacuum filterization unit. The required filter mesh should be stipulated in the project work plans.

8. Cap the bottle and attach custody tape across the cap so that any attempt to remove the sample or open the sample bottle will be evident. Fill out and attach the sample label to the bottle per WTS-SOP No. 2.1. The sample will be assigned a sample number per WTS-SOP No. 2.2.

5.1.4 Document the sampling event on the Field Logbook.

As soon as possible after sample collection, place the sample in a separate, appropriately sized, airtight, seam sealing, polyethylene bag (i.e., Ziplock™ or equivalent). Seal the bag, removing any excess air. Place the bagged sample inside the shipping container.

Handle and ship the sample according to the procedures outlined in WTS-SOP No. 2.1, following appropriate custody procedures described in WTS-SOP No. 1.1. Samples stored temporarily on site will be maintained per WTS-SOP No. 2.3.

5.1.5 Sampling with a Peristaltic Pump

Sampling will be conducted per the project work plans. The standard procedure for surface water sampling using a peristaltic pump will be conducted as described below.

1. Inspect the equipment to ensure that it is in good working order.
2. Conduct all field analytical test equipment (pH, temperature, and conductivity) calibration as discussed in Section 5.1.2.2.
3. Conduct equipment decontamination as described in Section 5.1.2.3. However, the old Tygon™ tubing should not be decontaminated. New tubing should be used for each site.
4. Connect new Tygon™ tubing to the rotor head of the pump motor and tighten until snug.
5. Run a short section of the tubing from the discharge side of the pump head to a collection vessel.
6. Insert the free end of the influent tubing into the surface water site and lower it to the middle of the water column.
7. Inspect the sampling bottles to be used per Section 5.1.2.12.
8. Turn on and adjust the rotor speed of the pump so that the water will flow smoothly and without agitation into the sample bottles.
9. Collect the sample directly into the provided sample bottle (container), allowing the discharge to flow gently down the inside of the bottle, minimizing aeration of the sample. Completely fill the bottle; however, samples collected for metals and general water chemistry analyses should be filled to the base of the bottle neck.
10. The samples should be collected in the order of volatility as described in Section 5.1.2.15. VOC samples should not be collected with a Peristaltic Pump.
11. Samples that require filtering should be collected last. The samples should preferably be filtered using a disposable vacuum filterization unit. The required filter mesh should be stipulated in the project work plans.
12. Appropriately cap, label, and number the samples as discussed in Section 5.1.2.17.
13. Document the sampling event on the Field Logbook.
14. Appropriately seal, store, handle, and ship the samples per Sections 5.1.2.19 and 5.1.2.20.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

LOW-FLOW GROUND WATER SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for use by field personnel in the collection and documentation of ground water samples for chemical analysis using low flow procedures. Proper collection procedures are necessary to assure the quality and integrity of all ground water samples. Additional specific procedures and requirements will be provided in the project work plans, as necessary and/or related SOPs. Work plans may range in complexity and formality from fully published, reviewed, and approved plans (typically provided for single events) down to WAO responses with notes (typically provided for routine, ongoing monitoring programs).

2.0 REFERENCES

EPA, September 1987, *Compendium of Superfund Field Operations Methods,* EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, *EPA Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA,* Interim Final OSWER Directive 9355.3-01.

ASTM, 1988, *Standards Technology Training Program – Ground Water and Vadose Zone Monitoring,* Nielsen, et al.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QC/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to ground water sampling activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from procedures to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Bladder Pump

A bladder pump is an enclosed cylindrical tube containing a flexible membrane bladder. Well water enters the bladder through a one-way check-valve at the bottom. Gas is forced into the annular space (positive displacement) surrounding the bladder through a gas supply line. The gas displaces the well water through a one-way check-value at the top. The water is brought to the surface through a water discharge line. Compressors or cylinders provide gas (air or nitrogen).

4.2 Electric Submersible Pump

An electric submersible pump is an enclosed cylindrical tube containing a motor with rotary attachments. Well water enters the cylinder through a one-way check valve. Electrical power to the motor causes rotors or impellers to turn and displace the ground water.

4.3 Dedicated Ground Water Monitoring Equipment

Dedicated ground water monitoring equipment is used to purge and sample only one well. The equipment is installed and remains in the well for the duration of the monitoring program. Dedicated equipment does not need to be decontaminated between sampling events.

4.4 Materials:

- Clean rope or wire line of sufficient length for conditions.
- Appropriate sample containers with labels and preservatives, as required.
- Hard plastic or steel cooler with cold packs (or ice) for samples.
- Temperature, pH, conductivity, and turbidity meters.
- Equipment calibration standards.
- Electronic water level indicator.
- Organic vapor meters.
- Plastic sheeting, if needed.
- 55-gallon drums for purge water.
- Decontamination supplies, as required.
- Personal protective clothing and equipment, if required by the project health and safety plan.
- Field Log Book.

5.0 PROCEDURE

This section contains the procedures involved with low flow ground water sampling. Proper ground water sampling procedures are necessary to insure the quality and integrity of the samples. The details within this SOP should be used in conjunction with project work plans. The project work plans will generally provide the following information:

- Sample collection objectives
- Locations of ground water samples to be collected
- Numbers and volumes of samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling required
- Any additional ground water sampling requirements or procedures beyond those covered in this SOP, as necessary.

At a minimum, the procedures outlined in this SOP for low flow ground water sampling will be followed.

5.1 Ground Water Sampling Requirements – Equipment Selection and Sampling Considerations

Purging and sampling equipment is constructed from a variety of materials. The most inert material (e.g., Teflon, stainless steel), with respect to known or anticipated contaminants in the well(s), should be used whenever possible. The project work plans will describe the type of equipment to be used.

If non-dedicated sampling is to be used and the contaminant histories of the wells are known, it is advisable to establish a sampling order starting with the least contaminated well and progressing to the most contaminated last.

5.2 Ground Water Purging and Sampling

Pre-sample purging and sampling should be conducted in accordance with the project work plans. The standard procedure for purging and sampling will be conducted as described below.

1. Inspect the equipment to ensure that it is in good working order.

2. Calibrate all field analytical test equipment (e.g., pH, temperature, and conductivity) according to the instrument manufacturer's specifications. Calibration results will be recorded in the Field Log Book and any appropriate form(s) as specified by the project work plans. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.

   NOTE: An exception to the daily calibration requirements will be made in the case of the water level meters. These instruments will be calibrated at the beginning of the project and then every six months using a steel surveyors tape.

3. If non-dedicated equipment is being used, decontaminate according to WTS SOP No. 6.0. During decontamination, the equipment should again be inspected for damage and, if present, repaired or replaced with undamaged equipment.

4. Visually inspect the well to ensure that it is undamaged, properly labeled and secured. Damage or other conditions that may affect the integrity of the well will be recorded in the Field Log Book and brought to the attention of the Sampling Team Leader.

5. Uncap the well and monitor the air space immediately above the open casing per the health and safety plan. Observe if any air is flowing into or out of the casing. In the event such conditions are observed, they should be noted in the Field Log Book.

6. Obtain a depth to water level measurement according to the procedures outlined in WTS SOP 5.0. Record static water level measurement in the Field Log Book.

5.3 Purging with various devices

If using non-dedicated equipment, lower the pump and associated tubing and/or lines into the well. For a bladder pump, attach the compressor or cylinder to the controller and the controller to the gas supply line, making sure that the compressor is downwind of and located 20ft away from the monitoring well. Attach the sampling tube to the discharge supply line. Adjust the pressure/discharge cycle on the controller based on manufacture specs and well depth.

For an electric submersible pump, place the generator downwind and a minimum of 20ft away of the well. Start the generator and then plug the pump into the generator.

Set up pump control and drawdown meter on selected well as noted in equipment manuals. Begin purging. Collect, transport, and dispose of purge water in accordance with the criteria specified by the project work plans. The optimum pumping rate will need to be established for each well to be sampled. The steps below should be followed:

1. Measure the initial water level.

2. Begin pumping at an approximate rate of 100 mL/min.

3. After one to two minutes of pumping, measure the water level to determine drawdown. If little or no drawdown has occurred, the pumping rate may be increased. Typical pumping rates range from 100 mL/min to 500 mL/min. Note: ASTM recommends that when sampling for VOC analysis, pumping rates should not exceed 250 mL/min.

4. If turbidity increases significantly or drawdown exceeds the allowable values, pumping should be decreased (or even stopped if necessary). According to NMED guidance, the water level should be checked at minimum every five minutes during purging.

5. Pumping rate should not exceed 500 mL/min.

Once the pumping rate has been established, begin recording parameters (pH, specific conductance, temperature, and turbidity) at standard intervals (the interval should be the time it takes to clear the volume of the flow cell at the chosen pumping rate).

Physical parameters (pH, specific conductance, and temperature) of the purge water will be measured when purging begins and then periodically throughout the purging procedure. These measurements will be recorded in the Field Log Book. Purging is considered complete when pH, specific conductivity, and temperature measurements have stabilized (i.e., three consecutive pH, specific conductance, and temperature readings are within tolerances specified in the project work plans). Standard tolerances for successive readings are as follows:

- pH within 0.1 standard unit;
- Specific conductance within 10%;
- Temperature within 0.5^{o} C; and
- No trends among the successive readings.

If stability is not reached within the removal of three well volumes, then purging is continued until a maximum of five cased well volumes have been removed. If stability is not reached within removal of five well volumes, the Sampling Team Leader will, at their discretion, elect to collect the sample or discontinue the effort.

Inspect the sampling bottles (obtained from the analytical laboratory prior to the sampling event) to be used to ensure that they are appropriate for the samples being collected, are undamaged, and have had the appropriate types and volumes of preservatives added. The types of sample containers to be used and sample preservation requirements will be provided in the project work plans.

5.4 Sampling with various devices

For a bladder pump, turn on the pump and adjust the pressure/discharge cycle on the pump controller so that the water will flow smoothly and without agitation into the sample containers.

For an electric submersible pump, turn on and adjust the flow rate of the pump by using the check-valve on the discharge line so that the water will flow smoothly and without agitation into the sample bottles.

Collect the sample directly into the provided sample bottle (container), allowing the discharge to flow gently down the inside of the bottle, minimizing aeration of the sample. Completely fill the bottle. Samples collected for metals and general water chemistry analysis should be filled to the base of the bottleneck.

The samples should be collected in the order of volatility, collecting the most volatile samples first, followed by the least volatile samples. The volatile samples should be collected during one full discharge cycle. Do not partially fill a volatile sample during one cycle and complete the filling during the next cycle.

Samples that require filtering should be collected last. The samples should preferably be filtered using a disposable vacuum filterization unit. The required filter mesh should be stipulated in the project work plans. The standard filter size is 0.45 microns.

Cap the bottle and attach custody tape across the cap so that any attempt to remove the sample or open the sample bottle will be evident. Fill out and attach the sample label to the bottle per WTS-SOP No. 2.1. The sample will be assigned a sample number per WTS-SOP No. 2.2.

Document the sampling event on the Field Log Book.

As soon as possible after sample collection, place the sample in a separate, appropriately sized, airtight, seam sealing, polyethylene bag (i.e., Ziplock™ or equivalent). Seal the bag, removing any excess air. Place the bagged sample inside the shipping container.

Handle and ship the sample according to the procedures outlined in WTS SOP No. 2.1, following appropriate custody procedures described in WTS SOP No. 1.1. Samples stored temporarily on site will be maintained per WTS SOP No. 2.3.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Log Book

LITHOLOGIC LOGGING

1.0 PURPOSE

The purpose of this procedure is to define the requirements necessary for borehole and sample logging. The major objective of this procedure is to provide a uniform set of guidelines that will aid in developing consistency among sample descriptions and sample techniques. The importance of accurate, complete, clear, and concise logs cannot be overemphasized.

2.0 BACKGROUND

Borehole logging is used to determine the geologic relationships of subsurface soil and rock formations. The relationship of geologic formations and features is important in describing groundwater flow and in determining probable contaminant migration pathways.

3.0 RESPONSIBILITIES

The Field Geologist is responsible for on-site monitoring of drilling and soil sampling operations, for recording (logging) pertinent information regarding the geologic materials penetrated during the operations, and for ensuring that the well and sample numbering system is consistent with the site specific sampling and analysis plan.

4.0 EQUIPMENT

4.1 Required Equipment

- Clipboard
- Drilling record forms
- Portable organic vapor detector
- Field logbook, straight edge and black permanent ink
- Weighted engineer's tape
- Folding rule or tape measure
- Sand gauge
- Color chart
- Acid bottle
- Water level indicator
- Site map
- Copy of drilling contract
- Waterproof marking pen
- Sample jars or bags

4.2 Optional Equipment

- Hand lens
- Brunton or equivalent compass
- Pocket penetrometer
- Equipment pouch
- Flagging tape
- Cooler and water bottles
- Flashlight
- Rock hammer

5.0 PROCEDURE FOR FILLING OUT SOIL BORING/WELL LOG

This form is intended for use in the field during the drilling, sampling, and logging process for soil borings and wells. Most of the items can be neatly and legibly included in the field; however, some items, such as the graphic log column, may be reserved for completion in the office. The purpose of the log is to clearly document the events and findings of the drilling activity. All pertinent data related to boring/drilling operations must be concisely recorded as objectively as possible. The geologist or engineer has the option to resubmit this form in a deliverable as a completely redrafted/typed form, or as a combination of information applied in the field and in the office. Regardless, the original field log should be retained in the permanent file. Any alterations or changes between the office copy and the original should be justified. To complete the boring or well logs:

- Fill out information on header of the log noting either boring or well number, if well is to be installed. Use the sampling site identification number.
- Note number under "Location".
- Note start and end date of boring or well installation under "Date", use MM/DD/YY format.
- Briefly describe wind direction, speed, and temperature under "Weather".
- The logging geologist or engineer should include his name under "Logged by", include three initials.
- The driller's name and drilling company should be included under "Drilled by", include three initials for the driller's name.
- "Drilling method" should contain information such as hollow-stem auger and auger inside diameter. If using rotary methods, include size of bit and rotary method used.
- "Sampling method" should be described as length of sampler and type, i.e., 2.5´ split spoon. The sampling method should be described such that it is easily translatable to one of the following codes at time of data entry:

B	Bail
C	Composite grab
G	Single grab
P	Pump
S	Split-spoon core sampling
T	Shelby tube core sampling
U	Soil auger
X	Composite core sample
Z	Scraping from physical surface
1	Magnetometer (UXO survey)
2	Well sampler
9	Trip and rinse blanks

- "Gravel pack" should include the depth interval of gravel pack installation, sieve filter size, and type, e.g., 50´-39´, 20-40 Colorado silica.
- "Seal" The seal should describe the depth interval of seal above the gravel pack and type. The seal should also describe the depth interval of grout slurry, e.g., 39´ - 34´ - Bentonite pellets, 34´ - 0´ - Bentonite/grout slurry

5.1 Under the header of casing, the casing description will require the following:

- "Type" Schedule 40 polyvinyl chloride (PVC), stainless steel etc.
- "Diameter" The information supplied here will be reported in inches (usually 4 inch).
- "Length" The length of casing or riser should include stick-up at the surface.

5.2 Under the heading of screen, the well screen will require the following information:

- "Type" Schedule 40 polyvinyl chloride (PVC), stainless steel etc.
- "Slot" The screen slot size. For silts and fine-grained sands, the slot size will be 0.01 inch. For sands medium to coarse grained, the slot size will be 0.02 inch.
- "Diameter" The diameter for well screens reported in inches (usually will be 4 inch).
- "Length" The length of the well screen in reported feet.
- "Hole Diameter" The diameter of hole cut by either a rotating bit or auger cutting head. Reported in inches.
- "Total Depth" The total depth drilled (in feet). If sampled deeper than depth drilled, this should be noted at the bottom of the log.
- "Location Map" A sketch of the boring location should be constructed in this corner.

5.3 Topographical setting will be one of the following:

DEPR	Local depression
DTCH	Drainage ditch
DUNE	Dunes (mound, ridge, or hill of windblown sand; bare or covered with vegetation)
FLAT	Flat surface
HLSD	Hillside slope
HLTP	Hilltop
PDMT	Pediment (broad, gently sloping erosion surface)
TRCH	Trench (a long, narrow excavation, natural or artificial)
VALY	Valley - flat valleys of all sizes

- "Surface cover" will be bare, wooded, or grassy.
- Below the header are lithology/remarks and sample classifications. The following sample classifications should be described as follows:
- "Moisture Content" (Clays and Sands)
- Dry
- Damp
- Moist (compactable)
- Wet (not compactable)
- Saturated
- "Sorting" (Sands only)
- Very well
- Well
- Moderately
- Poorly
- Very poorly
- "Density" or consistency (CONSS) (Sands and Clay) Density is described by the number of drops required by a 140 lb. hammer over 30 inches to drive a 2-inch outside diameter, 1 3/8 inch inside diameter, split-spoon 6 inches. The following is a description of soil consistency (density):

Sand or Gravel	Blows per Foot	Silt or Clay	Blows per Foot	Thumb Penetration
VL (Very Loose)	0-4	VSO (Very Soft)	0-2	Very easy-inches
L (Loose)	4-10	SO (Soft)	2-4	Easily inches
MD (Medium Dense)	10-30	M (Medium Soft)	4-8	Moderate effort-inches
D (Dense)	30-50	ST (Stiff)	8-15	Indented easily
VD (Very Dense	> 50	VST (Very Stiff)	15-30	Indented by nail
		H (Hard)	> 30	Difficult by nail

5.4 Other descriptions may include:

- NC (Non-cemented)
- PC (Poorly cemented)
- "Plasticity" Plasticity refers to the case in which cohesive soils are molded. The following describes the plasticity terms.
- EXTREMELY HARD, resistant to pressure, not broken by hand
- NONPLASTIC, not wire formable
- SLIGHTLY PLASTIC, wire formable but soil remains easily deformed
- PLASTIC, wire formable, moderate pressure required
- VERY PLASTIC, wire formable, much pressure required
- "Sample Number" In this column, record the number order that the sample was taken.
- "TIP Reading" Refers to "Total Ionizables Present". Record the headspace reading here and the type of instrument used, i.e., HNU, OVM, etc.
- "Sample Recovery" After obtaining a split-spoon sample or Shelby sample, measure the length of recovered sample to the nearest 0.01´ and record level.
- "Penetration Resistance" The blow counts for every 6 inches of driving the sample are to be recorded under this heading.
- "Color" The Munsell soil color or Geological Society of America soil color codes (COLOR) are a combination of the hues, values, and colors listed below:
- Hue: 2Y, 2YR, 5B, 5BG, 5G, 5GY, 5P, 5PB, 5R, 5RP, 5Y, 5YR, 7R, 7YR, 10G, 10GY, 10R, 10Y, 10YR, N
- Value: 0 - 9
- Color: 0 - 8 (not used when hue is "N"). A Munsell color chart will be available for color determination.

"USCS Classification/Lithology/Grain Size, Modifications/Remarks". The predominant lithology or lithologies should be identified first in capital letters, followed by qualifying adjectives that define grain size, color (using a Munsell chart), mineralogy, structural/textural features, bedding and laminations. For mixed lithologies within a common interval, provide relative percentages of the two or more lithologies within parenthesis following the lithologic name. For example, Sand (fine-medium [60%]) brownish yellow (10 yr. 6/6), and Gravel coarse (40%) very pale brown (10 yr. 7/3). Any obvious features related to evidence for contamination, such as odor or staining, should be documented. Drilling comments and occurrences should also be noted under this section. The acceptable codes, based on Unified Soil Classification System (USCS) augmented by lithology and special codes, are identified in Table 1. Codes for grain size (soil) are listed on the following page:

Action or Measurement		Acceptable Entries	
Code	**Description**	**Code**	**Description**
GRAIN	Grain size (soil)	For soils:	
		C	Coarse
		CF	Coarse to fine
		F	Fine
		FM	Fine to medium
		LG	Large
		vM	Medium
		MC	Medium to coarse
		SMALL	Small
		VC	Very coarse
		VF	Very fine

Rock texture codes are available, but have not been included here since they are not expected.

5.5 Soil Classification and Lithology.

Action or Measurement		Acceptable Entries	
Code	**Description**	**Code**	**Description**
USCS	Unified Soil Classification System augmented by lithology and special codes		Separate dual USCS codes by a hyphen.
		USCS Codes:	
		CH	Fat clay, inorganic clay of high plasticity
		CL	Lean clay, sandy clay, silty clay, or low to medium plasticity
		GC	Clayey gravel, gravel-sand-clay mixtures
		GM	Silty gravel, gravel-sand-silt mixtures
		GP	Gravel, poorly graded, gravel-sand mixtures, little or no fines
		GW	Well graded gravel-sand mixture, little or no fines
		MH	Silt, fine sandy or silty soil with high plasticity
		ML	Silty and very fine sand, silty or clayey fine sand or clayey silt with slight plasticity
		OH	Organic clays of medium to high plasticity, organic silts
		OL	Organic silts and organic silty clays of low plasticity
		PT	Peat or other highly organic soil
		SC	Clayey sand, sand-clay mixtures
		SI	Shells
		SM	Silty-sand, sand-silt mixtures
		SP	Sand, poorly-graded, gravelly sands
		SW	Sand, well-graded, gravelly sands
		WD	Wood
USCS	Unified Soil Classification System augmented by lithology and special codes		Separate dual USCS codes by a hyphen.
		Special:	
		ASH	Ash
		ASPHLT	Asphalt (road material
		CONC	Concrete
		CRLMSN	Crushed limestone
		FILL	Unknown man-made landfill material
		LC	LC Lost core
		NR	NR No recovery
		NTLOGD	Not logged
		RUBBLE	Construction debris rubble or demolition fill
		VOID	Void or cavity
WSTAT	Final status of the well	CB	Well filled with grout: cement-bentonite
		FB	Well filled with bentonite
		FC	Well filled with concrete
		FG	Well filled with gravel
		FS	Well filled with soil
		NC	Well filled with grout: neat cement
		O	Open well
		OP	Open well with piezometer or observation well installed
		WD	Well damaged

Action or Measurement		Acceptable Entries	
Code	**Description**	**Code**	**Description**
MODIF	Lithology modifications	B	Boulders
		BDWX	Badly weathered
		CAL	Calcareous
		CARB	Carbonaceous
		CC	Concretions
		CEM	Cemented
		CHE	With chemicals (based on headspace reading)
		CL	Clayey
		CS	Clay strata or lenses
		DCOLOR	Discolored
		FAULT	Faulted
		FECC	Iron concentrations
		FILL	Disturbed soil
		FRACT	Fractured
		FRIA	Friable
		G	Gravelly
		HPL	Highly plastic
		IRNST	Ironstained
		LIG	Lignite fragments
		MICA	Micaceous
		ML	Silty
		MOT	Mottled
		O	Organic matter
		ODOR	Odiferous
		OX	Oxidized
MODIF	Lithology modifications	PL	Plastic
		ROUND	Rounded
		RT	Rootlets
		S	Sandy
		SDL	Sandstone lenses
		SDS	Sandstone fragments
		SH	Shale fragments
		SHLN	Shale lenses
		SHLY	Shaly
		SIS	Silt strata or lenses
		SL	Slickensides
		SLF	Shell fragments
		SLWX	Slightly weathered
		SO	Solid
		THSK	Thin streaks
		TR	Trace
		TRCL	Trace of clay
		TRG	Trace of gravel
		TRML	Trace of silt
		TRMN	Trace of manganese
		TRS	Trace of sand
		WCL	With clay
		WFE	With iron oxide
		WG	With gravel
		WGML	With gravel and silt
		WLAM	With laminations
		WML	With silt
		WS	With sand
		WX	Weathered

6.0 REQUIRED FORMS/DOCUMENTATION

Soil Boring Log Forms

SOIL STOCKPILING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines for stockpiling of excavated soils. The details within this SOP should be used in conjunction with project work plans and/or related SOPs. The work plans may present additional project-specific requirements and procedures for soil stockpiling.

2.0 REFERENCES

None.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for assigning project staff to complete soil stockpiling activities, and for ensuring that this and any other appropriate procedures are implemented by project personnel. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for the periodic review of field generated documentation associated with soil stockpiling. If perceived variances occur, the Quality Assurance Officer is also responsible for issuing notices of nonconformance and requests for corrective action.

The Sampling Team Leader(s) assigned to this task is responsible for performing the task according to this SOP and other appropriate procedures identified in the project work plans. All staff members are responsible for reporting deviations from the procedures to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

None.

5.0 PROCEDURE

5.1 General

Stockpiling of soils is overseen by various regulatory agencies. Prior to initiating excavation activities, ensure that the procedures and requirements for compliance with applicable federal, state, and local regulations regarding stockpiling of soils have been reviewed and understood. The standard procedures for short-term and long-term stockpiling are described below. The project work plans will also present the following information pertaining to soil stockpiling:

- Any additional requirements or procedures to be followed
- Equipment to be used
- Stockpile locations.

5.2 Short-term Stockpiling

Upon initiation of excavation activities, soil will be segregated on a site-specific basis. Potentially clean soils will be stored in a separate short-term stockpile at the site. Soil that is suspected or known to be contaminated will be short-term stockpiled at the site separately from the clean soil.

The short-term stockpiles will be placed upon two layers of impermeable sheeting (such as polyvinyl chloride, polyethylene, etc.). For short-term storage, the separated soils may also be placed in bins or drums for subsequent transport to long-term stockpiles, per the project work plans.

Each pile will be covered with impermeable sheeting at the end of each workday. The covering will be secured at both the top and base of the stockpile. Plastic sheeting will be utilized to limit soil aeration and the release of windborne dust and particulates. The cover will also limit access by rainwater, resulting in possible contamination of surface water runoff from the stockpile. If bins or drums are used for short-term storage, impermeable sheeting should be used to cover the bins and the covers to the drums should be secured and seated at the end of each workday.

Short-term stockpiling activities will be documented by the Project Technical Coordinator or field geologist on the Field Logbook.

5.3 Long-term Soil Stockpiling

When space and logistics allow, long-term stockpiles will be constructed on a concrete or asphalt base. Two layers of impermeable sheeting will be placed on top of the concrete or asphalt. All sheeting will be folded at joining edges with a three-foot overlap to prevent seepage.

A berm will be erected around each stockpile. Boards or hay bales can be used to construct the berm. The material used to construct the berm will be placed under the two layers of impermeable sheeting to provide containment of any liquids that might leach from the soil.

Soil will be segregated by contaminant type (i.e., separate stockpiles for storage of soils impacted by gasoline, diesel, halogenated hydrocarbons, metals, etc.).

Each stockpile will be visibly labeled.

Covering of each pile with impermeable sheeting will be completed at the end of each workday. The covering will be secured at both the top and base of the stockpile. The sheeting will be utilized to limit soil aeration and the release of windborne dust and particulates. This cover will also limit access by rainwater, resulting in possible contamination of surface water runoff from the stockpile.

The Project Technical Coordinator or field geologist will document on the Field Logbook long-term stockpiling activities.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

HOLLOW STEM AUGER DRILLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for field personnel to use during the supervision of drilling operations involving hollow stem auger techniques. Additional specific hollow stem auger drilling procedures and requirements will be provided in the project work plans and/or related SOPs.

2.0 REFERENCES

None

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all hollow stem auger-drilling activities are conducted and documented in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for the implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to hollow stem auger drilling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to hollow stem auger drilling activities is responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from the procedures to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Hollow Stem Auger Drilling

A drilling method using rotating auger flights (typically in 5-foot joints) with a bit on the bottom of the lead flight (sometimes called the “lead auger”). The flights consist of a hollow pipe and an outer spiral plate, that when rotated, forces soil cuttings upward along the borehole wall to the surface. The auger string is advanced by rotation, with pressure exerted by the rig, forcing the bit to cut the soil at the bottom and direct cuttings to the augers.

A retractable plug with a pilot bit is placed at the bottom of the auger string to prevent cuttings from entering the hollow stem. When the plug is retracted, a sampler may be sent through the hollow center to sample soil at the bottom of the borehole without requiring the augers to be removed. A wireline sampler may also be attached to the inside of the lead auger for coring as the borehole is advanced.

This method is commonly used for drilling and sampling of soil borings, collection of soil gas and screening-level water samples, and installation of some smaller diameter wells. The well casing string may be placed through the hollow stem.

The hollow stem auger drilling method has advantages over other drilling techniques in certain circumstances, and disadvantages in others. This method is highly suitable for unconsolidated and consolidated fine-grained soils. Hollow-stem auger drilling can achieve the most rapid rates of penetration in soft sticky clay-dominated soils. However, coarse and consolidated gravels and hard bedrock may be too dense for adequate drill penetration. Soil cuttings are typically disaggregated and remolded, making bedding, fabric, and soil property determination difficult.

The most reliable method for logging of soils during hollow stem auger drilling is by collecting relatively intact samples through the hollow stem. An advantage of the hollow stem auger method is that soil samples can be readily obtained from the bottom of the hole without requiring the removal of the auger string (unlike air or mud rotary methods).

This drilling method may be used to install monitoring wells (limited by diameter) as there is good depth control, and the auger can be progressively pulled as well construction materials are added to the borehole. The methodology may also be used to drill out monitoring wells for abandonment.

Another advantage of the hollow stem auger method is that air or mud is not required as circulating media. Therefore, there is limited to no potential for flushing of soil samples collected for chemical analyses, and a reduction in volumes of investigated derived wastes requiring costly handling and management procedures. Auger-type rigs can be significantly smaller than other types of rigs, making them the most suitable for some jobs with significant space constraints, including overhead clearance.

Disadvantages of the hollow stem auger method include a typical maximum depth of 100 to 200 feet (may be less depending on soil conditions). Hard soil horizons or very coarse gravel (cobbles and boulders) may be impenetrable with this method.

5.0 PROCEDURE

This section contains procedures and requirements for hollow stem auger drilling. The selection and implementation of hollow stem auger drilling techniques must incorporate site-specific conditions and requirements. Consequently, the project work plans will identify the following:

- The purpose of each borehole (e.g., to install monitoring well, soil sampling, well abandonment, etc.)
- Specific methodology for drilling, including equipment and cuttings/fluid containment
- Specific locations, depths, and diameters of boreholes
- Objectives and types of sampling and/or logging of borehole
- Details of mobilization/demobilization and decontamination of equipment
- Appropriate health and safety guidelines and personnel protective equipment
- Additional procedures or requirements beyond those covered in this SOP

5.1 Drilling Site Mobilization

5.2 Rig Decontamination and Preparation

All drilling and sampling equipment should be decontaminated before drilling as per MSOP Nos. 6.0 and 6.1, and the project work plans.

The driller and rig geologist/engineer should inspect the drilling equipment for proper maintenance and appropriate decontamination prior to each time the rig is mobilized to a site. All clutches, brakes and drive heads should be in proper working order. All cables and hydraulic hoses should be in good condition. All auger joints and bits should also be in good condition (e.g., no cracked or bent blades, bits are not excessively worn, etc.).

Any observed leakage of fluids from the rig should be immediately repaired and the rig decontaminated again before it is allowed to mobilize.

5.3 Site Preparation

The logistics of drilling, logging, sampling, cuttings/fluid containment, and/or well construction should be determined before mobilizing. The site should be prepared as per the project work plans.

Before mobilization, the Field Geologist should assess the drilling site with the driller. This assessment should identify potential hazards (slip/trip/fall, overhead power lines, etc.), and determine how drilling operations may impact the environment (dust, debris, and noise). Potential hazards should be evaluated and corrected, or the borehole location changed or shifted, as per the project work plans.

The Project Technical Coordinator or appropriate designee should ensure that all identifiable underground utilities around the drilling location have been marked and the borehole location appropriately cleared per the project work plans. At a minimum, copies of the site clearance documents should be kept on-site.

5.4 Mobilization and Set-Up

Once the site is prepared, the rig is mobilized to the site and located over the borehole location. The rig is leveled with a set of hydraulic pads attached to the front and rear of the rig. The driller should always raise the mast slowly and carefully to prevent tipping or damaging the rig, and avoiding obstructions or hazards.

Appropriate barriers and markers should be in place prior to drilling, as per the site health and safety plan. Visqueen (plastic, 6-mil thickness minimum) will be placed beneath the rig to contain any leakage of hydraulic fluids.

Appropriate cuttings and other investigation-derived waste containment should be set on site prior to commencement of drilling.

5.5 Health and Safety Requirements

Tailgate Safety Meetings should be held in the manner and frequency stated in the health and safety plan. All personnel at the site should have appropriate training and qualifications as per the health and safety plan.

During drilling all personnel within the exclusion zone should pay close attention to rig operations. The rotating auger blades can snag or catch loose clothing and literally screw someone into the ground.

Establishing clear communication signals with the drilling crew is mandatory since verbal signals may not be heard during the drilling process. The entire crew should be made aware to inform the rig geologist/engineer of any unforeseen hazard or when anyone is approaching the exclusion zone.

5.6 Drilling Procedures

5.7 Breaking Ground

Prior to the commencement of drilling, all safety sampling and monitoring equipment will be appropriately calibrated per the project work plans.

The Field Geologist should inform the driller of the appropriate equipment (e.g., cookie cutter, etc.) to be used for penetration of the surface cover (e.g., asphalt, concrete, cement, etc.). In the event of breaking ground where a shallow subsurface hazard may exist (unidentifiable utility, trapped vapors, etc.), the driller should be informed of the potential hazard and drilling should commence slowly to allow continuous visual inspection and/or monitoring and, if necessary, to stop for probing.

5.8 Borehole Drilling

During drilling operations, and as the borehole is advanced, the rig geologist/engineer will generally:

- Observe and monitor rig operations;
- Conduct all health and safety monitoring and sampling, and supervise health and safety compliance;

- Prepare a lithologic log from soil samples or cuttings; and
- Supervise the collection of, and prepare soil, soil vapor, and groundwater samples.

As drilling progresses the rig geologist/engineer should observe and be in frequent communication with the driller regarding drilling conditions. This includes relative rates of penetration (indicative of fast or slow drilling) and chattering or bucking of the rig. These conditions, including the relative drilling rate, should be recorded on the boring log per MSOP No. 10.0. Drilling should not be allowed to progress faster than the rig geologist/engineer could adequately observe conditions, compile boring logs, and supervise safety and sampling activities.

The Field Geologist should also observe the rig operations, including the make-up and tightening of connections as additional auger joints are added to the auger string. Any observed problems, including significant down time, and their causes are recorded on the Field Logbook.

Cuttings and fluids containment during drilling should be observed and supervised by the Program Geologist, as per specifications in the project work plans.

The Field Geologist will oversee or conduct appropriate health and safety sampling and monitoring. If any potentially unsafe conditions are evident from the above drilling observations and the health and safety sampling and monitoring, the Field Geologist may suspend drilling operations at any time and take appropriate actions as per the health and safety plan. In the event suspension of drilling activities occur:

- The Project Technical Manager must be informed of the situation;
- Appropriate corrective action must be implemented before drilling may be continued; and
- The observed problem, suspension, and corrective action are entered on the Field Logbook.

During drilling the rig geologist/engineer will compile a boring log as per MSOP No. 10.0. The log will be compiled preferably from soil samples recovered while drilling. Logs should only be compiled from cuttings if this is the only option. Observations of drilling conditions are also entered on the log as discussed above and in MSOP No. 10.0. If total depth was reached prematurely due to refusal, the cause of refusal should be noted on the boring log and the Field Logbook.

Subsurface soil samples may be collected with a split spoon sampler or Shelby tube during drilling per MSOP No. 3.1. The Field Geologist will supervise the sampling. Soil samples (drive samples) can be readily obtained at discrete intervals with these methods.

Soil organic vapor (SOV) sampling may be conducted at discrete intervals during hollow stem auger drilling. This is done by stopping at the desired depth and driving a sample probe through the hollow stem into the soil ahead of the bit and then collecting a vapor sample. The sampling should be supervised by the rig geologist/engineer.

Ground water screening (grab) samples can be obtained at discrete intervals during drilling. One method is to auger to the bottom of the selected interval or zone and pull the auger back to the top of the interval, allowing ground water through the open borehole. A water sample is then collected with a bailer run through the inside of the augers. Another method is to stop the augers at a selected interval or zone and advance a hydropunch sampler beyond the lead auger to retrieve a water sample.

5.9 Borehole Abandonment

If the borehole is to be abandoned once drilling is completed, the abandonment will follow procedures outlined in the project work plan. The abandonment will be supervised by the rig geologist/engineer.

5.10 Monitoring Well Completion

If a monitoring well is to be installed in the borehole, the well completion will follow procedures outlined in MSOP No. 8.1. The rig Field Geologist will supervise the well installation activities.

5.11 Demobilization/Site Restoration

After drilling, sampling, well installation or borehole abandonment is completed the hollow stem rig is rigged down and removed from the borehole location. The rig geologist/engineer or appropriate designee will supervise the demobilization/site restoration. All debris generated by the drilling operation will be removed and appropriately disposed.

The site should be cleaned (ground washed if necessary) and surface conditions restored as per the project work plans. All abandoned borings should be topped off and completed as per the project work plans. All monitoring wells will also have their surface completions finished as per the project work plans.

Any remaining hazards as a result of drilling activities will be identified and appropriate barriers and markers put in place, as per the health and safety plan. All soil cuttings and fluids will be properly contained, clearly labeled, and maintained as per the project work plans.

The Field Geologist or appropriate designee should inspect the site to make sure that post-drilling site conditions are in compliance with the project work plans.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

Boring Log

FIELD QUALITY CONTROL (QC) SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for conducting field quality control (QC) sampling. Field QC sampling is required to assist in verifying the quality and integrity of samples collected during a given sampling event. Additional specific field QC sampling procedures and requirements will be provided in the project work plans and/or related SOPs.

2.0 REFERENCES

EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

EPA, August 1988, EPA Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA, Interim Final OSWER Directive 9355.3-01.

3.0 RESPONSIBILITIES

The Project Technical Manager and Technical Coordinator are responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing nonconformances, etc.) if quality issues are identified.

The Sampling Team Leader(s) assigned to environmental and QC sampling activities is responsible for completing tasks according to specifications outlined in this SOP and other appropriate procedures. All staff members are responsible for reporting deviations from procedures to the Project Technical Coordinator.

4.0 DEFINITIONS/MATERIALS

4.1 Field QC Sample

A field QC sample is a physical sample collected during or for a specific sampling event. The purpose of this sample is to evaluate the quality and integrity of original samples collected during the specific sampling event.

5.0 Procedure

This section contains the requirements for field QC sampling. Field QC sampling is required to provide data to verify the quality and integrity of environmental samples collected during a given sampling event.

The details within this SOP should be used in conjunction with project plans. These plans will generally provide the following information:

- Sample collection objectives
- Numbers, types and locations of environmental (non-QC) samples to be collected
- Numbers and types of supportive QC samples to be collected
- Any additional QC sampling requirements or procedures beyond those covered in this SOP, as necessary.

5.1 Quality Control Sampling Requirements

Field QC samples may consist of different media. Typical QC samples are as follows:

- Trip blank (TB)
- Equipment rinsate (ER)
- Field blank (FB)
- Field duplicate (FD)

Trip blanks are analyte-free water, shipped from and returned unopened to the laboratory in the same shipping containers for volatile organic, and at times gasoline hydrocarbons. The blanks are prepared at the laboratory using ASTM Type II DI Water, sent to the project location, carried with the sampling team(s) during sampling, and shipped to the laboratory for analysis with the environmental samples.

Trip blank samples are commonly collected and analyzed at a rate of one per sample cooler containing samples for volatile organic analyses or the gasoline fraction of petroleum hydrocarbons. The number or rate of trip blanks to be collected and the specific analyses to be conducted for the trip blanks will be provided in the project work plans.

Equipment rinsate samples are collected from the final rinse water during decontamination of groundwater, soil, or waste sampling equipment. This type of equipment includes bailers, split-spoon samplers, soil sample sleeves, hand augering equipment, surface soil sampling equipment, purge and sample pumps, etc.

Rinsate samples are generally collected at a rate of one per day per sampling team during the sampling event. Equipment rinsates are usually collected from dedicated sampling equipment only upon installation. The number or rate of equipment rinsate samples to be collected for a particular project will be specifically developed and documented in the project work plans. The specific chemical analyses to be conducted for the rinsate samples will also be developed and documented in the project work plans.

Field blanks are prepared from the water that is used for decontamination. One sample from each sampling event and each water source or lot number is generally collected and analyzed for all parameters of interest for the project. Upon collection, a description of the water source for the field blank sample should be documented in the Field Logbook.

The number or rate of field blank samples to be collected for a particular project will be specifically developed and documented in the project work plans. The specific chemical analyses to be conducted for the field blank samples will also be developed and documented in the project work plans.

For soils, field duplicate samples are generally collected by co-located sampling (e.g., using successive sample tubes from the same split-spoon sampling run) or by splitting samples. Field duplicate water samples are commonly collected by retaining consecutive samples from the sampling device (e.g., bailer or sample pump discharge line). Field duplicate water samples may also be generated by splitting a collected volume; however, this practice may lead to a loss in volatile organic compounds and is not common practice for volatile analyses.

Field duplicate samples are commonly collected at a rate of 10 percent per media sampled. However, the number or rate of field duplicate samples to be collected for a particular project will be specifically developed and documented in the project work plans. The specific chemical analyses to be conducted for the field duplicates will also be developed and documented in the project work plans.

The type and number of QC samples collected for a particular project is based on specifications provided in project specific documents, i.e., the project work plans. Field QC samples are to be collected at appropriate times during a sampling event.

All field QC samples will be collected in proper containers with appropriate preservation per the project work plans.

The collection of field QC samples consisting of various media (e.g., soil, groundwater, etc.) will follow procedures in sample collection SOPs for the respective media and any other applicable procedures in the project work plans. For example, the collection of a groundwater field duplicate QC sample will follow procedures specified in the groundwater sampling SOP (MSOP No. 9.0). Equipment rinsate samples are collected directly while rinsing the sampling equipment following appropriate procedures in MSOP No. 9.0 and the project work plans. Field blank samples are collected by pouring decontamination water directly into sample containers following appropriate protocol in MSOP No. 9.0 and the project work plans.

Field QC samples will be labeled and numbered as described in MSOP Nos. 2.1 and 2.2 respectively and the project work plans.

The field QC samples will also be maintained under custody per MSOP No. 1.1, and be appropriately stored, handled and shipped per MSOP Nos. 2.0 and 2.3.

6.0 REQUIRED FORMS/DOCUMENTATION

Field Logbook

Chain of Custody Form

MANAGEMENT OF INVESTIGATION-DERIVED WASTE

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for the proper management of investigation-derived waste (IDW) generated during environmental activities under contract number DAAD07-95-C-0125. Management includes waste minimization, hazardous waste determination, storage, labeling and transportation to the White Sands Missile Range Hazardous Waste Minimization Center.

During environmental investigations at the White Sands Missile Range (WSMR), WTS sampling crews may generate potentially contaminated IDW, including but not limited to the following types of materials:

- Saturated and unsaturated soil
- Groundwater
- Non-aqueous phase liquid (NAPL)
- Decontamination water
- Personal Protective Equipment (PPE) and miscellaneous refuse

Deviations from this procedure should be detailed in site-specific waste management plans approved by the New Mexico Environment Department (NMED).

2.0 REGULATORY AUTHORITY

The NMED has consolidated authority for all remedial investigations and corrective actions at the WSMR under the Hazardous Waste Bureau (HWB). The bureau regulates these activities under the **New Mexico Hazardous Waste Act** (NMSA 1978, sections 74-4-1 through 14), the corresponding regulations (Title 20 of the New Mexico Administrative Code, Chapter 4.1), and the **New Mexico Solid Waste Act** (NMSA 1978, sections 74-9-1 through 74-9-42) and its corresponding regulations (Title 20 of the New Mexico Administrative Code, Chapter 9.1). The federal regulations governing hazardous waste, 40 CFR 260-273 (also known as RCRA) have been adopted by New Mexico almost in their entirety and are referred to in this document.

The transportation of hazardous waste (and some non-hazardous waste) is regulated under the DOT **Hazardous Material Regulations** (49 CFR 171-178). **The New Mexico Hazardous Waste Act** and the corresponding regulations refer the reader to the DOT Hazardous Material Regulations when addressing transportation of hazardous waste beyond manifesting requirements. The transportation of other non-hazardous waste is regulated under the **New Mexico Solid Waste Act** (NMSA 1978, sections 74-9-1 through 74-9-42) and its corresponding regulations (Title 20 of the New Mexico Administrative Code, Chapter 9.1).

3.0 REFERENCES

State of New Mexico, 1983. *Hazardous Waste Act (NMSA 1978, sections 74-4-1 through 14)*. Santa Fe, New Mexico.

New Mexico Environment Improvement Board, June 2000. *New Mexico Hazardous Waste Management Regulations (20 NMAC 4.1)*. Santa Fe, New Mexico.

State of New Mexico, 1991. Solid *Waste Act (NMSA 1978, sections 74-9-1 through 42)*. Santa Fe, New Mexico.

New Mexico Environment Improvement Board, November 1995. *New Mexico Solid Waste Management Regulations (20 NMAC 9.1)*. Santa Fe, New Mexico.

U.S. Department of Environmental Protection, 1999. *Hazardous Waste Regulations (40 CFR Parts 260-273).* Washington D.C.

U.S. Department of Transportation, 2001. *Hazardous Materials Regulations (49 CFR Parts 171-178).* Washington D.C.

EPA, 1991. Memo from S. Lawrence (Director of Office of Solid Waste) to John Ely addressing the EPA's "Contained-In Policy".

EPA, 1998, Management of Remediation Waste Under RCRA, EPA Publication Number 530-F-98-026.

Forsythe, G. (Environmental Compliance Division, WSMR), July 10, 2002. Email to Don Emig: Transporting items across U.S. 70.

4.0 RESPONSIBILITIES

The project Task Manager and Task Coordinator are responsible for ensuring that all investigation-derived waste is managed in accordance with this SOP and any other appropriate procedures or related SOPs. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

The Quality Assurance Officer is responsible for periodic review of field-generated documentation associated with this SOP. The Quality Assurance Officer is also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing nonconformance memorandums, etc.) if quality issues are identified.

The project Sampling Team Leader assigned to environmental and QC sampling activities is responsible for completing tasks according to specifications outlined in this SOP and other appropriate procedures.

All staff members are responsible for reporting deviations from procedures to the Project Task Coordinator.

5.0 REQUIRED MATERIALS

- Field logbook: surveyor's book or field book, bound and ruled/gridded, record book with sequentially numbered and waterproof pages.
- Indelible black ink pens.
- Paint pens for marking drums
- Drum Labels

6.0 PROCEDURES

6.1 Waste Management Procedures Overview

These procedures are conservative in their approach to waste management so that they may ensure the protection of human health and the environment and comply with regulatory requirements that are applicable or relevant and appropriate requirements (ARARs). They include the management of waste from the point of generation to the transfer of responsibility at the WSMR Hazardous Waste Minimization Center (HWMC).

The HWMC is responsible for the transportation and disposal of all wastes from the WSMR. The center makes the final waste determination for all waste streams using information provided by their customers. The center is the repository for all of the waste determination analytical data, waste profiles, manifests and certificates of disposal for the WSMR.

6.2 Waste Minimization

To the extent that it is practical, environmental investigations will follow waste minimization procedures.

Guidelines for waste minimization are:

- Minimize materials that are introduced into any exclusion zone in an investigation area.
- Combine similar wastes throughout an investigation area in a single container wherever possible.
- Combine decontamination water from multiple sites in one container.
- Use a container of the appropriate size (e.g., use a 5-gallon drum for small amounts of waste unless a 55-gallon drum is needed to hold all the waste).
- Decontaminate and reuse material and equipment whenever practical.
- Minimize the volume of decontamination water generated.
- With solid environmental media and materials, ensure that waste is tightly packed to minimize the number of containers.
- Use less hazardous substances whenever possible.

6.3 Waste Determinations

The initial waste determination may be established using the guidelines outlined below. This determination should be used to properly manage the waste until the final waste determination is made by the HWMC. A copy of the analytical data and supporting documentation shall be provided to the HWMC upon completion of the initial waste determination. The center will notify the project Task Coordinator if they do not concur with the initial waste determination. If there is a discrepancy, the two parties shall meet and review the conclusions and supporting data. Appropriate corrective actions shall be subsequently taken to ensure that the waste is being properly managed.

6.3.1 Background

Investigation derived waste (IDW) originates from solid waste or environmental media. Solid waste as defined in 40 CFR 261.2 is <u>any discarded material</u> that is not excluded by 261.4(a) or that is not excluded by variance granted under 260.30 and 260.31. The reader should familiarize himself or herself with the exclusions, but it is not expected that they will apply. Examples of IDW that is solid waste are personal protective equipment, disposable equipment, non-aqueous phase liquid and decontamination water.

The EPA describes environmental media as being soil, groundwater or sediment (EPA, 1991). The presumption is that they were not discarded and therefore do not meet the definition of solid waste. The EPA has established and upheld in court of law, a policy, which addresses the applicability of RCRA to contaminated environmental media. This policy is known as the “contained-in-policy”. Simply put, the environmental media will be considered a solid waste, if it “contains” a solid waste. Examples of IDW that is environmental media are soil cuttings and purge water.

6.3.2 Regulatory Requirement

RCRA compels the solid waste generator under 40 CFR 262.11, to determine if that waste is a hazardous waste using the following method:

- He should first determine if the waste is excluded from regulation under 40 CFR 261.4.
- He must then determine if the waste is listed as a hazardous waste in subpart D of 40 CFR part 261.

NOTE: Even if the waste is listed, the generator still has an opportunity under 40 CFR 260.22 to demonstrate to the Administrator that the waste from his particular facility or operation is not a hazardous waste.

- For purposes of compliance with 40 CFR part 268, or if the waste is not listed in subpart D of 40 CFR part 261, the generator must then determine whether the waste is identified in subpart C of 40 CFR part 261 by either:
    - Testing the waste according to the methods set forth in subpart C of 40 CFR part 261, or according to an equivalent method approved by the Administrator under 40 CFR 260.21; or

- Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.

- If the waste is determined to be hazardous, the generator must refer to parts 261, 264, 265, 266, 268, and 273 of this chapter for possible exclusions or restrictions pertaining to management of the specific waste.

6.3.3 Waste Analysis

It is the policy of the HWMC to make waste determinations based on analytical data and supported by generator knowledge. They also require that the analytical data be no older than one year.

The sample collected for waste analysis should be representative of the material being evaluated. Acquiring a representative sample can include compositing and statistical analysis.

Waste analysis should be performed for those analytes that are suspected to be present based on site information and/or generator knowledge. The approved testing methods are indicated in 40 CFR 261 Subpart C. When generator knowledge is absent a full waste characterization should be performed. This would include running the toxicity characteristic leaching procedure for the entire Table 1 constituents listed in 40 CFR 261.24 and ignitability, corrosivity and reactivity.

6.3.4 Methodology

Waste determinations will be established as soon as practical after the waste is generated.
The determination is made using the three-step process outlined below. Sites that have not been previously investigated are inherently problematic. It often requires substantial individual judgment in making waste management decisions. It is recommended that the person responsible for waste management handle the material as though it were hazardous waste, if sufficient information is not available at the time of generation. This would include labeling the drums as hazardous waste and managing them accordingly. Refer to section 6.5.1 of this procedure for further instruction on proper labeling of containers lacking adequate waste determination.

Step 1: <u>Is the waste a solid waste</u>?

The EPA's "contained-in policy" should be referred to for direction in determining whether environmental media is a solid waste. The policy provides that environmental media will be considered a solid waste if it contains a listed waste or exhibits the characteristics of a hazardous waste.

The EPA has not defined what volume or concentration of a listed waste constitutes "contained-in". They have advised that the determination be made in consultation with the regulatory authority and be based on conservative risk-based screening levels.

This document advises the use of the universal treatment standards (UTS) provided in 40 CFR 268.48 for determination as to whether the media contains the chemical(s), which gave origin to the listing. These standards are utilized to determine whether underlying hazardous constituents require further treatment as required by the Land Disposal Restrictions in 40 CFR Part 268 prior to disposal. This document presumes that the UTS would provide adequate screening for waste disposal purposes. Any material left onsite at a concentration below the UTS, would still be subject to risk based cleanup criteria for corrective action. Therefore this procedure presumes that the environmental media contains a listed waste if the UTS are exceeded for the chemical that gave origin to the listing.

If the environmental media does not contain a listed waste or exhibit the characteristic of a hazardous waste, it shall be considered to contain a solid waste when any constituent exceeds the appropriate detection limit or established background level for organic and inorganic naturally occurring compounds. Other investigation-derived waste is a solid waste at the point at which it is discarded.

Step 2: <u>Is the solid waste a hazardous waste?</u>

Once the waste has been declared a solid waste, it is necessary to determine whether it is hazardous. The process is the same whether or not it is environmental media. The only difference being whether the "mixture rule" or the "contained-in" policy applies.

Review the site history and interview current and former employees to determine whether a listed (F, K, P or U) waste caused the contamination. The EPA has stated that one may assume a listed waste did not cause the contamination if the documentation for making such as determination is unavailable or inconclusive and the facility owner/operator has made a good faith effort to do so (EPA, 1998). If a listed waste caused the contamination, then the (non-environmental media) solid waste will be considered a hazardous waste, based on the "mixture rule". Environmental media containing by a listed waste is considered a hazardous waste based on the "contained in policy".

Analyze the waste for the Subpart C hazardous waste characteristics (ignitability, corrosivity, reactivity and toxicity). If the levels exceed the values provided in 40 CFR 261.21 thru 261.24 the material exhibits a characteristic of a hazardous waste and shall be managed as such.

Step 3: <u>Does the waste contain an underlying hazardous constituent?</u>

Identification of underlying hazardous constituents (UHC) is an important part of waste profiling in order to satisfy the land disposal restrictions. Although the management activities covered in this procedure does not address disposal options, gathering this information up front is an important step.

Sufficient laboratory analysis should be performed to determine whether other contaminants are present in the waste. The analysis should be based on generator knowledge of the waste and include those contaminants that may reasonably be expected. The results should be provided to the HWMC for evaluation as UHCs when considering disposal options.

6.3.5 Storage of IDW

Waste may be stored in a variety of portable containers, such as 5-gallon buckets, 55-gallon drums, rolloff boxes, and baker tanks. The specifications of each device will depend on the hazardous waste determination.

Containers used to store hazardous waste must meet the requirements of 40 CFR 262.34 (c) (1) (Accumulation), by being in good condition, being compatible with the waste and being closed except when adding or removing waste. Containers must also satisfy the DOT shipping requirements appropriate for the hazard classification. Refer to column 8 of the Hazardous Materials Table in 49 CFR 172.101. The containers will be marked with appropriate hazardous waste labels as prescribed in 40 CFR 262.34 (c)(1)(ii) and will be transported within 3 days of generation to the HWMC.

Non-hazardous solid waste must meet the requirements of 20 NMAC 9.1, Section 106 by being covered, reasonably clean and leak proof. The containers will be labeled, indicating the contents and potential health, safety, and environmental hazards associated with the waste (20 NMAC 9.1 Section 703) and will be shipped to the HWMC for disposal within 45 days of generation in accordance with Section 712 of 20 NMAC 9.1.

IDW that has been classified as hazardous waste "pending analysis" must be moved to a permitted 90-day storage facility within three days of generation and stored until analytical results have been received and reviewed. It is imperative that analytical results be received sufficiently in advance of the 90-day limit to allow for disposal within that time period.

Drums used for storage of liquid waste will not be completely filled. At least 6 inches of space will be left at the top of each drum to allow for expansion of waste due to freezing. All containers must be covered and sealed daily before field personnel leave the site.

6.4 Container Labeling and Marking

All containers used to store investigation-derived waste at the White Sands Missile Range will be labeled by the end of each workday. Containers will be assigned numbers sequentially. Duplicate numbers will be avoided by reviewing the Field Logbook before assigning a number to an IDW drum. Containers will be marked on the side and lid using a paint marker. Marking will include the following:

- Container number
- Dates of first use and last use
- Site Identification (include SWMU #, sample type, sample No.)
- Level of PPE worn when IDW was generated

Non-hazardous waste containers will be labeled using the green label (figure 1). The contents will be written in the space provided at the bottom.

Hazardous waste containers will be labeled using the yellow label (figure 2). The proper shipping name will be filled in the space provided at the bottom of the label. The contents of the container (ie. decontamination water, soil cuttings) will be marked on the side and top of the container, as practical, with the other information listed above.

Containers of IDW that do not have a hazardous waste determination will be labeled as Hazardous Waste using the label in Figure 2 and a Pending Analysis label shown in Figure 3.

Figure 1

Figure 2

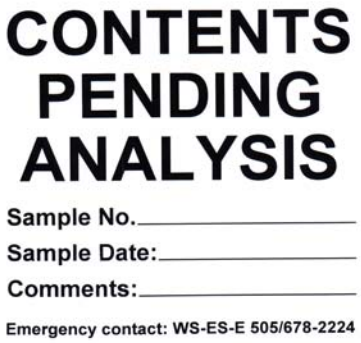

Figure 3

6.5 Field Logbook

The field operations leader will keep all container inventory information in the Field Logbook. The Field Logbook will contain the following information

1. Unique container ID number
2. Site ID
3. Container contents
4. Dates:
   - Container filled
   - Sample collected
   - Container transfer to HWMC
   - Analytical results received
5. Hazardous waste determination
6. Date the containers were turned over to the Hazardous Waste Minimization Center

6.6 Alternate Disposal of Environmental Media

Environmental media determined to be non-hazardous waste may be placed back within the area of investigation provided that the concentration of contaminants are below (in order of preference):

- Established naturally occurring organic and inorganic background levels.
- Human Health Standards for groundwater (20 NMAC 6.2 Section 3103).
- NMED Residential and/or DAF 20 Soil Screening Levels (whichever is lower).
- EPA Region IX Preliminary Remediation Goals and DAF 20 Soil Screening Levels.

Environmental media will not be placed within the area of investigation even if the above criteria are met, if it is known to exceed established ecological risk criteria.

6.7 Record keeping

The Investigation Contractor will maintain completed Field Logbooks and waste characterization data packages that they generate.

6.8 Transportation

WTS may transport hazardous and non-hazardous waste within the boundaries of the White Sands Missile Range without a manifest, bill of lading, placarding, DOT container marking or Hazardous Material Transporter registration. WTS may also cross non-range roads to transport hazardous and non-hazardous waste between contiguous properties of WSMR, without being subject to the DOT Hazardous Materials Regulations or the Uniform Hazardous Waste Manifest (the manifest) requirements of RCRA (G. Forsythe, 2002).

WTS will not transport the waste along non-range roads, even within the boundaries of the WSMR. If this is necessary, WTS shall require these transportation services be provided by the HWMC.

If the waste will be transported offsite, a manifest must be prepared. The manifest is a form used to track the movement of hazardous or non-hazardous waste from the point of generation to the point of ultimate disposition ("cradle to grave") (40 CFR Part 262, Subpart B). The manifest generally requires the following information;

- Name, address and US EPA ID No. of the generator, transporter, and the destination facility
- U.S. DOT description of the waste being transported and any associated hazards
- waste quantity
- name and phone number of a contact in case of an emergency
- special handling or hazard information
- Generators Certification (Signature required by authorized Gov't POC)
- other information required either by EPA or the state

In all cases the "Generator" shall be White Sands Missile Range and the manifest should be signed by the authorized Government point of contact. **UNDER NO CONDITION SHOULD A WTS EMPLOYEE SIGN AS OR FOR THE GENERATOR ON A MANIFEST.**

PREPARATION, REVISION, AND APPROVAL OF PLANS AND PROCEDURES

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the methods and responsibilities associated with the preparation, revision, and approval of quality-affecting documents.

2.0 REFERENCES

None.

3.0 RESPONSIBILITIES

The Program Manager has the responsibility to assure that standard operating procedures and plans that are required for work assignment orders are prepared by qualified personnel and are reviewed and approved by authorized personnel, prior to the implementation of the work assignment order activities.

The Quality Assurance Officer is responsible for the preparation and maintenance of SOPs. He/she reviews and approves SOPs. He/she is also a part of the approval cycle for the technical planning documents (e.g., Work Plan, Sampling and Analysis Plan, etc.).

4.0 DEFINITIONS

4.1 Standard Operation Procedures (SOP)

A set of implementing procedures that prescribe the actions necessary to complete a work operation in accordance with accepted practices for quality and safety.

5.0 PROCEDURE

5.1 Preparation

The Program Manager determines the need for establishing a procedure describing how to perform quality-affecting activities. He/She also initiates revisions to these documents due to programmatic requirement changes, audit findings, or corrective actions, as applicable.

Procedures, fieldwork variance, and drawings will include appropriate qualitative and quantitative acceptance criteria for determining satisfactory work performance and quality compliance.

5.2 Format

The SOPs will adhere to a consistent format in accordance with the following guidelines.

Revision Block - This area will contain the document identification, section or procedure number, revision number, date, and pages. This information will appear consistently on each page of the document in the upper right-hand corner.

Title Block - This area will contain the title of the SOP and will appear on the first page only.

5.3 Contents

Procedures required to implement work assignment order activities will include the information listed below. When any of these items are not required or are inappropriate to the SOP, they will be noted by the word "none".

1.0 **Purpose** - Describe the purpose of the SOP. Be as specific as possible; do not generalize.

2.0 **References** - Identify pertinent documents or procedures that interface with the SOP being prepared. Reference to specific documents that are directly applicable to the SOP (e.g., Chemical Data Quality Management Plan (CDQMP), Sampling and Analysis Plan (SAP), Field Sampling Plan (FSP), Health and Safety Plan (HSP) etc.) is acceptable.

3.0 **Responsibilities** - Assign responsibility for accomplishing activities, be specific in context. Include appropriate reporting requirements for assuring that important activities have been satisfactorily accomplished.

4.0 **Definitions/Materials** - Define words and phrases having a special meaning of application within the SOP. List materials and equipment required for the procedure(s) being performed.

5.0 **Procedure** - Identify the sequence of activities to be followed for accomplishing activities, be specific in context. Incorporate examples of forms or documents that are required to be completed as a result of the procedure implementation.

6.0 **Required Forms** - List all forms that are required for the successful implementation of the specific SOP.

5.4 Approval

The signature of the Program Manager, Quality Assurance Officer and others as deemed necessary on the Table of Contents/Log of Revisions or cover page will signify the documents and revisions listed are authorized for use. For SOPs, the Program Manager and Quality Assurance Officer will sign the Table of Contents/Log of Revisions Page of the procedure manual indicating their approval.

5.5 Manual Change Requests

Personnel responsible for complying or interfacing with the requirements of the approved plans, SOPs may request revisions to these documents via a Manual Change Request memo. Manual Change Requests are different from fieldwork modifications, as they are used to suggest improvements to existing processes or systems and are not structured to adjust the plans and procedures based on changing site conditions. Originators of the Manual Change Request are responsible for forwarding a Manual Change Request to the Program Manager for dispositioning.

The Program Manager is responsible for reviewing all Manual Change Requests and either accepting or rejecting them. If a Manual Change Request is accepted, the Program Manager will indicate this acceptance by signing and dating the Manual Change Request. He/she will forward a copy of the signed Manual Change Request to the originator for their files. The Program Manager will maintain a copy of accepted Manual Change Request for logging and revision inclusion.

If a Manual Change Request is not accepted, the Program Manager will indicate this by marking, signing and dating the Manual Change Request. Non-accepted Manual Change Requests will be maintained in the project files.

5.6 Revisions

Revisions to approved plans will be documented and will receive the same level of review, approval, and control as the original document.

The Program Manager using the Fieldwork Variance form will issue fieldwork variances. When twelve (12) months have elapsed for a Field Work Modification Form or six (6) have been issued, whichever comes first, the Program Manager will issue new revisions to the affected documents to incorporate the Field Work Variances.

6.0 REQUIRED FORMS/DOCUMENTATION

Manual Change Request

QUALITY INSPECTIONS AND INSPECTION RECORDS

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the methods and responsibilities for the performance and documentation of Quality Control inspection of activities performed during delivery order activities to ensure compliance with established requirements.

2.0 REFERENCES

None.

3.0 RESPONSIBILITIES

The Program Manager and the Quality Assurance Officer will select the most qualified individual(s) to perform the QC inspection. This determination will be made based on the nature of QC inspection.

4.0 DEFINITIONS

4.1 Inspection

Examination or measurement to verify whether an item or activity conforms to a specified requirement(s).

5.0 PROCEDURE

5.1 Qualification of Inspectors

Personnel performing inspection activities will have the necessary expertise in the area to be inspected but will be sufficiently independent of the activity performed.

Prior to performance of inspection activities, personnel designated for that responsibility would review and be thoroughly familiar with the procedures, regulations, etc., governing the activities to be inspected.

5.2 Field Inspection Plans and Reports

Activities requiring inspection (i.e., Preparatory Phase, initial Phase and Follow-up Phase) will have a definable features of work matrix prepared for that activity. Inspection(s) will be performed for definable features of work that are identified for each delivery order and will be performed consistent with ongoing delivery order activities. The definable features of work matrix will identify the items and activities to be inspected and will provide or reference the specification section and paragraph which specifies the requirements for each activity or item.

If a Nonconformance Report is required for activities being inspected, a reference will be provided on the Daily QC Report. The Daily QC Reports will be issued identifying inspections performed. The report will be completed by the Quality Assurance Officer (or designee) and will address each inspection performed during the course of the daily activities and submitted to the Program Manager.

Items or activities not conforming to inspection acceptance criteria will be resolved and when determined necessary documented on a Nonconformance Report. Daily QC Reports will be logged and sequentially numbered. Each Daily QC Report will be signed by the inspector certifying that the activities listed within the report have been completed in accordance with the project planning documents to the best of his/her knowledge, and submitted for review by the Program Manager.

6.0 REQUIRED FORMS/DOCUMENTATION

Definable Features of Work Matrix

Daily QC Report