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Los Alamos NATIONAL LABORATORY
EST. 1943

Los Alamos National Laboratory/University of California
Environmental Stewardship (ENV)
Environmental Remediation & Surveillance Program (ERS), MS M992
Los Alamos, New Mexico 87545
(505) 667-0469/FAX (505) 665-4747

National Nuclear Security Administration
Los Alamos Site Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-7203/FAX (505) 665-4504

Date: March 31, 2006
Refer to: ER2006-0285

Mr. James Bearzi
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

SUBJECT: SUBMITTAL OF "INTERIM MEASURES WORK PLAN FOR CHROMIUM CONTAMINATION IN GROUNDWATER"

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the "Interim Measures Work Plan for Chromium Contamination in Groundwater." This report fulfills the requirement in the New Mexico Environment Department's (NMED's) letter dated December 29, 2005, that an interim measures work plan be prepared pursuant to Section VII.B.1 of the Compliance Order on Consent and submitted within 90 days of receipt of NMED's letter. This work plan is being submitted for approval, and its contents reflect discussions held with NMED over the past two months. Los Alamos National Laboratory is available to present an overview of the work plan to support NMED's review.

If you have questions, please contact Danny Katzman at (505) 667-6333 (katzman@lanl.gov) or Mat Johansen at (505) 665-5046 (mjohansen@doeal.gov).

Sincerely,

David McInroy, Deputy Program Director
Environmental Remediation & Surveillance
Los Alamos National Laboratory

Sincerely,

David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Office

DK/jk

Enclosure: Two hard copies with electronic files – Interim Measures Work Plan for Chromium Contamination in Groundwater (ER2006-0214)

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LA-UR-06-1961
March 2006
ER2006-0214

Interim Measures Work Plan for Chromium Contamination in Groundwater

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Prepared by
Environmental Stewardship Division–
Environmental Remediation and Surveillance Program

LA-UR-06-1961
ER2006-0214

Interim Measures Work Plan for Chromium Contamination in Groundwater

March 2006

Responsible project leader:

Danny Katzman		Project Leader	ENV-ECR	3.29.06
Printed Name	Signature	Title	Organization	Date

Responsible UC representative:

David McInroy		Deputy Program Director	ENV-ERS	3/30/06
Printed Name	Signature	Title	Organization	Date

Responsible DOE representative:

David Gregory	David R Gregory	Federal Project Director	DOE-LASO	3/30/06
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

This interim measures work plan (work plan) describes the investigation that addresses chromium contamination in groundwater beneath Los Alamos National Laboratory (LANL or the Laboratory). The investigation will be conducted in accordance with requirements in the Compliance Order on Consent (hereafter, Consent Order) between the U.S. Department of Energy (DOE), the Regents of the University of California (UC), and the New Mexico Environment Department (NMED). The work plan is being prepared in response to a requirement in a letter from NMED dated December 29, 2005 (NMED 2005, 91683). The letter requires that the Laboratory submit an interim measures work plan pursuant to Section VII.B.2 of the Consent Order.

Characterization monitoring at R-28 in Mortandad Canyon in 2005 led to the identification of chromium in the groundwater at concentrations above NMED and U.S. Environmental Protection Agency standards (50 µg/L and 100 µg/L, respectively). R-28 is near water-supply wells PM-1, PM-3, PM-4, PM-5, and Otowi-4. In response to a requirement in NMED's letter (NMED 2005, 91683), a group of intermediate and regional groundwater wells (including water-supply wells) surrounding R-28 was sampled in late January- early February 2006 for an analyte suite intended to help characterize the chromium contamination and define potential sources. Results from the sampling event indicate that chromium contamination is present in the regional aquifer in a limited area beneath Sandia and Mortandad canyons and is present in intermediate-depth perched groundwater beneath Mortandad Canyon. Chromium contamination was not detected in water-supply wells.

The likely sources of chromium contamination are related to usage of chromate-containing compounds as a corrosion inhibitor in cooling-tower systems that were located in the upper portions of the Sandia, Los Alamos, and Mortandad watersheds. Preliminary indications are that Sandia Canyon received the largest mass of chromium. Available information indicates that the usage of chromates in cooling-tower systems ceased in the early 1970s.

This document presents the interim measures required by NMED to ensure the protection of drinking water while longer-term corrective action remedies are evaluated and implemented. Thus, the work presented herein represents an initial phase of the work to be conducted related to the chromium contamination. Data collected for this phase of the investigation will be used to reduce uncertainties in the conceptual model of the nature and extent of present-day chromium contamination. Results will also be used to assess current and potential future impacts of chromium contamination on the drinking water supply by merging conceptual and computer models that quantitatively describe the hydraulic and contaminant mass transport relationships between surface water, unsaturated strata, and groundwater. Subsequent phases will be guided by the results of this initial phase and by agreements with the NMED on the path forward. The specific goals of the investigation presented in this work plan are to

- determine the primary source(s) of chromium contamination and the nature of operations associated with releases,
- characterize the present-day spatial distribution of chromium and related constituents,
- collect data to evaluate the geochemical and physical/hydrologic processes that govern chromium transport, and
- collect and evaluate data to help guide subsequent investigations and remedy selection.

To accomplish these goals and to address key uncertainties in the conceptual model, the work plan activities are to

1. conduct quarterly sampling of selected regional aquifer and intermediate groundwater wells;
2. investigate surface water and alluvial groundwater loss in Sandia Canyon;
3. install six core holes in lower Sandia Canyon;
4. install five alluvial wells in lower Sandia Canyon;
5. determine chromium distributions in the upper vadose zone from archival and new cores collected from Los Alamos, Sandia, and Mortandad canyons;
6. rehabilitate well R-12 in lower Sandia Canyon;
7. refine the understanding of background concentrations and speciation of chromium in groundwater; and
8. collect and synthesize data and information to support conceptual model development and remedy selection.

An investigation report will be prepared and delivered to NMED on a date yet to be determined. The report will present the results of this interim measures work plan and will provide the basis for the next phase of work associated with the chromium contamination in groundwater.

CONTENTS

Appendixes

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1.0 INTRODUCTION

This interim measures work plan (work plan) describes the investigation to address chromium contamination in groundwater beneath Los Alamos National Laboratory (LANL or the Laboratory). The investigation will be conducted in accordance with requirements in the March 1, 2005, Compliance Order on Consent (hereafter, Consent Order) between the U.S. Department of Energy (DOE), the Regents of the University of California (UC), and the New Mexico Environment Department (NMED). The work plan is being prepared in response to a requirement in a letter from NMED dated December 29, 2005 (NMED 2005, 91683). The letter requires that the Laboratory submit an interim measures work plan pursuant to Section VII.B.2 of the Consent Order.

This document presents the interim measures required by NMED to ensure the protection of drinking water while longer-term corrective action remedies are evaluated and implemented. Thus, the work presented herein represents an initial phase to be conducted related to the chromium contamination. Data collected for this phase of the investigation will be used to reduce uncertainties in the conceptual model for chromium contamination. Results will also be used to assess current and potential future impacts of chromium contamination on the drinking water supply by merging conceptual and computer models that quantitatively describe the hydraulic and contaminant mass transport relationships between surface water, unsaturated strata, and groundwater. Subsequent phases will be guided by the results of this initial phase and by agreements with the NMED on the path forward. Monitoring is an immediate and continuing means of ensuring protection of human health. As discussed later in this work plan, frequent sampling of regional and intermediate monitoring wells and production wells will be conducted as a central component of this project. The specific goals of the investigation presented in this work plan are to

- determine the primary source(s) of chromium contamination and the nature of operations associated with releases,
- characterize the present-day spatial distribution of chromium and related constituents,
- collect data to evaluate the geochemical and physical/hydrologic processes that govern chromium transport, and
- collect and evaluate data to help guide subsequent investigations and remedy selection.

The work plan presents background information on chromium contamination at the Laboratory in Section 2. Section 3 of the work plan presents a conceptual model that addresses sources and processes related to the chromium contamination, present-day distribution, and hydrologic and geochemical processes that are consistent with the observations of chromium in the regional aquifer. The scope described in Section 4 is developed specifically to address uncertainties in the conceptual model.

2.0 BACKGROUND

Groundwater sampling is conducted at the Laboratory for routine monitoring and for initial characterization purposes after new wells are installed. Characterization monitoring at R-28 in Mortandad Canyon in 2005 led to the identification of chromium in the groundwater at concentrations above NMED and U.S. Environmental Protection Agency (EPA) standards (50 µg/L and 100 µg/L, respectively). R-28 is near water-supply wells PM-1, PM-3, PM-4, PM-5, and Otowi-4 (Figure 2-1). In response to a requirement in NMED's letter (NMED 2005, 91683), a group of intermediate and regional groundwater wells (including water-supply wells) surrounding R-28 was sampled in late January–early February 2006 for an analyte suite intended to help characterize the chromium contamination and define potential sources (Table 2-1 and Figure 2-1). The results are presented in Appendix 6 on the enclosed CD. A key aspect of the suite was the inclusion of analysis for hexavalent chromium. The natural ratios of hexavalent to trivalent chromium in groundwater beneath the Laboratory are not currently known. Therefore, the data from the first round cannot be fully interpreted until further work is conducted to improve the conceptual model for speciation of natural chromium in groundwater. Additional characterization is proposed in Section 4 of this work plan to address this issue.

A review of solid waste management units (SWMUs) and areas of concern in Los Alamos, Sandia, and Mortandad canyons was conducted to identify the potential source(s) of chromium. Knowledge of operations at the Laboratory and groundwater flow paths supports a focus on those three watersheds as the likely sources. Appendix 1 provides a table of the sites thought to be the primary potential sources. The table also includes information on the operational processes and the nature of potential releases. In summary, the likely sources are related to usage of chromate-containing compounds as a corrosion inhibitor in cooling-tower systems that discharged to each of the three watersheds. Available information indicates that the usage of chromates for this purpose ceased in the early 1970s. Records also indicate that Sandia Canyon received the largest mass of chromium (Comprehensive Environmental Assessment and Response Program [CEARP] DOE 1987, 52975; Herceg 1973, 04966; Birdsell 2006, 91685). Further discussion of sources is provided in Section 3.

Significant additional information on background and environmental setting for the Los Alamos, Sandia, and Mortandad watersheds is presented in existing work plans for each (LANL 1995, 50290; LANL 1999, 64617; LANL 1997, 56835), and in the Los Alamos and Pueblo Canyons Investigation Report (LANL 2004, 87390).

3.0 SITE CONDITIONS

3.1 Chromium Sources

3.1.1 Natural Sources

Natural sources of chromium at Los Alamos occur within soils, sediments, Bandelier Tuff, Cerros del Rio basalt, Tschicoma Formation, Puye Formation, Santa Fe Group basalt, and Santa Fe Group sediments. This trace element is concentrated within iron-rich minerals, including hematite, magnetite, biotite, pyroxenes, ferric oxyhydroxide, smectite, and volcanic glass. Natural chromium is most often stable in the trivalent oxidation state, substituting for both iron and manganese in oxides and hydroxides.

The mean Laboratory background concentration of total chromium is 19.3 mg/kg within soil horizons (Ryti and Longmire 1998, 59730). Higher concentrations of natural total chromium are found within the Cerros del Rio basalts at concentrations ranging from 170 to 240 mg/kg beneath Mortandad Canyon (Broxton 2002, 76006) and in lavas of the Tschicoma Formation as well as Puye Formation detritus derived from Tschicoma sources at concentrations ranging from 24 to 39 mg/kg (Kopp 2002, 73707).

These iron-rich mineral phases are characterized by low solubilities under near-neutral pH conditions, which leads to low concentrations of dissolved chromium in groundwater. Background concentrations of dissolved total chromium range between 3 and 5 μg/L within perched-intermediate zones and the regional aquifer (LANL 2005, 90580). The natural ratio of hexavalent to trivalent chromium in groundwater is uncertain, but activities defined in Section 4 of this work plan address this speciation issue.

3.1.2 Historic Anthropogenic Sources

Several types of historic anthropogenic chromium sources are present in the Los Alamos, Sandia, and Mortandad canyon watersheds. These include facilities for electroplating and photoprocessing and for use as a corrosion inhibitor in cooling-tower systems. Based on the review of SWMUs in these watersheds, the highest chromium usage was as a corrosion inhibitor (see Appendix 1). Potassium dichromate ($K_2Cr_2O_7$), phosphate, and zinc were used in cooling-tower systems in the upper parts of the Los Alamos and Sandia canyon watersheds (e.g., Technical Area [TA] 02 in Los Alamos Canyon, TA-03 in Sandia Canyon, and possibly TA-48 in Mortandad Canyon). The process involved adding sulfuric acid to lower the pH of cooling-tower water to prevent precipitation of silica, calcium carbonate, and other solids. A mixture of potassium dichromate, phosphate, and zinc was then added to coat metal components with a corrosion-inhibiting film (Birdsell 2006, 91685). These chemicals were contained in cooling-tower blow-down released as effluent and in drift emitted with steam from the towers. Available records reviewed for this work plan indicate that use of chromate as a cooling-tower additive was suspended in the early to mid-1970s.

Sandia Canyon Sources

Available records indicate that the cooling tower for the TA-03 power plant at the head of Sandia Canyon [Consolidated Unit 03-012(b)-00, currently National Pollutant Discharge Elimination System (NPDES) outfall 01A-00, Figure 2-1] used the largest amounts of potassium dichromate at the Laboratory. The CEARP report (DOE 1987, 52975) summarizes chromium usage at the power plant as averaging 35.9 lb per day from 1950 to the mid-1970s. This amount was discharged into upper Sandia Canyon with blow-down water volumes ranging from 128,000 to 288,000 gal./day. Hexavalent chromium levels of up to 34 ppm were reported for discharge concentrations; average stream concentrations of 10 to 15 ppm were also reported (DOE 1987, 52975).

Los Alamos Canyon Sources

The cooling tower (SWMU 02-005) for the Omega West Reactor (OWR) (Figure 2-1) at TA-02 used potassium dichromate as a corrosion inhibitor from 1957 to 1973. It is believed to be the second largest source of potassium dichromate at the Laboratory. An estimated 5000 lb of chromate may have been used at the TA-02 cooling tower from 1957 to 1973 and released into Los Alamos Canyon (LANL 1993, 15314, p. 7.6-1). The cooling tower operated 8 h/day, Monday through Friday, with a discharge rate of roughly 12,000 to 15,000 gal./day (Birdsell 2006, 91685).

Mortandad Canyon Sources

The SWMU summary presented in Appendix 1 indicates several possible sources, including cooling-tower systems [e.g., Consolidated Unit 48-007(a)-00)] and plating processes (e.g., 03-045(h)-00). These smaller cooling-tower systems and plating processes are assumed to be smaller sources than those in Sandia and Los Alamos canyons, both in terms of discharge volumes and total chromium mass released. Results from the sediment investigation in the Mortandad watershed indicate that the highest chromium concentrations are in reach E-1FW at the head of Effluent Canyon (Figure 2-1), indicating a TA-48 source (LANL 2005, 89308).

3.2 Present-Day Distribution of Chromium

Data from media in the canyons (sediment, surface water, groundwater, and vadose zone pore water) provide some information on the present-day distribution of chromium, especially in the near-surface media in these watersheds. Sediment investigations in these watersheds indicate that the highest concentrations of chromium are found near the sources described above (Figure 2-1 and Appendix 4). Maximum observed sediment concentrations for total chromium are found in reach S-2 in Sandia Canyon at 3200 mg/kg, in reach E-1FW in Effluent Canyon at 2210 mg/kg, and in reach LA-2W in Los Alamos Canyon at 19.5 mg/kg (an excavated sample in reach LA-2E had a concentration of 38.4 mg/kg).

Present-day concentrations of chromium in persistent surface water and alluvial groundwater in Los Alamos and Mortandad canyons are generally low but are also highest near the sources described above (Appendix 3). A time series of chromium in alluvial groundwater at monitoring well LAO-1 (near the release site at the OWR) shows the decline in concentration over time since chromates ceased being used in the early 1970s (Figure 3-1). Alluvial groundwater data are not available for Sandia Canyon because to date there are no alluvial monitoring wells with consistent saturation, but similar rates of decline might be expected. Older (mid-1970s) alluvial groundwater data for Mortandad Canyon appear to have problems regarding the quality of the analytical results, so they are not plotted here.

The greatest uncertainty in the present-day distribution of chromium is for the deeper portions of the alluvium in these canyons and for the vadose zone beneath the alluvium. Intermediate groundwater is present beneath all three canyons, but among existing monitoring wells, chromium is only elevated in Mortandad Canyon intermediate wells. A hexavalent chromium concentration of 53.2 µg/L was present in MCOI-6 in January 2006 (Figure 3-2).

Within the regional aquifer, elevated hexavalent chromium levels were found in January to February 2006 at R-28 (406 µg/L), R-11 (26 µg/L), and possibly at R-15 (7 µg/L) (Figure 3-2). Chromium concentrations in surrounding wells are thought to represent background values ($\leq$ 5 µg/L), suggesting that the spatial extent of contamination in the regional groundwater may be limited to the area beneath the Sandia and Mortandad canyons.

3.3 Factors Governing Distribution of Chromium

The present-day distribution of chromium results from a series of hydrologic and geochemical processes that have affected its transport since its initial releases. The hydrologic pathways are generalized in Figure 3-3 and are further explained in this section.

Chromium is stable in the trivalent and hexavalent oxidation states in surface water and groundwater (Rai et al. 1987, 91686; Rai and Zachara 1986, 91684). Natural chromium commonly occurs in the reduced, trivalent oxidation state in groundwater containing reductants, including dissolved organic carbon, ferrous iron, and hydrogen sulfide. Chromium(III) is less mobile and less toxic than chromium(VI). Oxidizing agents including manganese dioxide, dissolved oxygen, and nitrate, however, enhance the stability of chromium(VI) in groundwater (Rai and Zachara 1986, 91684).

Natural attenuation of chromium can occur in the soil, surface water, and subsurface pore waters as chromium(VI) anions are reduced to form chromium hydroxide, which has a low aqueous solubility under near-neutral pH conditions (Rai et al. 1987, 91686; Rai and Zachara 1986, 91684). The dominant geochemical processes that are expected to influence the distribution of anthropogenic chromium in the environment are listed below:

- Chromium in the acidic pH cooling-tower effluent is stable in the hexavalent form as soluble anions including bichromate ($HCrO_4^-$) and chromate (CrO_4^{2-}). These anions have high mobility, similar to bicarbonate and sulfate anions, respectively, under near-neutral pH conditions and do not readily adsorb onto mineral surfaces (Rai et al. 1987, 91686; Rai and Zachara 1986, 91684).
- Reduction of chromate in surface water to chromium(III) aqueous and solid species can occur in organic-rich settings such as wetlands and floodplain sediments containing solid organic matter and ferrous iron.

- Adsorption of aqueous chromium(III) onto colloids, minerals, and solid organic matter and precipitation of chromium hydroxide immobilize chromium in the trivalent form. In the near surface, a fraction of chromium(III) is expected to be present, largely adsorbed to these solid phases.
- In the subsurface, further attenuation is expected to occur as chromate is reduced to chromium(III) in the presence of dissolved and solid-bound ferrous iron found within Cerros del Rio basalt and other mafic rocks contained within deeper rock units (e.g., Cerro Toledo interval, Puye Formation). However, the presence of manganese(III, IV) oxides and hydroxides and/or dissolved oxygen can reoxidize chromium(III) back to chromium(VI).

Not all of the chromium(VI) discharged from cooling towers is expected to be reduced to chromium(III), even though chemical reduction of chromium within higher organic settings in these watersheds can be substantial (Rai and Zachara 1986, 91684). Therefore, some mobile chromate is expected to migrate along complex hydrologic pathways shown in Figure 3-3 to arrive in the regional aquifer beneath the Pajarito Plateau. Both natural and anthropogenic surface water sources act as potential drivers for mobile chromium migration along these surface and subsurface hydrologic pathways. Surface water sources in the three canyons are derived from the following:

- Effluents have been released into Sandia Canyon near its headwaters at TA-03 since at least the early 1950s. Currently, three facilities discharge into Sandia Canyon: the combined effluent from the Sanitary Wastewater System Consolidation, the Power Plant cooling-tower at NPDES outfall 01A-001, and the Strategic Computing Complex (SCC) cooling-tower discharges at outfall 03A027. The combined discharges from these three facilities ranged from 108 million gallons per year (MGY) to 138 MGY between 2002 and 2005. Stormwater runoff and continuous power-plant discharges since 1950 have supplied a sufficient water volume to facilitate potential chromate transport.
- Discharges of cooling-tower blow-down associated with the OWR (Figure 2-1) were sufficient to facilitate chromate transport while that facility operated. In addition to effluent discharges, upper Los Alamos Canyon receives varying amounts of natural surface water flow and alluvial groundwater recharge from the upper watershed (LANL 2004, 87390). Between 1995 and 2000, surface flow past gage E025, located in Los Alamos Canyon west of the OWR site, averaged 67.4 MGY (Kwicklis et al. 2005).
- The largest water volumes disposed in Mortandad Canyon are from the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) in Effluent Canyon. The RLWTF has been in operation since 1963, discharging from a historical maximum of 16 MGY in 1968 to 3 MGY in 2002. Lesser volumes of water associated with cooling towers at TAs-03, -48, and -55 also release into Mortandad Canyon. Snowmelt and stormwater runoff also contribute varying amounts of recharge.

Infiltration of surface water and alluvial groundwater is variable along the flow paths. Little infiltration of surface water is thought to occur along the steep bedrock-dominated sections of Sandia and Mortandad canyons. Los Alamos Canyon does not contain such sections in the investigation area. Surface water infiltration in Sandia Canyon will be assessed with the water balance investigation presented in this work plan.

Alluvial groundwater also infiltrates variably in these canyons. In each canyon, the areas of presumed infiltration from alluvium that correspond to historical chromium sources are described below:

- In Sandia Canyon, a preliminary water balance using data from gage stations E122 and E123 indicates little or no infiltration in the upper canyon. East of E123, the canyon is relatively steep and bedrock-dominated with little infiltration expected. Existing alluvial monitoring wells SCO-1 and SCO-2 in the lower canyon are historically dry, suggesting that the predominant area of infiltration is in the lower canyon as depicted in Figure 3-3. Aqueous-phase chromium (dissolved) is likely to have followed this same infiltration pathway.

- In Mortandad Canyon, maximum infiltration is thought to occur in the lower canyon near and immediately downstream of the confluence with Ten Site Canyon. Moisture and contaminant profiles obtained from investigations in Mortandad Canyon support this observation (Broxton et al. 2002, 76006).
- In Los Alamos Canyon, the areas with highest infiltration rates appear to occur west of the chromium source at OWR. Immediately downcanyon of the OWR, relatively low infiltration rates have been observed from a series of nested piezometers (LANL 2004, 87390). Higher infiltration rates are assumed further downcanyon where alluvium overlies the Cerros del Rio basalt. Nested piezometers placed in that area have not shown sufficient saturation to document this conceptual model, but the absence of alluvial groundwater in that segment supports the model.

Intermediate-perched zones of limited extent occur beneath all three canyons (Robinson et al., 2005 91682). It is not known whether these perched zones are relatively stagnant and/or if they facilitate lateral migration. The geometry of perching horizons is likely to strongly influence the flow behavior and the pathway locally, as indicated in Figure 3-3. Intermediate perched water was observed in wells PM-1, R-12, and R-10a in Sandia Canyon, as shown in Figure 3-3, predominantly within the Cerros del Rio basalt. In Mortandad Canyon, intermediate perched water was encountered in wells R-15, MCOBT-4.4, MCOI-4, MCOI-5, MCOI-6, and MCOI-8, also within the Cerros del Rio basalt. Unlike the localized perched zones in Sandia and Mortandad canyons, wells installed all along the length of Los Alamos Canyon intercept perched zones. Mobile chemicals, including nitrate, perchlorate, and tritium, have been observed in most of the perched zones, showing a connection to surface and alluvial waters.

The migration of chromium contamination is expected to include many of the geochemical and hydrologic factors described above. There is considerable uncertainty regarding the relative role and magnitude of each of these factors in and beneath each of these watersheds. The scope described in Section 4 is designed to address this uncertainty.

Water moving through the vadose zone ultimately mixes within the upper portion of the regional aquifer. A major control of the directions of flow and hydraulic gradient in the regional aquifer is provided by the zones of aquifer recharge (Sierra de los Valles and Jemez Mountain) and discharge (Albuquerque basin, Rio Grande). On a local scale beneath the Laboratory, the regional flow directions and gradients are expected to be a function of several variables, including potential effects of water-supply well pumping, local influences of recharge to the regional aquifer, stratigraphic and structural controls, and overall architecture of the facies in the regional aquifer.

Flow directions and hydraulic gradients in the shallow, phreatic (water-table) zone of the regional aquifer are expected to have a dominant influence on the migration of the observed contamination plume. Currently, there are two prevailing conceptual models for potential flow paths within the regional aquifer beneath the Laboratory. Two water-table maps are provided in this work plan to represent the two conceptual models for potential effects of pumping at regional production wells, Figures 3-4 and 3-5. The data used for this analysis were collected in accordance with the requirement in NMED's letter (NMED 2005, 91683) and are described in detail in Appendix 5.

The first conceptual model assumes that the water-supply wells strongly affect flow directions and hydraulic gradients in the phreatic zone. This conceptual model has been applied previously by Vesselinov and Keating (2002, 89752) to delineate capture zones of the water-supply wells. As a result, the capture zones extend to the water table, and contamination reaching the water table along the potential chromium pathways is likely to be captured by one or more of the water-supply wells. Figure 3-4 shows a contour map of the water-table elevation drawn using wellhead measurements collected on January 30, 2006. Water-level measurements and pressure data from R-wells and test wells were used to develop the water-table map. This approach yields a model with pumping-driven cones of depression around supply wells PM-1, PM-3, and O-4. From this analysis, migration of chromium observed at R-28 and R-11 would likely be toward O-4, PM-3, and possibly PM-1.

The second conceptual model proposes that the pumping water-supply wells have a minor effect on flow directions and hydraulic gradients in the phreatic zone, and the water-table shape is predominantly controlled by the spatial (and temporal) distribution of local aquifer recharge over the Pajarito Plateau (Vesselinov 2004, 90117; Vesselinov 2005, 89753; Vesselinov 2005, 90040). Figure 3-5 shows a contour map of the water-table elevation that is drawn using most of the same data as in Figure 3-4. However, water levels from wells R-9, R-12, R-5, TW-2, and R-4 are excluded in the interpretation because these data may not represent conditions at the water table. The resulting map indicates negligible impacts from pumping at PM-1, PM-3, and O-4 on the water-table shape. From this map, we can conclude that chromium observed at R-28 and R-11 is expected to migrate predominantly through the upper saturated portions of the regional aquifer. This conceptual model does not exclude the potential for some vertical mixing of shallow chromium contamination to deeper zones caused by downward flow components related to vertical leakage through laterally discontinuous aquitards/aquicludes due to pumping at production wells. If this mechanism exists, it is believed that PM-3 is the production well with the highest probability to be impacted.

4.0 SCOPE OF ACTIVITIES

This section describes the scope to address chromium contamination in groundwater. The investigation activities are designed to accomplish the goals described in Section 1 and to address key uncertainties in the conceptual model in support of optimizing subsequent investigation and/or remediation activities. These activities are

1. perform quarterly sampling of surface water and groundwater in Sandia and Mortandad canyons;
2. investigate surface water and alluvial groundwater loss in Sandia Canyon;
3. drill six core holes in lower Sandia Canyon;
4. install five alluvial wells in lower Sandia Canyon;
5. determine chromium distributions in the upper vadose zone from archival and new cores collected from Los Alamos, Sandia, and Mortandad canyons;
6. rehabilitate screens in well R-12 in lower Sandia Canyon;
7. refine the understanding of background concentrations and speciation of chromium in groundwater; and
8. collect and synthesize data and information to support conceptual model development and remedy selection.

4.1 Quarterly Sampling of Surface Water and Groundwater in Sandia and Mortandad Canyons

Sampling and analysis of surface water and groundwater in Sandia and Mortandad canyons are currently underway to determine the nature and extent of chromium contamination. The first round was conducted at selected intermediate and regional wells (see Table 2-1) pursuant to the requirement in the letter from NMED (NMED 2005, 91683) as described in Section 2. Subsequent rounds will include surface water and alluvial groundwater to provide snapshots of water quality throughout the hydrological system. Water-quality data from this sampling will provide information about constituents that can be used to fingerprint potential sources and pathways, leading to improved conceptual models of processes controlling chromium mobility and transport and subsequent remedy selection. The locations of all the sampling sites are shown in Figure 2-1. Both filtered and nonfiltered water samples will be collected, and the suite of analytes includes general inorganic constituents, metals (including total and hexavalent chromium), stable isotopes of hydrogen, nitrogen, and oxygen, perchlorate, volatile organic compounds (VOCs), high explosive (HE) compounds, total organic carbon (TOC), and tritium. The complete analytical suite for these wells is shown in Table 4-1. The field parameters for groundwater samples include temperature, conductivity, pH, alkalinity, dissolved oxygen, and turbidity.

The sampling locations and analytical suite presented in Table 4-1 will be included in the pending revision of the Laboratory's Interim Facility Groundwater Monitoring Plan, and the analytical results will be reported in periodic monitoring reports as well as in the report for this investigation.

4.2 Investigation of Surface Water and Alluvial Groundwater Loss

This work plan contains two activities designed to assess the loss of surface water and alluvial groundwater to deeper bedrock units. These activities include investigations of

- surface water loss in upper Sandia Canyon, and
- alluvial groundwater loss in lower Sandia Canyon.

Areas of surface water and alluvial groundwater loss probably coincide within those parts of the canyon floor that have been local zones of recharge to deeper perched zones and to the regional aquifer during and after the period of chromium release from the TA-03 power plant cooling tower. Results from these water-loss investigations will be integrated with results from the core-hole and alluvial-well investigations described below to identify potential deep infiltration pathways.

4.2.1 Water Loss in Upper Sandia Canyon

This activity will determine surface water and alluvial groundwater loss in two reaches of upper Sandia Canyon by evaluating the water balance using outfall and stream gage data. These reaches are the

- canyon floor wetland bracketed by the TA-03 power plant outfall on the west and surface water gaging station E123 on the east, and
- narrow bedrock-dominated portion of Sandia Canyon east of the wetland.

Discharge records from the TA-03 power plant outfall (presently 01A-001), the SCC outfall (03A-027), and the streamflow gage E122 will be used to constrain the input water volume entering the wetland. Streamflow gage data from E123 will be used to estimate the water volume exiting the wetland. Different periods of record (e.g., winter vs. summer) will be used to estimate evapotranspiration associated with cattails and other vegetation in the wetland. Downstream from the wetland, the stream channel runs for a distance of approximately 2200 m through a steep-walled canyon incised into unit Qbt 2 of the Tshirege Member of the Bandelier Tuff until the canyon widens and surface water infiltrates into the alluvial sediment deposits.

A temporary streamflow-monitoring station (conceptually shown as temporary gaging station E123.5 in Figure 2-1) will be installed at a suitable location near the downstream end of this reach where perennial flow is present in order to determine whether or not significant streamflow-infiltration losses occur within this reach. Comparison of these discharges with those measured at gage E123 will determine streambed infiltration losses that occur within this reach.

4.2.2 Alluvial Groundwater Loss in Lower Sandia Canyon

Two nests of piezometers, each containing up to three piezometers, will be installed to address uncertainties in the location and rate of infiltration of alluvial groundwater in lower Sandia Canyon. The water-level data collected from the piezometers will provide hydrologic information on hydraulic gradient and saturated thickness. The two piezometer nests will be installed near SC2 and SC3 (Figure 2-1), with the final locations contingent on the extent and thickness of alluvial saturation determined by core holes and alluvial wells that will be installed first. If possible, the piezometer nests will be installed near previously drilled core holes where the stratigraphy, lithology, and saturated intervals are identified. Lithologic logs will be prepared for both piezometer nests. Open-hole camera, gamma, and induction logs may be run to aid placement of the piezometer ports. The maximum depth for each of the piezometer nests is expected to be 30–50 ft, depending on the final locations selected.

4.3 Installation of Characterization Core Holes in Lower Sandia Canyon

Six deep characterization core holes will be drilled in lower Sandia Canyon to determine the nature and extent of chromium contamination in the upper vadose zone in order to identify infiltration pathways and to provide information for calculating contaminant inventories. Approximate locations of the characterization core holes are shown in Figure 2-1, designated as SCC-1 through SCC-6. Together with the alluvial wells described in the next section, these core holes will help define the extent of saturation in alluvium and will identify perched water in the underlying bedrock units. Both leachable pore water and solid cores will be analyzed to define contaminant distributions and to assess the geochemical processes controlling chromium mobility. The objectives for these core holes are listed in Table 4-2. Results from a direct-current resistivity survey conducted in the central portion of Sandia Canyon in 2005 (see Figure 4-1) and the Advanced Hydrotest Facility (AHF) core holes SC1 through SC5 (Kleinfelder 2002, 91687; also, see Appendix 2) were used to site the core holes in this work plan (Figure 2-1).

The six core holes will be drilled by using dry air-rotary coring methods. Before coring, surface casing will be installed to the base of alluvium to prevent alluvial groundwater from entering the deeper parts of the borehole and impacting moisture-sensitive samples collected during coring operations. The boreholes will be backfilled with bentonite and/or native material and abandoned after core samples have been collected. One well may be installed or the site may be earmarked for a future intermediate well if sufficient perched water is encountered in the bedrock units. Proposed locations and number of boreholes are shown in Figures 2-1 and 4-1 and include the following core holes:

- SCC-1 and SCC-2, the westernmost accessible sites in lower Sandia Canyon; both boreholes target the conductive zone west of SC2 on the resistivity profile
- SCC-3 and SCC-4 between SC2 and SC3; SCC-3 will penetrate a relatively resistive portion of the vadose zone and SCC-4 will penetrate an adjacent conductive zone
- SCC-5 penetrates a deep conductivity high near SC4
- SCC-6 investigates possible infiltration near SCO-1 and PM-3

Core samples will be selected for chemical analyses at 20-ft intervals in each core hole. Additional core samples will be selected for analysis at geologic contacts and features of interest such as soil horizons and fractures. Pore water leached from core and collocated solid core samples will be analyzed for moisture content, metals (including hexavalent chromium, uranium, boron, and molybdenum), anions, and TOC. The analyte suite for core collected from these boreholes is described in Table 4-3. Tritium will be analyzed at 40-ft intervals within the core samples. The remaining core will be protected against moisture loss and stored at the LABORATORY core storage facility.

The target horizon for the core holes is the top of the Cerros del Rio basalt. The predicted depth for reaching this target is given for each core hole in Table 4-2. The general stratigraphic sequence expected in the core holes includes, in descending stratigraphic order, alluvium, Tshirege Member of the Bandelier Tuff, Cerro Toledo interval, Otowi Member of the Bandelier Tuff (including the Guaje Pumice Bed), Puye Formation, and Cerros del Rio basalt. Lithologic logs will be prepared for all core holes. Whenever conditions permit, open-hole camera, gamma, and induction logs will be run after a core hole reaches the total depth to help define geologic contacts and to assess moisture conditions in the core hole. Screening water samples will be collected from any perched groundwater zones encountered, if possible. These screening samples will provide an indication of whether contaminants are present in perched groundwater. Screening samples will be analyzed for anions, metals, and tritium.

4.4 Installation of Alluvial Wells in Lower Sandia Canyon

Five alluvial wells, SCA-1 through SCA-5, will be drilled in lower Sandia Canyon to constrain the extent of alluvial saturation, to determine the nature and extent of chromium contamination within alluvial groundwater, and to provide information for calculating contaminant inventories. Water-quality data from these wells represent the first significant sampling of persistent alluvial groundwater in Sandia Canyon and will be used to determine if alluvial groundwater represents a continuing source of chromium to deeper groundwater. The projection of the new alluvial wells onto the resistivity profile for Sandia Canyon is shown in Figure 4-1. The target depth for each of the wells will be the base of the alluvial sequence. The locations of the new wells are shown in Figure 2-1 and include

- SCA-1, near the east end of the upper Sandia Canyon wetland,
- SCA-2, as far west as possible in lower Sandia Canyon to determine the western extent of alluvial perched groundwater,
- SCA-3, in lower Sandia Canyon near AHF borehole SC2 that contained shallow groundwater when drilled in the summer of 2002,
- SCA-4, in lower Sandia Canyon near AHF borehole SC3 that contained alluvial groundwater when drilled in the summer of 2002, and
- SCA-5, near the canyon axis north of AHF borehole SC5 and R-11 (both of which may have been dry in the alluvium because they are located too far from the canyon axis).

Lithologic logs will be prepared from cuttings for each alluvial well. Open-hole geophysical logs will be run in the boreholes, conditions permitting. Gamma logs will help define geologic contacts and induction logs and water-level measurements will be used to identify target horizons for well screens.

After each well is completed and developed, two rounds of groundwater samples will be collected and analyzed for metals (including hexavalent chromium, uranium, boron, and molybdenum), anions, stable isotopes of hydrogen, oxygen, nitrogen, tritium, HE compounds, VOCs, and TOC as described in Table 4-1. Filtered water samples will be collected for analyses of metals, hexavalent chromium, anions, and nitrogen isotopes. Nonfiltered water samples will be collected for metals, hexavalent chromium, VOCs, HE compounds, stable isotopes of hydrogen and oxygen, and tritium. The field parameters for groundwater samples include temperature, conductivity, pH, alkalinity, dissolved oxygen, and turbidity.

4.5 Analysis of Existing Core

Selected archival core samples from Los Alamos, Sandia, and Mortandad canyons will be sampled and analyzed to help bound the extent of chromium contamination in the vadose zone. The specific cores that are proposed for sampling are listed in Table 4-4. Analysis of these available cores will be used to determine the nature and extent of chromium contamination in the upper vadose zone, identify infiltration pathways, and provide information for calculating contaminant inventories. Data from the archival core will supplement the investigations proposed for Sandia Canyon in this work plan and provide new information to evaluate chromium distributions beneath Los Alamos and Mortandad canyons. Core samples will be selected for analysis at 20-ft intervals in each core hole, except for tritium, $\delta^{15}N$, and radiological screening which will be analyzed at a 40-ft interval. Additional core samples will also be selected for analysis at geologic contacts and features of interest such as soil horizons and fractures. Pore water leached from core and collocated solid core samples will be analyzed for the analyte suite described in Table 4-4.

4.6 Rehabilitation of Well R-12

The representativeness of groundwater data from all three screens at R-12 is presently compromised because of geochemical effects caused by the use of organic additives during drilling (LANL 2005, 91121). This well is equipped with a Westbay multilevel sampling system and has two well screens in perched-intermediate groundwater and one screen in the regional aquifer. R-12 is considered an important monitoring site because of its location along the eastern Laboratory boundary, its proximity to supply well PM-1, and its position potentially downgradient of chromium contamination within the regional aquifer (e.g., R-11 and R-28). In the recently published "Well Screen Analysis Report," the well was rated as fair in its ability to produce reliable and representative water-quality samples for the regional aquifer screen, and the well was rated as poor for the upper perched-zone screen (LANL 2005, 91121, Figure 6-2b). The lower perched-zone screen was not evaluated because of a lack of water-quality data. The technical approach for well-screen rehabilitation is currently under consideration, and a pilot study for rehabilitation is currently planned to begin in the spring of 2006. The R-12 well rehabilitation will take place as part of the Laboratory's pending well rehabilitation work plan, and R-12 will be identified as a high-priority well under that plan.

If attempts at rehabilitation of the screens are unsuccessful, a replacement well for the screen in the regional aquifer will be drilled. The specific location will be recommended and will be based on several factors related to the objectives of this work plan.

4.7 Background Chromium Concentrations in Groundwater

Background concentrations of dissolved total chromium and chromium(VI) will be evaluated at 21 selected springs and wells within the Sierra de los Valles, on the Pajarito Plateau, and within White Rock Canyon. Background concentrations represent natural chromium in groundwater in areas not affected by Laboratory operations and provide a baseline for evaluating the presence of anthropogenic chromium in Laboratory wells. The background sample sites in this investigation were selected based on their position within recharge and discharge zones and along groundwater flow paths. Testing for chromium along flow pathways is being undertaken to better understand natural variations in chromium concentrations and ratios of trivalent to hexavalent forms as the groundwater reacts with aquifer materials along the flow path. Table 4-5 provides names of sampling sites, field preparation of samples, and analyte suites.

4.8 Collection and Synthesis of Data to Support Conceptual Model Development and Remedy Selection

Other supporting activities include collecting and synthesizing data to support refinement of the conceptual model and potential remedy selection. Key components include modeling activities to support interpretations during data collection. Such interpretation can later guide decisions in the characterization activities and provide an overall framework for synthesis of the data after they are collected.

Numerical models of the hydrologic system, as it relates to chromium migration pathways, will be developed to provide the overall water and contaminant budgets and to support predictions of the fate and transport of contaminants. A key focus of the models will be to quantify fate and transport uncertainties to evaluate whether sufficient data have been collected. The regional aquifer analyses will particularly concentrate on estimation of potential impact of water-supply wells on the water-table flow and contaminant transport. If possible, data will be collected from several of the production wells discussed in this work plan (e.g., PM-3, PM-1) to enhance the understanding of variations in productivity along the long screens and to assess potential variations in water quality. Data may be obtained from spinner logs (or equivalent) and possibly from stratified sampling methods. The production wells are owned and operated by Los Alamos County, and consequently production schedules and well configuration may impact the ability to collect these data.

Finally, geochemical reactive transport modeling will be conducted to provide a basis for understanding processes (oxidation and reduction, adsorption, and precipitation) that control chromium transport. Recommendations regarding potential remedial alternatives will be based on an integration of characterization data and geochemical and contaminant-transport models.

5.0 INVESTIGATION METHODS

A list of the standard operating procedures (SOPs) that will be used in this investigation is given in Table 5-1. All work will be performed in accordance with the ENV-ECR Group quality management plan (QMP) and applicable quality procedures (QPs).

5.1 Drilling

Six characterization core holes, five alluvial wells, and two piezometer nests will be drilled by hollow-stem auger, air-rotary, direct-push, or hand-auger methods. A brief description of these methods is provided below. More information can be found in SOP-04.01, Drilling Methods and Drill Site Management.

5.1.1 Hollow-Stem Auger

The hollow-stem auger consists of a hollow-steel shaft with a continuous spiraled steel flight welded onto the exterior of the stem. The stem is connected to an auger bit and when rotated, it transports cuttings to the surface. The hollow stem of the auger allows drill rods, split-spoon core barrels, Shelby tubes, and other samplers to be inserted through the center of the auger so that samples may be retrieved during drilling operations. The hollow stem also acts to case the borehole temporarily, so that a well casing (riser) may be inserted down through the center of the auger once the desired depth is reached, thus minimizing the risk of possible collapse of the borehole. A bottom plug or pilot bit can be fastened onto the bottom of the auger to keep out most of the soils and/or water that have a tendency to clog the bottom of the augers during drilling. Drilling without a center plug is acceptable if the soil plug, formed in the bottom of the auger, is removed before sampling or installing a well casing. The soil plug can be removed by washing out the plug using a side-discharge rotary bit or augering out the plug with a solid-stem auger bit sized to fit inside the hollow-stem auger.

5.1.2 Air Rotary

The air-rotary method uses a drill pipe or drill stem coupled to a drill bit that rotates and cuts through soil and rock. The cuttings produced from the rotation of the drill bit are transported to the surface by compressed air, which is forced down the borehole through the drill pipe and returns to the surface through the annular space (between the drill pipe and the borehole wall). The circulation of the compressed air not only removes the cuttings from the borehole but also helps to cool the drill bit. The use of air-rotary drilling is best suited for hard-rock formations. In soft unconsolidated formations, casing is driven to keep the formation from caving. When using air rotary, the air compressor shall have an in-line organic filter system to filter the air coming from the compressor. The organic filter system shall be inspected regularly to ensure that the system is functioning properly. In addition, a cyclone-velocity dissipater or similar air-containment/dust-suppression system shall be used to funnel the cuttings to one location instead of allowing the cuttings to discharge uncontrolled from the borehole. Air rotary that employs the dual-tube (reverse-circulation) drilling system is acceptable because the cuttings are contained within the drill stem and are discharged through a cyclone-velocity dissipater to the ground surface.

5.1.3 Direct Push

Direct push is a subsurface sampling method that pushes a tool string into the ground using the weight of a truck in combination with a hydraulic ram or hammer. Various tool strings can be used for obtaining discrete samples, continuous samples, both discrete and continuous samples, and groundwater samples. The direct-push core samples to be collected in this investigation will be continuous. The inside of the continuous sampler is exposed to the subsurface environment while it is advanced to the sample interval. This is a dual-tube sampler, so named because it uses two sets of rods to collect soil cores. The outer rods receive the driving force from the hydraulic pushing method and provide a sealed hole from which soil samples may be recovered without the threat of cross-contamination or cave-in. The inner set of rods is placed within the outer rods and holds a sampler in place as the outer rods are driven to the sample interval. The inner rods are then retracted to retrieve the soil core. Water samples are collected using a grab-sample tool in the direct-push method. The grab-sample tool is installed temporarily to collect groundwater samples or hydrogeologic data and is then removed from the subsurface. Groundwater grab-samplers include profilers that can collect multiple, discrete samples during one downhole push and standard samplers, which can be driven to a desired depth at which a screen is exposed and a sample is collected through use of a check-valve apparatus or pump. The direct push methods will follow the American Society of Testing and Materials D18 Subcommittee on Direct Push Sampling (D18.21.01).

5.1.4 Hand Auger

Hand augers may be used to bore shallow holes (0 to 15 ft) such as SCA-1. The hand auger is advanced by turning or pounding the auger into the soil until the barrel is filled. The auger is then removed and the sample is dumped out. Motorized units for one or two operators may be used and can reach depths up to 30 ft under certain conditions.

5.2 Sampling and Analytical Methods

5.2.1 Core

Core is collected by means of a core barrel included at the bottom of the drill string. As the drill bit is advanced, the core barrel "shoe" (beveled cutting edge) slightly precedes the advancing drill bit. The core barrel assembly is stationary within the rotating drill string. In this fashion, undisturbed geologic materials are pushed up into the hollow core barrel and are not pulverized by the drill bit. When the core barrel is filled, the drilling is halted and the core barrel is retrieved. If contaminants are anticipated, portable field instruments are used to monitor the cuttings from the cored interval for radioactivity and volatile organic compounds. Guidance for collection, preservation, and storage of core can be found in SOP-06.10, Hand Auger and Thin-Wall Tube Sampling; SOP-0.6.24, Sample Collection from Split-Spoon Samplers and Shelby Tube Samplers; and SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials.

Once the core is removed from the core barrel, it is screened in the field for hazardous contamination. Upon determining that the core is safe to handle, the core is measured and marked to determine core loss and the depth interval the core was collected from. The core is logged to document stratigraphic contacts, lithology, and any structural features. Portions of the core will be removed for analysis. Samples for chemical analysis are placed in appropriate containers and transported to the Sample Management Office (SMO) for off-site analysis or to Laboratory analytical labs.

Geologic samples are removed from the core and placed in appropriate containers, usually zip-type plastic bags. The core will be examined by binocular microscope to determine lithology and alteration features. Geologic samples are kept in the Laboratory Earth and Environmental Sciences Sample Storage Area.

The volumes and sample handling requirements for core and cuttings are specified in Table 4-3.

5.2.2 Water

Screening water samples may be collected from the core holes if perched water is encountered during drilling. Water samples will be collected from the alluvial wells after well development in the completed well. The procedure that is used for sampling water during drilling (screening samples) is different from the procedure for sampling from the completed well (characterization samples). Both methods are described in this section.

5.2.2.1 Collection of Water Samples during Core-Hole Drilling

If saturation is encountered as a characterization core-hole advances, drilling will be stopped to determine whether the water represents natural fluids and if a sufficient volume is available to analyze the water quality. These analyses will include metals, anions (including nitrate and perchlorate), alkalinity, and tritium. Generally, the total volume required for a turbid core-hole groundwater sample is approximately 2.0 L. Of this volume, 500 mL is nonfiltered and nonpreserved; another 500 mL is filtered and preserved with nitric acid. A 1-L sample is required for tritium analysis. If this minimum volume of groundwater cannot be collected, the borehole will be continued to the planned total depth (TD) or until saturation is encountered again and the process is repeated. Insufficient water sample volumes from discrete depths will not be composited to make the required volume for screening analysis.

Analytical suites for groundwater collected during drilling of the core holes are a subset of those specified in Table 4-1.

5.2.2.2 Collection of Water Samples from a Completed Alluvial Well

The alluvial wells will be constructed with single well screens. Guidance for collection of groundwater samples can be found in SOP-06.01, Purging and Sampling Methods for Single Completion Wells.

The first step in collecting a groundwater sample is to measure the static water level. This information, in conjunction with the TD and diameter of the well, is used to calculate the volume of water that must be purged before collecting a sample. The water is purged with either a submersible pump or a bailer. The total volume of water purged is recorded as are periodic measurements of discharge rate and water level. Field parameters are measured at the start of purging and several times thereafter. The well is ready to sample when three casing volumes have been removed, the field parameters have stabilized, and the turbidity is stable. Field parameters are also measured with each sample run. Purge water will be managed and characterized in accordance with the methodology described in the pending interim facility-wide groundwater monitoring plan.

The field parameters for groundwater samples include temperature, conductivity, pH, alkalinity, dissolved oxygen, and turbidity. Samples are collected when the representative field parameters are stable. If the field parameters do not stabilize, a sample is still collected and the field parameters are recorded so that the analytical data may be reviewed in the context of the field data.

After the groundwater sample has been collected and processed, aliquots of the sample are placed in appropriate containers and preserved according to SOP 01.02, Sample Container and Preservation. A 0.45-µm pore size filter is used to filter samples that are to be analyzed for dissolved constituents. These include anions, metals, nitrogen isotopes, and hexavalent chromium. Nonfiltered samples will be analyzed for tritium, metals, hexavalent chromium, stable isotopes of oxygen and hydrogen, TOC, total Kjeldahl nitrogen (TKN), ammonia (NH_3), VOCs, and HE compounds. Groundwater samples for chemical analysis are placed in appropriate secondary containers and transported to the SMO for shipment to off-site analytical laboratories or to the Laboratory analytical labs for more rapid local analysis; see SOP-01.03, Handling, Packaging, and Shipping of Samples for more details.

Analytical suites, estimated detection limits, and EPA analytical protocols for inorganic chemicals in postdevelopment well sampling are specified in Table 4-1.

5.2.2.3 Installation of Temporary Gaging Station

A 15-pounds-per-square-inch (psi) pressure transducer will be hung in a stilling well installed below the streambed and anchored into the bedrock to ensure a stable installation. A suitable location will be determined where the channel geometry is well defined by bedrock. The channel cross section will be surveyed so that the cross-sectional area of flow can be determined. Multiple flowmeter measurements will be performed at representative varying streamflow stage levels to generate a rating curve for the site whereby stream-stage levels measured with the transducer can be converted to volumetric discharges.

5.3 Borehole Geophysics

Borehole geophysical studies will be conducted to determine the distribution of saturation, to help interpret stratigraphy and lithology, and to aid in well design. The types of geophysical data collected are dependent on the objectives of each borehole.

Methods include natural gamma, induction, caliper, and borehole video following SOP-05.07, Operation of LANL Owned Borehole Logging Trailer. These tools will be used as necessary to supplement the information obtained from a geophysical logging contractor or in lieu of contractor data collection in wells where limited depth and constrained objectives do not justify the more expensive suite of contractor tools.

The natural gamma tool is used to measure naturally occurring variations in cumulative gross gamma radiation from potassium, uranium, and thorium. Use of the Laboratory natural gamma tool will be advantageous where a contractor geophysical suite is not deployed and there is a need to refine geologic contacts.

The induction tool provides information on conductivity and resistivity. This information will be important for comparison with core or cuttings in determining that component of rock resistivity/conductivity attributable to the degree of saturation. The Laboratory induction tool will not be required if a logging contractor array induction tool is used to meet resistivity/conductivity characterization objectives.

The caliper tool is a three-arm system that provides information about hole diameter to a maximum of 29 in. It is not anticipated that this tool will be used because the logging contractor’s caliper tool will be used in those boreholes where diameter measurements are needed for defining washout intervals, which are critical for the evaluation of data from other tools in the contractor’s suite.

The borehole video camera provides an axial downward view along the borehole in either unsaturated conditions or within saturation where the water is clear enough. This tool is not replicated in the standard contractor’s suite and it provides unique information on borehole wall conditions (or condition of casing and screens in a completed well), moist or flowing intervals within the vadose zone, and fracture distributions. It can also supplement other tools in defining depth to water and lithology.

6.0 MONITORING AND SAMPLING PROGRAM

The surface water and alluvial, intermediate, and regional groundwater monitoring required under this work plan will be integrated with the requirements of the pending revision of the interim facility-wide groundwater monitoring plan. It is proposed that this monitoring be conducted by watershed, so that all sampling within a watershed be conducted within a 21-day sampling window. The sampling for Mortandad and Sandia canyons will be conducted either concurrently or with overlapping 21-day windows.

The next round of sampling following that conducted pursuant to NMED’s letter (NMED 2005, 91683) will not include the Sandia Canyon alluvial wells because those are not expected to be installed in time for that round but will be included in subsequent rounds.

7.0 SCHEDULE, DELIVERABLES, AND REPORTING

7.1 Schedule

The scope described in this work plan is expected to take approximately 9 months to implement. A specific completion date cannot be determined at this time because it is dependent on the timing of NMED approval of this work plan and a variety of field conditions that may be encountered.

The proposed sequence for the drilling activities described in Section 4 is to drill the characterization core holes first to obtain useful information on the stratigraphy and extent and saturated thickness of alluvial groundwater. Installation of the nested piezometers and the alluvial monitoring wells will occur next. Drilling of the characterization core holes and installation of piezometers and alluvial wells is targeted to begin in early June and will require approximately 2 months to complete. Geochemical analysis of new core and sampling of the alluvial wells will follow.

Sampling and analysis of existing core, implementation of the chromium background study, and analysis of existing and new gage data will all begin upon approval of the work plan. Rehabilitation of all three screens at R-12 will begin after implementation of the well rehabilitation pilot study at R-16 and R-20 which is currently scheduled to begin in spring 2006.

Ongoing analysis of regional groundwater-level data and modeling will be conducted and updated with data collected under this work plan and will occur concurrent with implementation of the field activities. These analyses are expected to help inform subsequent investigation activities and potential remedy selection.

A report on the results of this investigation will be prepared and submitted to the NMED following completion of the field and analytical activities. The report will present all data and an updated conceptual model of the chromium contamination. If necessary, the report will also recommend subsequent work.

8.0 REFERENCES

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Stewardship–Environmental Remediation and Surveillance (ENV-ERS) Program Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the ENV-ERS Program. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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Figure 2-1. Locations of Sandia, Los Alamos, and Mortandad canyons showing major chromium release sites, stream-flow gages, and existing and planned boreholes, wells, and surface-water sampling stations

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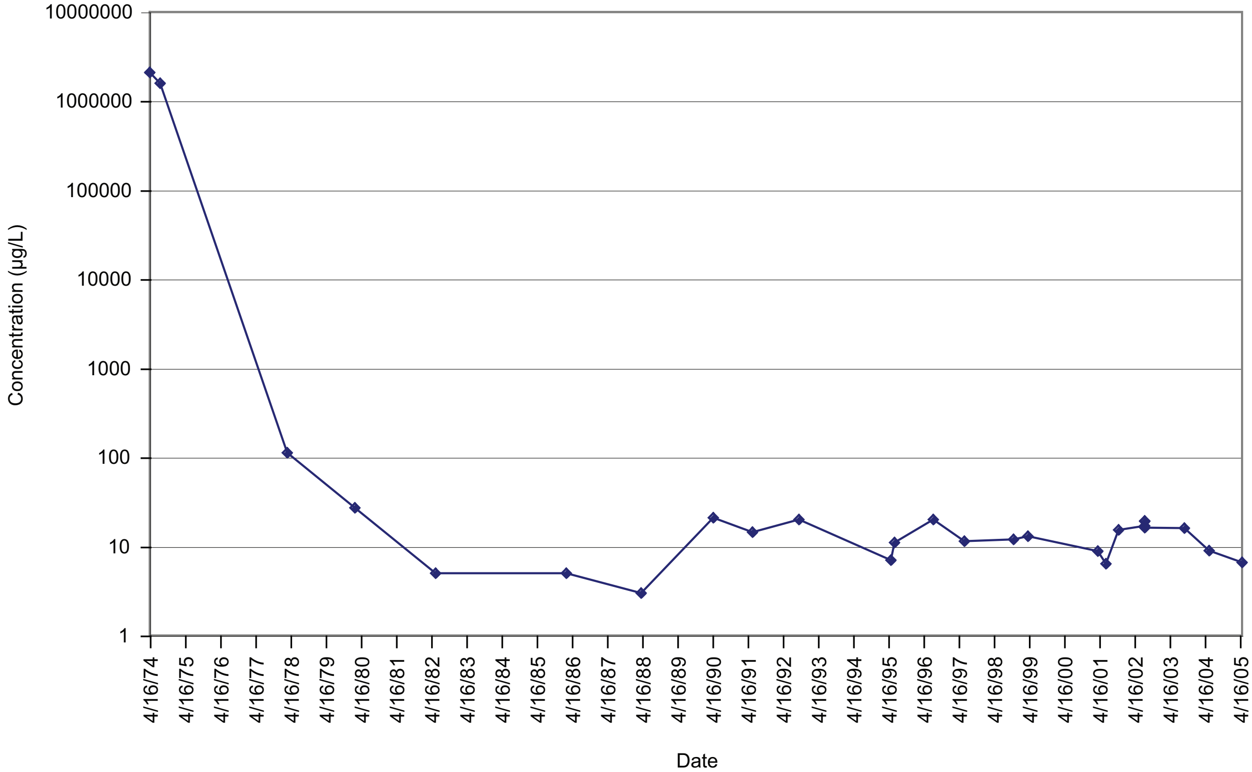


Figure 3-1. Time-series plot of dissolved total chromium concentrations at alluvial well LAO-1, Los Alamos Canyon

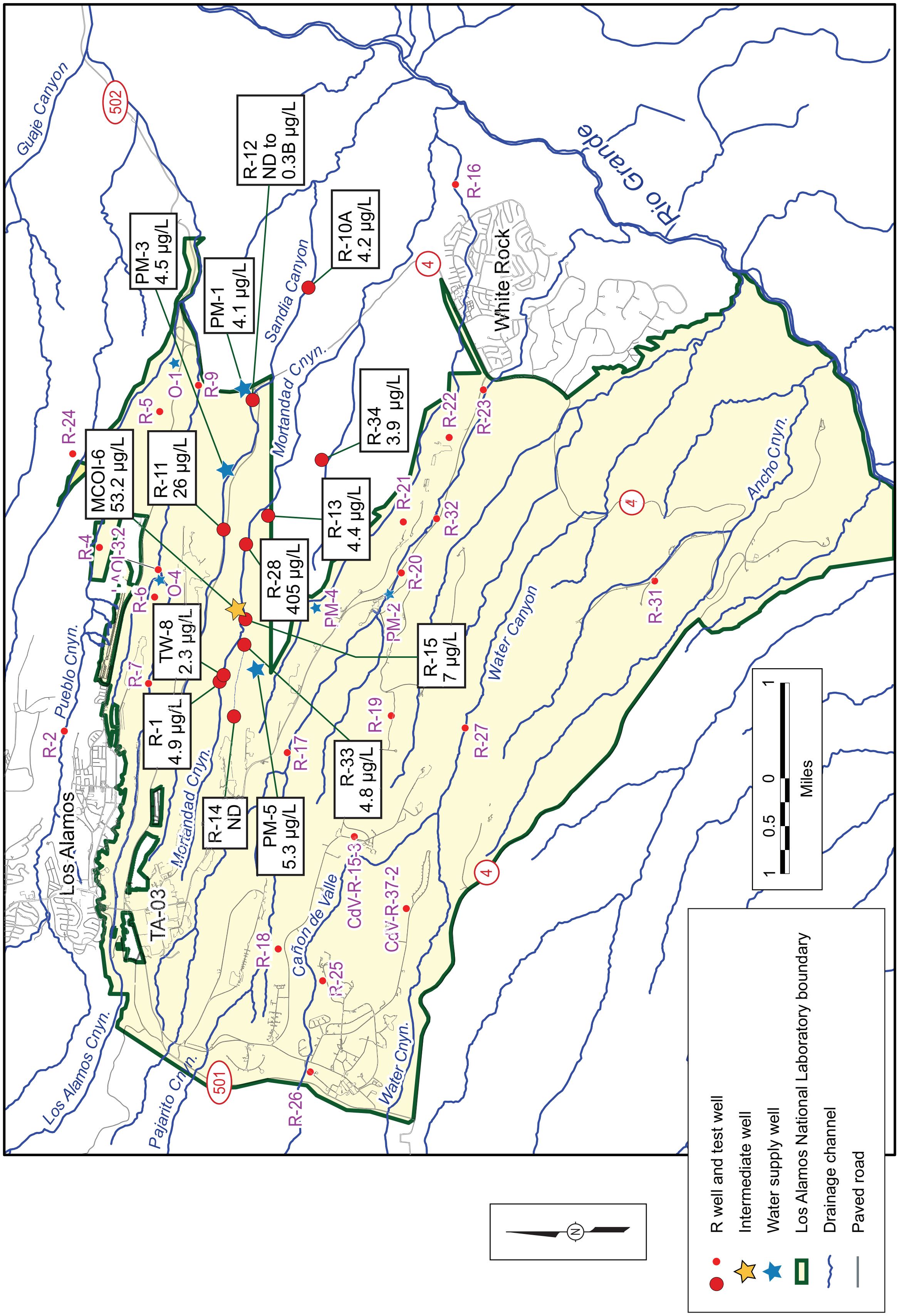
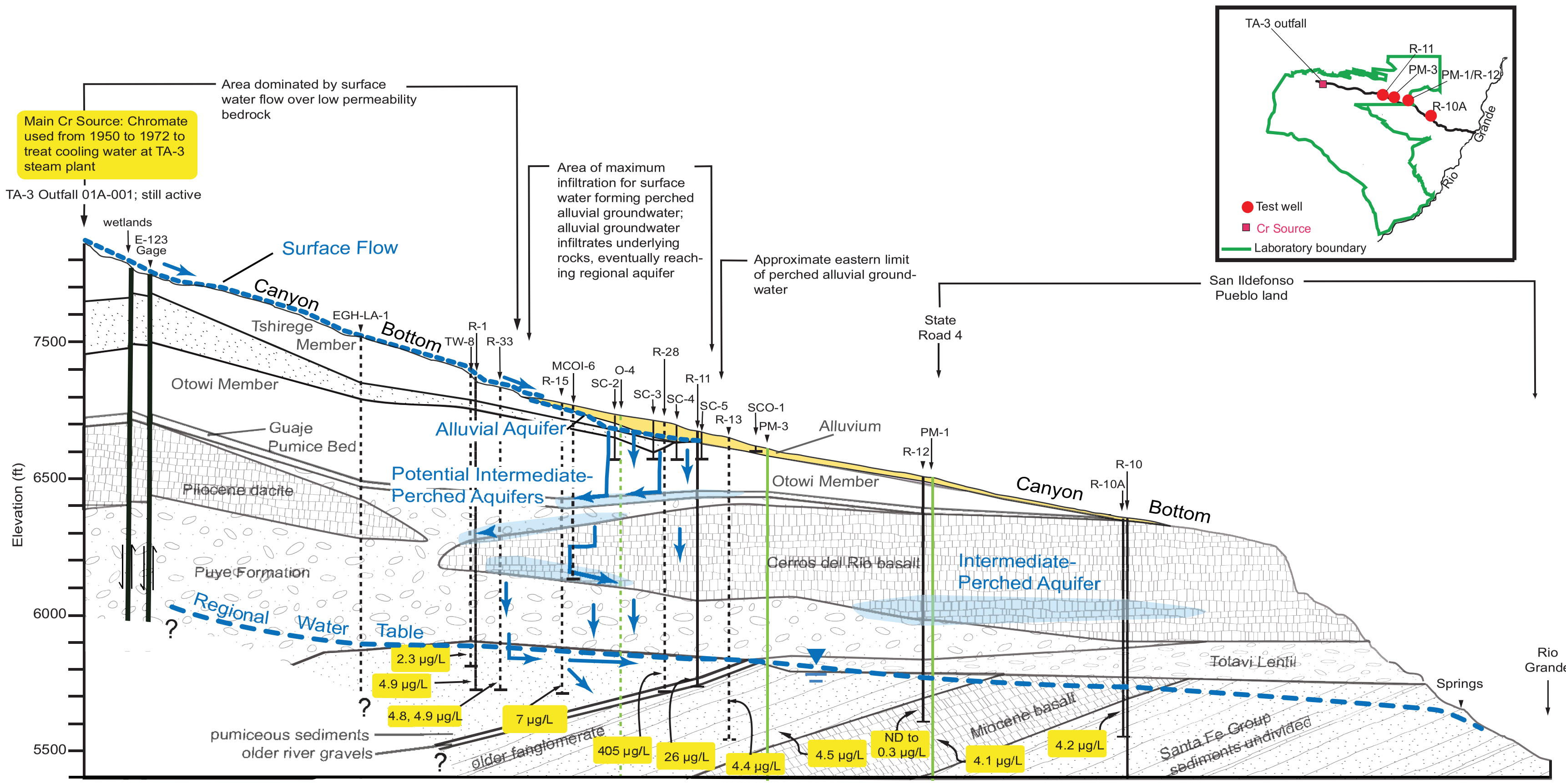


Figure 3-2. Hexavalent chromium concentrations (filtered) in regional and intermediate wells



Vertical Exaggeration = 10x

Note: Wells in Sandia Canyon are shown by solid lines. Nearby test wells projected into the line of section from Mortandad Canyon (located to the south) are shown as dashed lines. Water supply wells shown in green. Supply well O-4, shown as dashed green line, is projected into the line of section from Los Alamos Canyon (located to the north). The line of section follows the Sandia Canyon stream channel. The anomalously low water level for R-12 not included; see the text for discussion of alternative models of the regional water table.

Figure 3-3. Conceptual hydrogeologic cross section showing potential chromium transport pathways and dissolved hexavalent chromium values (µg/L) for monitoring wells and water supply wells in the vicinity of Sandia Canyon

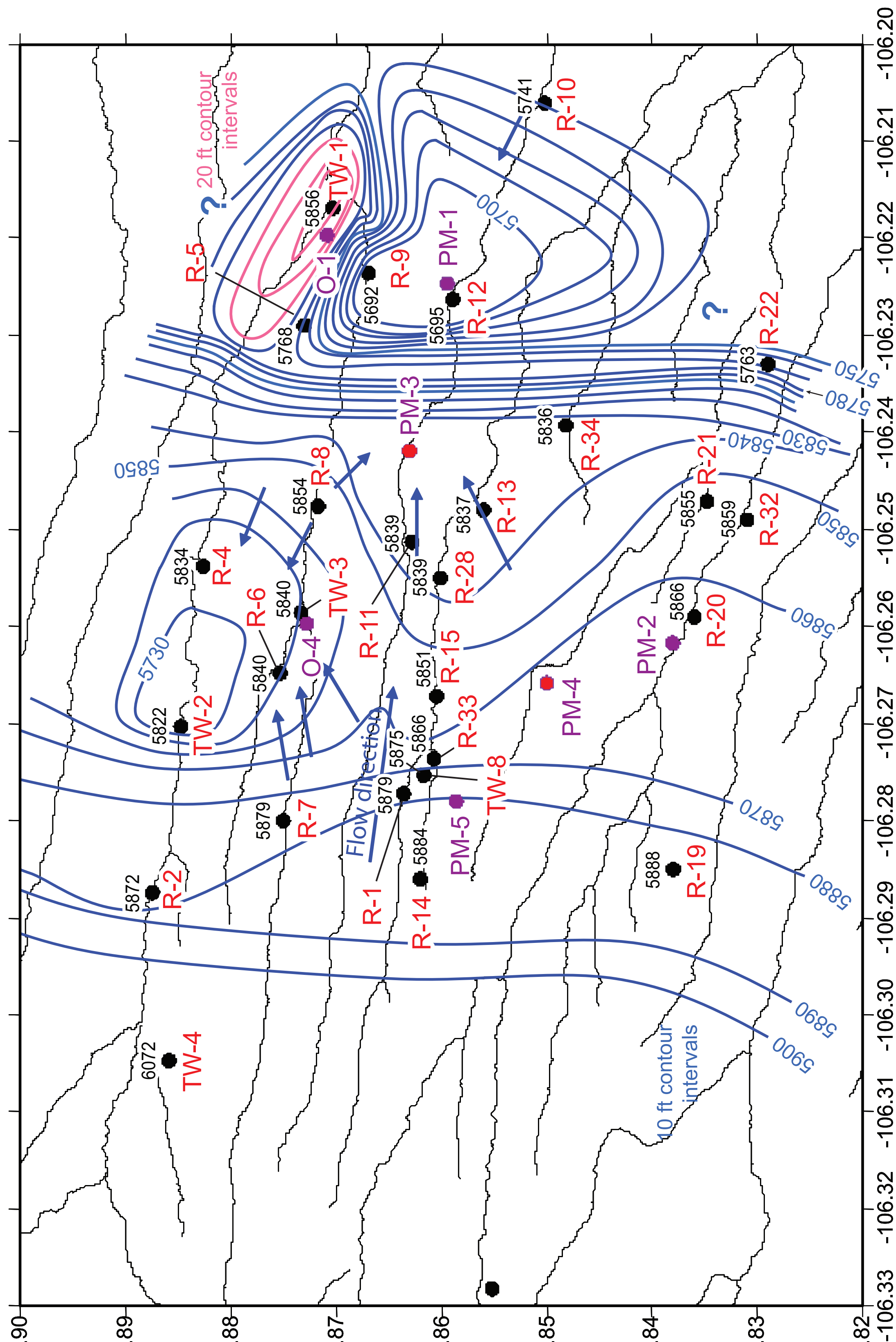


Figure 3-4. Conceptual Model A: Data-driven contour map (10- and 20-ft intervals) of the water table based on January 30, 2006, measurements at the monitoring wells. Blue arrows define flow directions. Contour lines suggest that pumping at water-supply wells (at O-4, PM-3 and PM-1) impacts flow directions at the water table.

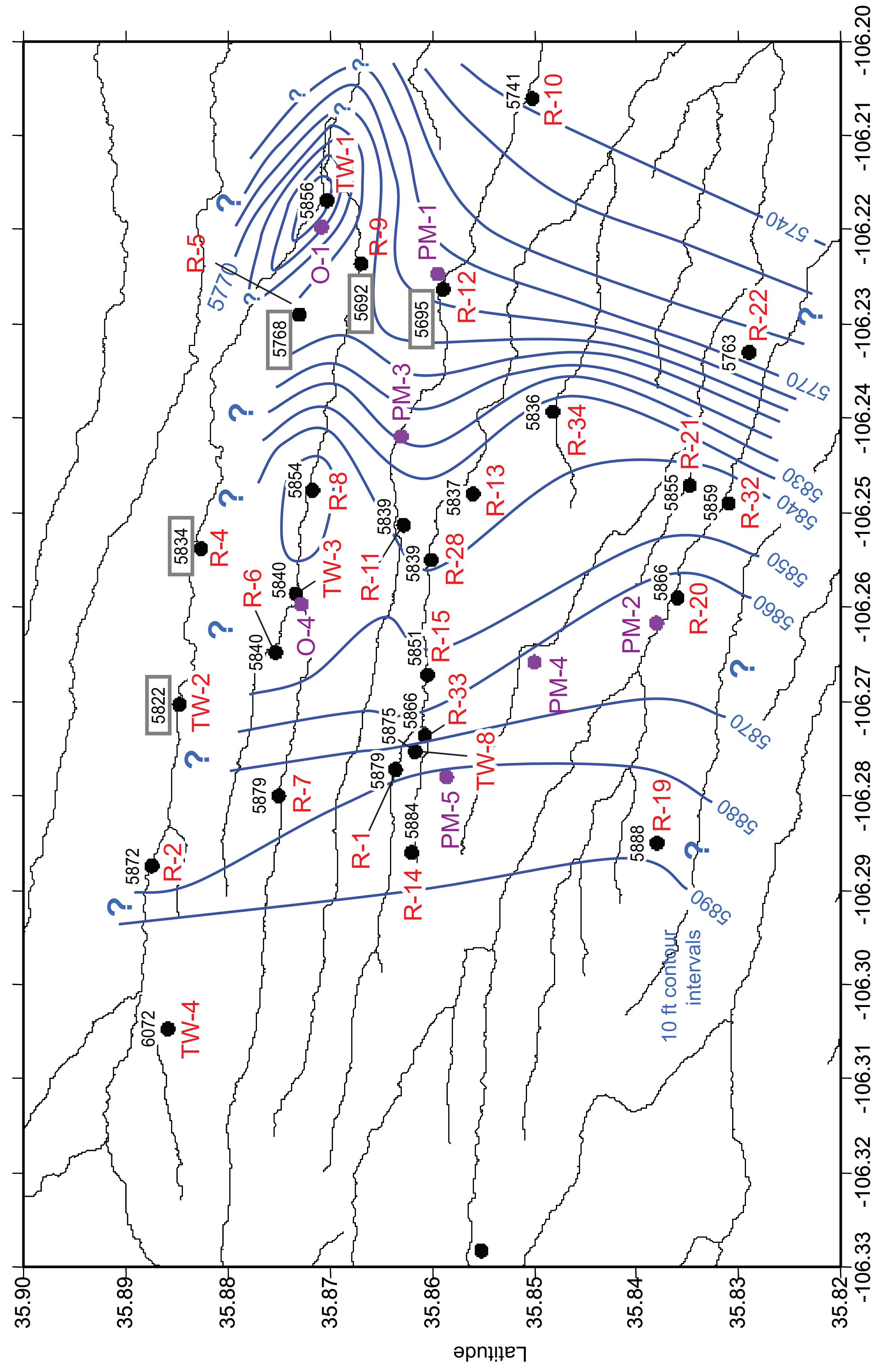


Figure 3-5. Conceptual Model B: Data-driven contour map (10-ft intervals) of the water table based on January 30, 2006, measurements at the monitoring wells (TW-2, R-4, R-5, R-9 and R-12 well data have been ignored). Contour lines suggest that infiltration recharge along canyons impacts flow directions at the water table.

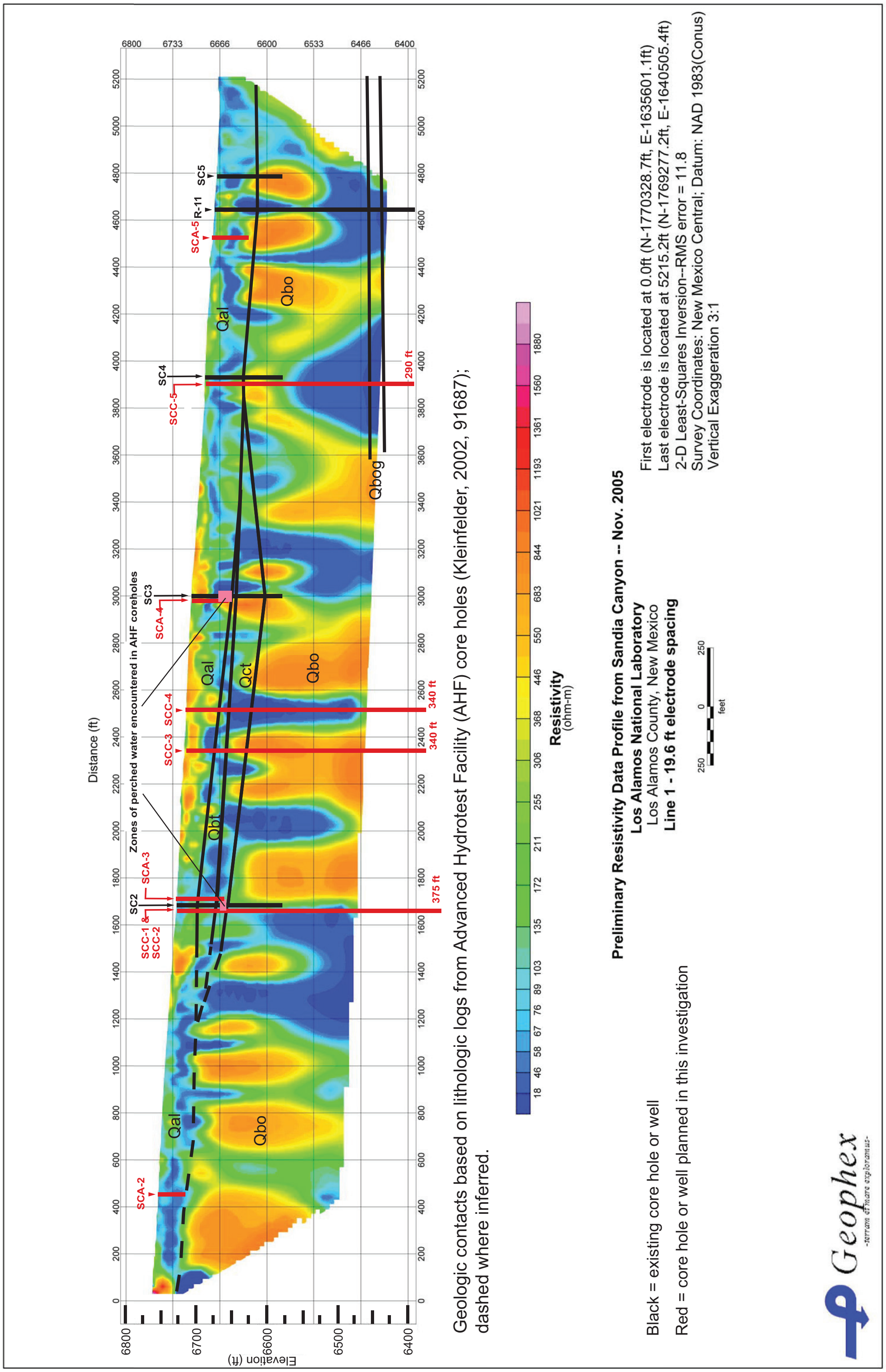


Figure 4-1. 2005 DC resistivity survey profile of lower Sandia Canyon showing existing and new wells and core holes

Table 2-1
Analytical Suites and Field Preparation for Intermediate and Regional Wells Selected for Enhanced Quarterly Sampling

Location	Monitored Zone	Analytical Suite/Field Preparation															
		General Inorganics[a] (F[b])	Metals[c] (F/NF[d])	Hexavalent Chromium (IC) (F/NF)	Stable Isotopes (EES-6)[e] (see footnote for prep)	TKN + NH_3 (NF)	NO_3/NO_2 (F)	TOC (NF)	Humic Acid (F)	VOCs (NF)	Perchlorate (F)	Low-Level Perchlorate (LC/MS/MS) (F)	Expanded HE Suite (NF)	Low-Level Tritium	Tritium (Liquid Scintillation) (NF)	Field Parameters[f]	Water Levels (method)
Intermediate-Depth Groundwater (Mortandad)																	
MCOI-8	Intermediate	√	√	√	√	√	√	√	√	√	√	—[g]	—	—	√	√	XD[h]
MCOI-4	Intermediate	√	√	√	√	√	√	√	√	√	√	—	—	—	√	√	XD
MCOI-5	Intermediate	√	√	√	√	√	√	√	√	√	√	—	—	—	√	√	XD
MCOI-6	Intermediate	√	√	√	√	√	√	√	√	√	√	—	—	—	√	√	XD
MCOBT-4.4	Intermediate	√	√	√	√	√	√	√	√	√	√	—	—	—	√	√	XD
Regional Groundwater (Sandia and Mortandad)																	
R-1	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-14, screen 1	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-14, screen 2	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-33, screen 1	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	manual
R-33, screen 2	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	manual
R-15	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-28	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-13	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-11	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-12(i)-1	Intermediate	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-12(i)-2	Intermediate	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-12	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD

Table 2-1 (continued)

Location	Monitored Zone	Analytical Suite/Field Preparation															
		General Inorganics[a] (F[b])	Metals[c](F/NF[d])	Hexavalent Chromium (IC) (F/NF)	Stable Isotopes (EES-6)[e] (see footnote for prep)	TKN + NH_3 (NF)	NO_3/NO_2 (F)	TOC (NF)	Humic Acid (F)	VOCs (NF)	Perchlorate (F)	Low-Level Perchlorate (LC/MS/MS) (F)	Expanded HE Suite (NF)	Low-Level Tritium	Tritium (Liquid Scintillation) (NF)	Field Parameters[f]	Water Levels (method)
TW-8	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-34	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	XD
R-10a	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	manual

[a] General inorganics consist of anions including alkalinity, bromide, chloride, fluoride, nitrate and nitrite, phosphate, and sulfate.

[b] F = Filtered.

[c] Metals include target analyte list (TAL) metals plus boron, molybdenum, and uranium.

[d] N = Not filtered.

[e] Water samples collected for analysis of oxygen and hydrogen isotopes are not filtered. Water samples collected for analysis of nitrogen isotopes are filtered and chilled.

[f] Field parameters include pH, temperature, specific conductance, turbidity, and dissolved oxygen.

[g] — = Not analyzed.

[h] XD = Transducer.

Table 4-1
Analytical Suites and Field Parameters for Surface and Groundwater Sampling

Location	Monitored Zone	General Inorganics[a] (F[b])	Metals[c] (F/NF[d])	Hexavalent Chromium (IC) (F/NF)	Stable Isotopes (EES-6)[e] (see footnote for prep)	TKN + NH3 (NF)	NO3/NO2 (F)	TOC (NF)	Humic Acid (F)	VOCs (NF)	Perchlorate (F)	Low-Level Perchlorate (LC/MS/MS) (F)	High Explosives (NF)	Low-Level Tritium (NF)	Tritium (Liquid Scintillation) (NF)	Field Parameters[f]	Water Levels/Flow Estimates
Sandia Watershed																	
South Fork of Sandia Canyon at E122	Baseflow	√	√	√	√	√	√	√	√	√	—[g]	√	√	√	—	√	√
Sandia below Wetlands (E123)	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
Middle Sandia at terminus of persistent baseflow	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
SCA-1	Alluvial	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
SCA-2	Alluvial	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
SCA-3	Alluvial	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
SCA-4	Alluvial	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
SCA-5	Alluvial	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
SCO-1	Alluvial	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
SCO-2	Alluvial	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-12, screen 1	Intermediate	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-12, screen 2	Intermediate	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-10, screen 1	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-10, screen 2	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-10a	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-11	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-12, screen 3	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√

Table 4-1 (continued)

Location	Monitored Zone	General Inorganics[a] (F[b])	Metals[c] (F/NF[d])	Hexavalent Chromium (IC) (F/NF)	Stable Isotopes (EES-6)[e] (see footnote for prep)	TKN + NH3 (NF)	NO3/NO2 (F)	TOC (NF)	Humic Acid (F)	VOCs (NF)	Perchlorate (F)	Low-Level Perchlorate (LC/MS/MS) (F)	High Explosives (NF)	Low-Level Tritium (NF)	Tritium (Liquid Scintillation) (NF)	Field Parameters[f]	Water Levels/Flow Estimates
Mortandad Watershed																	
Surface water in reach E-1FW	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Surface water in reach E-1W	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Surface water in reach E-1E	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Mortandad below Effluent Canyon (E200)	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Surface Water in reach M-1W	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Surface water in reach M-1E	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Surface water in reach M-2E	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Surface water in reach TS-1W	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
Surface water in reach TS-2E	Baseflow	√	√	√	√	√	√	√	√	√	—	√	√	—	√	√	√
MCO-0.6	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCA-1	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCA-5	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCO-2	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√

Table 4-1 (continued)

Location	Monitored Zone	General Inorganics[a] (F[b])	Metals[c] (F/NF[d])	Hexavalent Chromium (IC) (F/NF)	Stable Isotopes (EES-6)[e] (see footnote for prep)	TKN + NH3 (NF)	NO3/NO2 (F)	TOC (NF)	Humic Acid (F)	VOCs (NF)	Perchlorate (F)	Low-Level Perchlorate (LC/MS/MS) (F)	High Explosives (NF)	Low-Level Tritium (NF)	Tritium (Liquid Scintillation) (NF)	Field Parameters[f]	Water Levels/Flow Estimates
MCO-3	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCO-4B	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCO-5	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCO-6	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
TSCA-6	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCA-2	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCO-7.5	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MT-1	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MT-2, MT-3, or MT-4	Alluvial	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCOI-8	Intermediate	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCOI-4	Intermediate	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCOI-5	Intermediate	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
MCOI-6	Intermediate	√	√	√	√	√	√	√	√	√	√	—	√	—	√	√	√
R-1	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-14, screen 1	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-14, screen 2	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-33, screen 1	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-33, screen 2	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-15	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-28	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
R-13	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√

Table 4-1 (continued)

Location	Monitored Zone	General Inorganics[a] (F[b])	Metals[c] (F/NF[d])	Hexavalent Chromium (IC) (F/NF)	Stable Isotopes (EES-6)[e] (see footnote for prep)	TKN + NH3 (NF)	NO3/NO2 (F)	TOC (NF)	Humic Acid (F)	VOCs (NF)	Perchlorate (F)	Low-Level Perchlorate (LC/MS/MS) (F)	High Explosives (NF)	Low-Level Tritium (NF)	Tritium (Liquid Scintillation) (NF)	Field Parameters[f]	Water Levels/Flow Estimates
R-34	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√
TW-8	Regional	√	√	√	√	√	√	√	√	√	—	√	√	√	—	√	√

[a] General inorganics consist of anions including alkalinity, bromide, chloride, fluoride, nitrate and nitrite, phosphate, and sulfate.

[b] F = Filtered.

[c] Metals include target analyte list (TAL) metals plus boron, molybdenum, and uranium.

[d] N = Not filtered.

[e] Water samples collected for analysis of oxygen and hydrogen isotopes are not filtered. Water samples collected for analysis of nitrogen isotopes are filtered and chilled.

[f] Field parameters include pH, temperature, specific conductance, turbidity, and dissolved oxygen.

[g] — = Not analyzed.

Table 4-2
Objectives for Characterization Core Holes in Sandia Canyon

	SCC-1 and SCC-2	SCC-3 and SCC-4	SCC-5 and SCC-6
Conceptual Model Uncertainty	Constrain location of cooling-tower effluent infiltration. Reduce uncertainty in contaminant distributions and chromium speciation in area where Sandia Canyon widens and the alluvium thickens east of narrow slot canyon. Located near gaging station E124. SCC-1 is sited on historic stream channel identified by aerial photos and SCC-2 is adjacent to the present-day stream channel.	Constrain location of cooling-tower effluent infiltration. Reduce uncertainty in contaminant distributions and chromium speciation in lower Sandia Canyon. SCC-3 and SCC-4 are paired wells examining contrasting geophysical anomalies identified in the surface DC resistivity survey of 2005. SCC-3 is centered on a resistive anomaly and SCC-4 is centered on the adjacent conductive anomaly.	Constrain the eastern extent of location of cooling-tower effluent infiltration. Reduce uncertainty in contaminant distributions and chromium speciation in lower Sandia Canyon. The locations of SCC-5 and SCC-6 are expected to bracket the eastern limit of chromium infiltration in the canyon. SCC-6 will determine if infiltration has occurred near the water-supply well PM-3.
Projected Depth	~375 ft	~340 ft	SCC-5 ~290 ft, SCC-6 ~225 ft
Geology	Determine thickness variations of alluvium and Cerro Toledo deposits along N-S cross section of canyon floor. Identify western pinch out of Cerros del Rio basalt.	Relate contrasting geophysical anomalies to variations in geology or in rock properties. Identify areas where Cerro Toledo deposits subcrop canyon-floor alluvium.	Determine E-W thickness variations of Bandelier Tuff and the Puye Formation as these units become thinner over the Cerros del Rio basalt highland to the east.
Hydrology	Determine moisture content in Bandelier Tuff. Identify perched water in bedrock units. Extent of alluvial saturation.	Determine moisture content in Bandelier Tuff. Identify perched water in bedrock units. Extent of alluvial saturation.	Determine moisture content in Bandelier Tuff. Identify perched water in bedrock units. Extent of alluvial saturation.
Geochemistry/ Contaminant Chemistry	Determine contaminant profiles for metals (including hexavalent chromium), anions, nitrogen isotopes, total organic carbon (TOC), and tritium.	Determine contaminant profiles for metals (including hexavalent chromium), anions, nitrogen isotopes, TOC, and tritium.	Determine contaminant profiles for metals (including hexavalent chromium), anions, nitrogen isotopes, TOC, and tritium.
Core Needs	Collect core samples (every 20 ft) to total depth (~300 ft). The core-hole target depth is 20 ft into the top of the Cerros del Rio basalt.	Collect core samples (every 20 ft) to total depth (~325 ft). The core-hole target depth is 20 ft into the top of the Cerros del Rio basalt.	Collect core samples (every 20 ft) to total depth (~350 ft). The core-hole target depth is 20 ft into the top of the Cerros del Rio basalt.

Table 4-3
Core and Extracted Pore Water Analyte Suite, Sample Containerization, and Sample Frequency

Analyte Suite	Sample Size	Container	Sample Frequency
Target analyte list metals (including hexavalent Cr, U, Mo, and B)	0.5 ft of 2-in. diameter core	Sealed plastic bag and core protected; samples will be frozen until they are analyzed	Collect samples at 20-ft intervals from the bottom of surface casing to total depth (TD)
Anions, moisture, and total organic carbon	0.4 ft of 2-in. diameter core	8-oz preweighed glass jar	Collect samples at 20-ft intervals from the bottom of surface casing to TD
Tritium	0.5 ft of 2-in. diameter core	Sealed plastic bag wrapped with tape and core-protected	Collect samples at 40-ft intervals from the bottom of surface casing to TD
$\delta^{15}N$	0.5 ft of 2-in diameter core	Sealed plastic bag and core-protected; samples will be frozen until they are analyzed	Collect samples at 20-ft intervals from the bottom of surface casing to TD
Radiological screening for gross alpha, beta, and gamma (for off-site transport of samples)	0.2 ft of 2-in. diameter core	Sealed plastic bag	Collect samples at 40-ft intervals from the bottom of surface casing to TD

Note: Priority of sample core collection when recovery is less than 100% should be metals, anions, total organic carbon, moisture, nitrogen isotopes, tritium, and radiological screening.

Table 4-4
Archival Cores Selected for Characterization of Contaminant Distributions in the Upper Vadose Zone

Hole	Watershed	Core Depth	Anions	DI Leach Cr	EPA 3050 Leach Cr	Core in Moisture Protect for Cr(VI) Analysis (ft)	Chromium (VI)	Dried Core for DI and 3050 Leach of Cr (ft)	TAL Metals	Nitrogen Isotopes	Tritium	TOC
LAOI(A)-1.1	Los Alamos	320	C[a]	X[b]	X		no	use available material	X	X	X	X
LAOI-3.2/3.2a	Los Alamos	266	C	X	X		no	use available material	X	X	X	X
LAOI-7	Los Alamos	365.5	C	X	X		no	7.5 to 379 (12 samples)	X	X	X	X
LADP-3	Los Alamos	342	C	X	X		no	use available material	X	X	X	X
R-8	Los Alamos	261	C	X	X		no	7 to 229.8 (39 samples)	X	X	X	X
R-9	Los Alamos	intermittent	C	X	X		no	0 to 692	X	X	X	X
R-1	Mortandad	399	C	X	X	32.3, 63.7, 91.5, 151.2, 201.5, 251.5, 276.5, 301.2, 350.8	6 samples	21.5, 40.9, 51.1, 76, 101.1, 126.6, 176.5, 226.5	X	X	X	X
R-14	Mortandad	300	C	X	X		no	2.9 to 299.6 (24 samples)	X	X	X	X
R-15	Mortandad	750	C	X	X		no	2 to 746	X	X	X	X
R-28	Mortandad	325	C	X	X	31.4, 51.5, 76.3, 126.5, 251.5, 276.5, 319.8	7 samples	9.7 to 319.8	X	X	X	X
MCOI-6	Mortandad	498	C	X	X		no	9 to 498 (36 samples)	X	X	X	X
MCOI-8	Mortandad	478	C	X	X		no	8 to 478 (46 samples)	X	X	X	X
MC-1-AHF	Mortandad	146	C	X	X		no	3 to 146 (18 samples)	X	X	X	X
MC-2-AHF	Mortandad	161	C	X	X		no	3 to 161 (10 samples)	X	X	X	X
MC-3-AHF	Mortandad	119	C	X	X		no	5 to 119 (21 samples)	X	X	X	X
35-2028	Mortandad	298	C	X	X		no	use available material	X	X	X	X
R-11	Sandia	296.5	C	X	X	8.6 to 250.0 (13 samples)	6 samples	8.6 to 250.0 (13 samples)	X	X	X	X
R-12	Sandia	intermittent	C	X	X		no	5 to 880	X	X	X	X
SC-2-AHF	Sandia	146.5	X	X	X		no	use available material	X	X	X	X

Table 4-4 (continued)

Hole	Watershed	Core Depth	Anions	DI Leach Cr	EPA 3050 Leach Cr	Core in Moisture Protect for Cr(VI) Analysis (ft)	Chromium (VI)	Dried Core for DI and 3050 Leach of Cr (ft)	TAL Metals	Nitrogen Isotopes	Tritium	TOC
SC-3-AHF	Sandia	121.2	X	X	X		no	use available material	X	X	X	X
SC-4-AHF	Sandia	99	X	X	X		no	use available material	X	X	X	X
SC-5-AHF	Sandia	84	X	X	X		no	use available material	X	X	X	X

[a] C = Completed.

[b] X = Perform the analysis.

Table 4-5
Sampling Sites, Field Preparation, and Analyte Suites for Background Chromium Activity

Location	Analytical Suite/Field Preparation					
	Anions (EES-6)[a] (F[b])	Metals[c](EES-6) (F)	Hexavalent Chromium[d] (Severn Trent) (F)	Hexavalent Chromium[e] (EES-6) (F)	Field Parameters[f]	Water Levels/Flow Estimates
Alluvial Groundwater						
LAO-B	X	X	X	X	X	X
Intermediate-Depth Groundwater						
LAOI(a) - 1.1	X	X	X	X	X	X
Regional Groundwater						
R-27	X	X	X	X	X	X
R-2	X	X	X	X	X	X
R-18	X	X	X	X	X	X
R-24	X	X	X	X	X	X
Guaje-5	X	X	X	X	X	X
Otowi-4	X	X	X	X	X	X
Springs						
Campsite Spring	X	X	X	X	X	X
Young Spring	X	X	X	X	X	X
Sacred Spring	X	X	X	X	X	X
Sandia Spring	X	X	X	X	X	X
Spring 1	X	X	X	X	X	X
La Mesita Spring	X	X	X	X	X	X
Spring 3	X	X	X	X	X	X
Spring 5	X	X	X	X	X	X
Spring 6	X	X	X	X	X	X
Spring 9A	X	X	X	X	X	X
Spring 9B	X	X	X	X	X	X
Spring 4A	X	X	X	X	X	X
Spring 4B	X	X	X	X	X	X

[a] Anions by ion chromatography include Br^-, Cl^-, F^-, NO_3^-, NO_2^-, PO_4^{-3}, $C_2O_4^{-2}$ (oxalate), and SO_4^{-2}, total alkalinity (as $mgCaCO_3/L$).

[b] F = Filtered.

[c] Metals at EES-6 laboratory by inductively coupled optical emission spectroscopy and inductively coupled plasma mass spectroscopy w/cation exchange column for hexavalent chromium.

[d] Hexavalent Cr at Severn Trent by ion chromatography.

[e] Hexavalent Cr at EES-6 by ion chromatography.

[f] Field parameters include dissolved oxygen, pH, temperature, specific conductance, and turbidity.

Table 5-1
Applicable Standard Operating Procedures

Procedure	Title
SOP-01.01	General Instructions for Field Investigations
SOP-01.02	Sample Containers and Preservation
SOP-01.03	Handling, Packaging, and Shipping of Samples
SOP-01.04	Sample Control and Field Documentation
SOP-01.05	Field Quality Control Samples
SOP-01.06	Management of Environmental Restoration Project Waste
SOP-01.08	Field Decontamination of Drilling and Sampling Equipment
SOP-01.10	Waste Characterization
SOP-04.01	Drilling Methods and Drill Site Management
SOP-04.04	Contract Geophysical Logging
SOP-04.05	Leaching of Soil and Rock Samples for Anions
SOP-05.01	Well Construction
SOP-05.02	Well Development
SOP-05.03	Monitor Well and RFI Borehole Abandonment
SOP-05.07	Operation of LANL-Owned Borehole Logging Trailer
SOP-06.01	Purging and Sampling Methods for Single Completion Wells
SOP-06.02	Field Analytical Measurements of Groundwater Samples
SOP-06.10	Hand Auger and Thin-Wall Tube Sampling
SOP-06.13	Surface Water Sampling
SOP-06.24	Sample Collection from Split-Spoon Samplers and Shelby Tube Samplers
SOP-06.26	Core Barrel Sampling for Subsurface Earth Materials
SOP-07.01	Pressure Transducers
SOP-07.02	Water Level Measurements
SOP-09.10	Field Sampling of Core and Cuttings for Geological Analysis
SOP-09.11	Petrography
SOP-12.01	Field Logging, Handling, and Documentation of Borehole Materials
SOP-12.02	Transportation, Receipt, and Admittance of Borehole Samples to the Field Support Facility
SOP-12.04	Physical Processing, Storage, and Examination of Borehole Material at the Field Support Facility

Appendix 1

SWMU Review

Appendix 1 presents a review of solid waste management units (SWMUs) in Los Alamos, Sandia, and Mortandad canyons that are associated with chromium usage. The review was conducted using the Laboratory's potential release site database which derives information from a number of sources. The list of sites provided in the summary presented herein is not intended to be a complete list of all sites where chromium was used but are rather the most potentially significant sites. Emphasis was placed on SWMUs that had a combination of chromium usage and significant volumes of water released.

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TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
Los Alamos Watershed								
TA-02		02-005	Drift loss, cooling tower blow-down	An area affected by drift loss of potassium dichromate from the Omega West Reactor (OWR) cooling tower (structure 02-49) from 1957 to the mid-1970s.	SWMU Report 1990, Vol. 1 of 4 (LA-UR-90-3400)	Warner, C.L. 1971 (04251). "Potassium Dichromate Entrainment in OWR Cooling Tower Drift, "Los Alamos Scientific Laboratory memorandum to OWR Committee, December 10, 1971. See also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	The SWMU report states potassium dichromate was used to treat cooling water for the Omega cooling tower (structure 2-49) in the early days of operation. During the 1987 CEARP field survey, an employee recalled that the drift loss of potassium dichromate turned the hillside green. Measurements in 1971 indicate 0.05 lb of hexavalent chromium per hour of operations was lost.	See CEARP 1987, Section TA2-5-CA-I-HW (Potassium dichromate drift) p.TA2-9
					CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)		The CEARP states that potassium dichromate was used on the cooling tower (structure 2-49) at Omega. Measurements in 1971 indicated that 0.05 lb of hexavalent chromium per hour of operation of the cooling tower under normal loads was being lost because of the drift loss in the cooling tower (Warner 1971).	The 1987 CEARP also states that during the CEARP field survey in 1987, one employee recalled that the loss potassium dichromate "turned things green." When the heat exchangers were rebuilt and stainless steel was used rather than aluminum, there was no longer a need to use potassium dichromate, and the "greening of the landscape" went away. See CEARP 1987, Section TA2-5-CA-I-HW (Potassium dichromate drift) p.TA2-9

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-02		02-004(b)	Reactor facility effluent storage tank	Associated with Omega West Reactor activities	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Frechette, Muriel A. 1964 (04242). "Monthly Progress Report for Period January 21, 1964 through February 20, 1964, " Los Alamos Scientific Laboratory memorandum to Dean D. Meyer, February 24, 1964. See also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	The CEARP says in Feb. 1964, 125 gal. of slightly acidic liquid waste containing 2 mCi chromium-51, 0.43 mCi antimony-124, 0.2 mCi iron-59, and 0.2 mCi manganese-54 was reported to have been discharged from the OWR storage tanks to Los Alamos Canyon. How often this type of discharge occurred is not known (Frechette 1964) (p.TA2-8).	See CEARP 1987, Section "TA2-2-CA/S/UST-A/I-HW/RW (Sumps, lines and manholes) p. TA2-6
TA-02		02-011(e)	Former NPDES-permitted outfall [duplicate of 02-008(a)]	Associated with operation of Omega West Reactor	SWMU Report 1990, Vol. 1 of 4 (LA-UR-90-3400)	Duplicate of 02-008(a); Neely, Glenn, 1992. "Personal Communication to R. Brown (ERM/Golder) from G. Neely, Los Alamos National Laboratory," October 20, 1992. See also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	The 1990 SWMU report says that this outfall may have released hazardous materials associated with treating coolant waters.	
TA-02		02-008(a)	Outfall	Associated with operation of Omega West Reactor	SWMU Report 1990, Vol. 1 of 4 (LA-UR-90-3400)	RFI Work Plan for Operable Unit 1098 (LA-UR-93-3825); Neely, Glenn, 1992. "Personal Communication to R. Brown (ERM/Golder) from G. Neely, Los Alamos National Laboratory," October 20, 1992. See also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	The SWMU report says the cooling tower (structure 02-49) blow-down in early days of operation discharged to this outfall and the blow-down contained chromium. The discharge may have also included radioisotopes of chromium, zinc, and antimony.	PRS 02-011(e) is a duplicate of this PRS 02-008(a).

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-02		02-004(c)	Reactor facility effluent storage tank	Associated with Omega West Reactor activities	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Frechette, Muriel A. 1964 (04242). "Monthly Progress Report for Period January 21, 1964 through February 20, 1964, " Los Alamos Scientific Laboratory memorandum to Dean D. Meyer, February 24, 1964. See also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	The CEARP says in Feb. 1964, 125 gal. of slightly acidic liquid waste containing 2mCi chromium-51, 0.43 mCi antimony-124, 0.2 mCi iron-59, and 0.2 mCi manganese-54 was reported to have been discharged from the OWR storage tanks to Los Alamos Canyon. How often this type of discharge occurred is not known (Frechette 1964) (p.TA2-8).	See CEARP 1987, Section "TA2-2-CA/S/UST-A/I-HW/RW (Sumps, lines and manholes) p. TA2-6
TA-02		02-004(d)	Reactor facility effluent storage tank	Associated with Omega West Reactor activities	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Frechette, Muriel A. 1964 (04242). "Monthly Progress Report for Period January 21, 1964 through February 20, 1964, " Los Alamos Scientific Laboratory memorandum to Dean D. Meyer, February 24, 1964. See also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	The CEARP says in Feb. 1964, 125 gal. of slightly acidic liquid waste containing 2mCi chromium-51, 0.43 mCi antimony-124, 0.2 mCi iron-59, and 0.2 mCi manganese-54 was reported to have been discharged from the OWR storage tanks to Los Alamos Canyon. How often this type of discharge occurred is not known (Frechette 1964) (p.TA2-8).	See CEARP 1987, Section "TA2-2-CA/S/UST-A/I-HW/RW (Sumps, lines and manholes) p. TA2-6
TA-02		02-011(d)	Former NPDES-permitted outfall	Associated with the Omega West Reactor facility equipment building	SWMU Report 1990, Vol. 1 of 4 (LA-UR-90-3400)	See also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	The 1990 SWMU reports says that this outfall may have released hazardous materials associated with treating coolant waters.	

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-01	01-001(a)-99	01-006(a)	Drainlines and outfall	Associated with cooling tower 80	SWMU Report 1990, Vol. 1 of 4 (LA-UR-90-3400)	RFI Report for TA-01: Aggregates E, G, PRSs 01-001(g), 01-003(b), 0-006(a,g), 01-001(c), 01-006(b,c,d,n), 01-007(a,b,c,j)(p.31-49) (ERID 54465, LA-UR-96-1019, p. 32); LANL 1987 (02956), "Analytical Results of Verification Sampling Former Main Technical Area (TA-01) Los Alamos National Laboratory Environmental Surveillance Group (HSE-8) and Health and Environmental Chemistry Group (HSE-9)" May.	In the PRS database the description says it is speculated that the chromium-containing biocides may have been added to the cooling tower.	
Mortandad Watershed								
TA-03		03-054(e)	Outfall	Outfall that receives runoff from originates from several sources at the CMR (Building 03-29)	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	??	The 1990 SWMU report says cooling tower discharges may have contained chromates.	Possible associated cooling towers with structure numbers 3-102 and 3-156 (SEE 1990 SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-46		46-004(y)	Outfall	Historical blow-down outfall from the cooling tower that serves Building 46-31.	PRS Database	LANL 1996 (54929.3) "RFI Report for Potential Release Sites in TA-46: PRSs 46-003(h), 46-004(b,g,h,m,q,s,u,v,x,y,z,a2, b2,c2,d2,e2,f2), 46-006(a,b,c,d,f,g), 46-007, 46-008(b), 46-010(d), C-46-002, C-46-003, Field Unit 3" (p.88-93; LA-UR-96-1957); LANL 1993 (20952.1) "RFI Work Plan for Operable Unit 1140" (p. 5-127; LA-UR-93-1940); Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments" McCulla, A. 1992 (40095), "Summary of Summer Work (Outfalls)"	SWMU 46-004(y) was the historical blow-down outfall from the cooling tower that serves Building 46-31. It also received effluent from the building's floor and roof drains, as well as its laboratory sinks.	
TA-03	03-049(b)-00	03-049(b)	Operational release	Discharge area at the south wall of the press building (Building 03-35) associated with an inactive vacuum pump that served furnaces in Building 03-35	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	??	The 1990 SWMU report says gold citrate and HCW are produced in the gold electroplating process, in addition numerous metals, acids and cyanide were used in the process of chromium plating. The cooling tower was treated with organo-chelates. Oil and grease may have been discharged from the vacuum pump.	
TA-03		03-049(e)	Outfall	Possible soil contamination from an outfall pipe located south of the Sigma Building (Building 03-66)	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	??	The 1990 SWMU report says gold citrate and HCW are produced in the gold electroplating process, in addition numerous metals, acids and cyanide were used in the process of chromium plating. The cooling tower was treated with organo-chelates. Oil and grease may have been discharged from the vacuum pump.	

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-045(h)-00	03-049(a)	Outfall	NPDES-permitted outfall associated with cooling towers	PRS Database	LANL 1997 (56660-4), "RFI Report for TA-03 for Potential Release Sites 3-004(c,d), 3-007, 3-014(k,l,o), 3-021, 3-049(a), 3-052(b), 3-056(k), C-03-014, Field Unit 1" (LA-UR-97-3571); LANL 1995 (57590), "RFI Work Plan for Operable Unit 1114, Addendum 1" (p. 5-13-1)	Between the 1950s and 1970s chromates were used to treat cooling water. The cooling tower has operated since 1960. From 1984 to 1990, the outfall also received discharge from rinse tanks associated with the electroplating operation in Building 03-66. The tanks contained the final rinse from electroplating and surface-finishing experimental components. Although the rinse tanks were flushed continually with tap water to preclude contaminant buildup, trace amounts of metals, acids, cyanide, and depleted uranium were introduced into the rinse water. The NPDES permit allowed discharge of 4680 gal. per day of treated cooling water and 24,000 gal. per day of electroplating rinse water. Since 1990, the outfall has received only treated cooling water and roof-drain runoff. The outfall discharges to Mortandad Canyon.	
					SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Mitchell, J. 1990 (no ERId), "Sigma Complex Drains and Outfalls Meeting Notes, June 22, 1990, Los Alamos National Laboratory Memorandum MST-DO/SRW-90-19 from J. Mitchell (MST-DO) to S. Whittington (MST-DO)"	The 1990 SWMU Report says gold citrate and HCW are produced in the gold electroplating process, in addition numerous metals, acids and cyanide were used in the process of chromium plating. The cooling tower was treated with organo-chelates. Oil and grease may have been discharged from the vacuum pump.	3-127 (structure number for associated cooling tower)
					CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Miller, E.L. 1971 (01088). "Effluent from Plant Cooling Towers," Los Alamos Scientific Laboratory memorandum to C. Christenson, July 30, 1971.	CEARP report states that "There are numerous cooling towers in TA-3 that have blow-down discharges to canyon outfalls. According to several employees, cooling tower water for the tower serving TA-3-66 had chromium added during the early years of operation. Blow-down was discharged to Mortandad Canyon.	See CEARP 1987, section TA3-6-CA/O-A/I-HW/RW (Outfalls) pp. TA3-12 to TA3-13 3-127 (structure number for associated cooling tower)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-46	46-004(d2)-99	46-004(g)	Outfall / stack emissions	Reported as potentially contributing to surface soil contamination at TA-46 in the form of airborne releases of radionuclides or hazardous constituents through building stacks.	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Miller, E.L. 1971 (01088). "Effluent from Plant Cooling Towers," Los Alamos Scientific Laboratory memorandum to C. Christenson, July 30, 1971.	A 1971 memo reported that building 1 had a cooling tower with a discharge of 10500 gal. per year. Between the 1950s and 1970s chromates were used to treat cooling water (p.TA46-5).	See CEARP 1987, section TA46-1-CA/O-I-HW/RW (outfalls and storm sewer) p. TA46-5
TA-48	48-007(a)-00	48-007(a)	Drains and outfalls	Outfall used to discharge treated cooling tower blow-down from two cooling towers located on the roof of Building 48-1	1990 SWMU report, Volume 3 of 4 (LA-UR-90-3400)	??	Report says water from cooling towers at TA-48-1discharges to this outfall.	
					PRS Database	LANL 1992 (07666), "RFI Work Plan for OU 1129" (LA-UR-92-0800; p. 3-102); Radzinski, B., July 20, 1991 (No ERId). "Personal communication between L. Clark and B. Radzinski, International Technology (IT) Corporation Telephone Log" LANL 1995 (50289.1) "RFI Report for TA-48: PRSs 48-001, 48-002(e), 48-003, 48-005, 48-007(a,b,c,d, f), 48-010 (located in former Operable Unit 1129)" (LA-UR-95-3328)	SWMU 48-007(a) is an active outfall used to discharge treated cooling tower blow-down from two cooling towers located on the roof of Building 48-1. This outfall is located east of Building 48-1 and discharges up to 750 gal. per hour of cooling tower blow-down. Water discharges from PRS 48-007(a) flows to impoundment PRS 48-010 The date that this outfall began operation is not known, but Building 48-1 was constructed in 1957, so discharges should not have preceded this date. Between the 1950s and 1970s chromates were used to treat cooling water.	

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-48	48-007(a)-00	48-007(d)	Drains and outfalls	Outfall used to discharge noncontact cooling water used to cool a vacuum pump housed in the south end of building 48-1.	1990 SWMU report, Volume 3 of 4 (LA-UR-90-3400)	??	Reports say water from cooling towers at TA-48-1discharges to this outfall.	
					PRS Database	??	Active outfall used to discharge noncontact cooling water used to cool a vacuum pump housed in the south end of Building 48-1. The date that this outfall began operation is not known, but Building 48-1 was constructed in 1957. Between the 1950s and 1970s chromates were used to treat cooling water.	
TA-48	48-007(a)-00	48-010	Surface impound-ment	Receives cooling tower blow-down discharged from 48-007(a), noncontact cooling water discharged from 48-007(d), and stormwater runoff from parking lot for Building 48-45.	1990 SWMU report, Volume 3 of 4 (LA-UR-90-3400)	??	Reports says water from cooling towers at TA-48-1discharges to this outfall.	
					PRS Database	LANL 1992 (07666), "RFI Work Plan for OU 1129" (LA-UR-92-0800; p. 3-102); No references in Work Plan or RFI Report: see possibly (03853.18) "LASL Survey of Effluent Streams ENG-4 TA-48 Bldg. 1" LANL 1995 (50289.1) "RFI Report for TA-48: PRSs 48-001, 48-002(e), 48-003, 48-005, 48-007(a,b,c,d, f), 48-010 (located in former Operable Unit 1129) (p.4-34 to 4-48)" (p. 4-35, LA-UR-95-3328)	Received treated cooling water. Between the 1950s and 1970s chromates were used to treat cooling water.	

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03		03-012(a)	Controlled operational release	Site of a controlled operational release located on the north slope of Mortandad Canyon	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	??	The 1990 SWMU report says between 1950s and 1970s chromates were used to treat cooling water from the steam/electric generating plant, TA-03-22. Drift loss and cooling water discharge contributed to elevated hexavalent chromium in the surrounding area.	This controlled operational release is stated to contain 600-700 lb of soluble fluoride, which was released to Mortandad Canyon; however, because chromates were used to treat cooling water, this PRS is a also possible source chromium. SEE 1987 CEARP REFERENCE
					CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	??	CEARP report states that, "According to several employees, cooling tower water for the tower serving TA-3-66 had chromium added during the early years of operation. Blow-down was discharged to Mortandad Canyon" (p. TA3-13)	The release was a controlled operational pipe cleaning procedure. See CEARP 1987, Section TA3-6-CA/O-A/I-W/RW (outfalls) p.TA3-13
TA-03		03-026(c)	Tank and/or associated equipment	11 sumps located at the base of cooling towers in the CMR Building (Building 3-29) that received blow-down water	PRS Database	LANL 1995 (57590) "RFI Work Plan for Operable Unit 1114, Addendum 1" (p. 6-43 to 6-44; LA-UR-95-0731) (RFI Work Plan cites SWMU Report); however, see also Rhodes 1993 (63188.3), "Chromate Use in TA-3 Cooling Towers"	Sump received blow-down water from cooling towers in the CMR building. Between the 1950s and 1970s chromates were used to treat cooling water.	

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-35		35-016(e)	Outfall	Inactive outfall for discharge of noncontact cooling water from the chemical laser facility (Building 35-85)	PRS Database	LANL 1996 (54373.3) "RFI Report for TA-35: PRSs 35-003(h,j,k), 35-004(b), 35-008, 35-009(a,b,c,d), 35-014 (a,b,d,e1,e2,f), 35-015(b), 35-016(e,f,i)" (p. 5-30 to 5-37, LA-UR-96-1293) LANL 1985 (00853), "Cross Index of NPDES Serial #s to Technical Areas and Types of Discharge" (Report also references 1990 SWMU Report)	The outfall consists of two adjacent 2-in. diameter steel pipes, insulated with fiberglass and wrapped with protective aluminum coating, that originate from cooling towers on the roof of Building 35-85. Between the 1950s and 1970s chromates were used to treat cooling water.	
TA-46		46-004(i)	Outfall	Two inactive outfalls, identified as Outfalls D and E, which discharged into Cañada del Buey	SWMU Report, 1990 Volume 3 of 4 (LA-UR-90-3400)	??	Outfall D received blow-down from a cooling tower, Structure TA-46-0086. No chromates or other hazardous additives were reportedly used in cooling towers at TA-46. Outfall E, located directly above Outfall D, served a holding tank located east of the cooling tower. The tank contained dilute lithium hydroxide solutions that were generated in Building TA-46-0031. The lithium hydroxide solutions were reportedly diluted to about 96 ppm with blow-down water before discharge. The outfalls were included on the Laboratory's National Pollutant Discharge Elimination System (NPDES) permit as Outfall 03A044. Outfall 03A044 was removed from the NPDES permit prior to 1990.	46-86 (structure number for associated cooling tower)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-46		46-004(j)	Outfall	Inactive outfall received blow-down from a cooling tower located at Building TA-46-0001.	SWMU Report, 1990 Volume 3 of 4 (LA-UR-90-3400)	??	Inactive outfall that formerly discharged into Cañada del Buey. This outfall received blow-down from a cooling tower located at Building TA-46-0001. No chromates or other hazardous additives were reportedly used in cooling towers at TA-46. The outfall was included on the Laboratory's NPDES permit as Outfall 03A042. Outfall 03A042 was removed from the NPDES permit on March 10, 1998.	
TA-46		46-004(k)	Outfall		SWMU Report, 1990 Volume 3 of 4 (LA-UR-90-3400)	??	Received cooling water. Between the 1950s and 1970s chromates were used to treat cooling water.	
TA-46		46-004(l)	Outfall		SWMU Report, 1990 Volume 3 of 4 (LA-UR-90-3400)	??	Received cooling water. Between the 1950s and 1970s chromates were used to treat cooling water.	
TA-46		46-004(m)	Outfall		SWMU Report, 1990 Volume 3 of 4 (LA-UR-90-3400)	??	Received noncontact cooling water. Between the 1950s and 1970s chromates were used to treat cooling water.	
TA-46		46-004(n)	Outfall		SWMU Report, 1990 Volume 3 of 4 (LA-UR-90-3400)	??	Received noncontact cooling water. Between the 1950s and 1970s chromates were used to treat cooling water.	
TA-46		46-004(o)	Outfall		SWMU Report, 1990 Volume 3 of 4 (LA-UR-90-3400)	??	Received treated cooling water. Between the 1950s and 1970s chromates were used to treat cooling water.	

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-48		48-007(b)	Drains and outfalls	Outfall used to discharge noncontact cooling water used to cool a magnet and laser housed in the main radiochemistry laboratory at TA-48	1990 SWMU report, Volume 3 of 4 (LA-UR-90-3400)	Looked in RFI Report for TA-48: PRSs 48-001, 48-002(e), 48-003, 48-005-48-007(a,b,c,d, f), 48-010 (located in former Operable Unit 1129) (p. 4-48 to 4-57), but it mentioned noncontact cooling water. LANL 1985 (00853), "Cross Index of NPDES Serial #s to Technical Areas and Types of Discharge"	Report says water from cooling towers at TA-48-1discharges to this outfall.	
TA-48		48-007(c)	Drains and outfalls	Outfall that receives discharges from nine floor drains, a trench drain, and six roof drains at the main radiochemistry laboratory at TA-48	1990 SWMU report, Volume 3 of 4 (LA-UR-90-3400)	Looked in RFI Report for TA-48: PRSs 48-001, 48--002(e), 48-003, 48-005, 48-007(a,b,c,d, f), 48-010 (located in former Operable Unit 1129) (p. 4-48 to 4-57), but it mentioned noncontact cooling water. LANL 1985 (00853), "Cross Index of NPDES Serial #s to Technical Areas and Types of Discharge"	Report says water from cooling towers at TA-48-1discharges to this outfall.	
TA-50		50-001(a)	Waste treatment facility TA-50-1 - RCRA Unit (active)	Active radioactive liquid waste treatment plant (Building 50-1) that has operated continuously since its construction in 1963	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	??	A liquid waste batch treatment system is located in Building 1 at TA-50. Wastes that have been treated include chromate plating solutions (p. TA50-7)	CEARP text states there is no evidence of residual environmental contamination. See CEARP 1987, Section TA50-7-CA-I/A-HW (batch processing plant) p. TA50-7

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
Sandia Watershed								
TA-03	03-045(h)-00	03-045(h)	Outfall (industrial or sanitary wastewater treatment)	NPDES-permitted outfall associated with cooling towers	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Request for Permit Modification, Units Proposed for NFA, September 1996, Volume I (ERID 55102.4, LA-UR-96-3357); see also Radzinski, B. 1992 (40068.1), "Cooling Tower Water Treatments"	Between the 1950s and 1970s chromates were used to treat cooling water. Treated cooling water and stormwater were discharged at the outfall into Sandia Canyon. CEARP report states that "There are numerous cooling towers in TA-03 that have blow-down discharges to canyon outfalls." In 1971 the following cooling systems discharging to Sandia Canyon were noted: TA-03-187; TA-03-285; and TA-3-127. Although the chemicals added were reported to be "biodegradable and nontoxic" (Miller 1971), chromates are known to have been added to cooling tower water between the 1950s and 1970s (p.TA03-13)	3-187 (structure number for associated cooling tower)
TA-03		03-054(c)	Outfall	Former cooling tower, pump house (structures 03-156 and -163) and an inactive outfall (deleted from the NPDES permit on 7/11/95)	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	LANL 1995 (57590), "RFI Work Plan for Operable Unit 1114, Addendum 1" (p. 6-71 to 6-72, LA-UR-95-0731)	PRS includes a former cooling tower, pump house (structures 03-156 and 163) and an inactive outfall (removed from the NPDES permit on 7/11/95). The cooling tower was located southwest of the Sherwood Complex (Building 03-105) and northwest of the Syllac Building (Building 03-287) and was used to cool an electromagnet formerly located in the Sherwood Complex. The outfall discharged into the storm sewer formerly located 25 ft east of the cooling tower. Between the 1950s and 1970s chromates were used to treat cooling water. Outfall received cooling tower water from TA-03-156. This cooling tower was noted to be leaking onto the surrounding soil in 1989.	

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-53		53-012(e)	Outfall	Drainline and outfall associated with the equipment test lab (Building 53-2).	PRS Database	RFI Report for TAs -20, -53, and -72 (located in the former Operable Unit 1100) (ERID 54466.4, LA-UR-96-0906)	Primary source of wastewater is blow-down from the Building 53-2 cooling tower, which is discharged to one of the trench drains. Between the 1950s and 1970s chromates were used to treat cooling water.	
TA-03	03-014(a)-99	03-014(a)	Wastewater treatment facility	WWTP Imhoff tanks	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	LANL 1996 (52930), "RFI Report for 53 Potential Release Sites in TAs -03, -59, -60, -61" (p. 83-94, LA-UR-96-0276); Root Reference from SWMU Report: Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	In previous years, unknown quantities of industrial liquids may have been included in waste received at this WWTP. In a 1985 memo it was noted that 167,000 gal/day of non-sanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-3-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(b)	Wastewater treatment facility	WWTP dosing siphon	SWMU Report 1990, Volume 1 of 4 (LA-UR-90--3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-3-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
0-03	03-014(a)-99	03-014(b2)	Outfall	WWTP historical outfall to Sandia Canyon	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	LANL 1996 (52930), "RFI Report for 53 Potential Release Sites in TAs -03, -59, -60, -61" (p. 94-102, LA-UR-96-0276); Root Reference from SWMU Report: Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of non-sanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(c)	Wastewater treatment facility	WWTP trickling filter	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-3-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-014(a)-99	03-014(c2)	Outfall	WWTP historical outfall to Sandia Canyon	PRS (potential relaease site) Database	RFI Report for 53 Potential Release Sites in TAs -03, -59, -60, -61(p.102-113) (ERID 52930, LA-UR-96-0726)	Effluent received by this outfall consisted of materials that previously were diverted to the TA-03 power plant (Building 03-22) for use as cooling tower water	
					SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(d)	Wastewater treatment facility	WWTP final clarifying tanks	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-014(a)-99	03-014(e)	Wastewater treatment facility	WWTP Imhoff tanks	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	LANL 1996 (52930), "RFI Report for 53 Potential Release Sites in TAs -03, -59, -60, -61" (p. 83-94, LA-UR-96-0276); Root Reference from SWMU Report: Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(f)	Wastewater treatment facility	WWTP dosing siphon	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(g)	Wastewater treatment facility	WWTP trickling filter	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-014(a)-99	03-014(h)	Wastewater treatment facility	WWTP final clarifying tanks	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(i)	Wastewater treatment facility	WWTP Splitter box, comminutor, and bar racks	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(j)	Wastewater treatment facility	WWTP chlorination system added in 1985	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-014(a)-99	03-014(k)	Wastewater treatment facility	WWTP unlined sludge drying beds	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Reference to chromium found in LANL 1997 (56660.4) RFI Report for TA-03 for Potential Release Sites 3-004(c,d), 3-007, 3-014(k,l,o), 3-021, 3-049(a), 3-052(b), 3-056(k), C-03-014, Field Unit 1 (p. 57-78, LA-UR-97-3571); Root Reference in SWMU Report: Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-03-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(l)	Wastewater treatment facility	WWTP unlined sludge drying beds	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Reference to chromium found in LANL 1997 (56660.4) RFI Report for TA-03 for Potential Release Sites 3-004(c,d), 3-007, 3-014(k,l,o), 3-021, 3-049(a), 3-052(b), 3-056(k), C-03-014, Field Unit 1 (p. 57-78, LA-UR-97-3571); Root Reference from SWMU Report: Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-014(a)-99	03-014(m)	Wastewater treatment facility	WWTP unlined sludge drying beds	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(n)	Wastewater treatment facility	WWTP unlined sludge drying beds	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(o)	Wastewater treatment facility	WWTP lower sludge drying beds that received overflow	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-014(a)-99	03-014(p)	Wastewater treatment facility	WWTP sewage lift station	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)
TA-03	03-014(a)-99	03-014(u)	Wastewater treatment facility	WWTP sludge bed effluent holding tank	SWMU Report 1990, Volume 1 of 4 (LA-UR-90-3400)	Sitzberger, E. 1985 (03979), "Improvements to the TA-3 Domestic Waste Treatment Plant" December 10.	Unknown quantities of industrial liquids may have been included in the waste in previous years. In a 1985 memo it was noted that 167,000 gal/day of nonsanitary waste was being diverted to the sewage treatment plant. This nonsanitary waste apparently included plating rinse water from TA-3-66, laser cooling water commingled with administratively controlled radioactive/toxic contaminated process water from TA-43-1 and cooling water from TA-41 and TA-03-29.	Plating waste and cooling tower water may contain chromium. In addition, photographic wastes were received (see SWMU Report)

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-012(b)-00	03-012(b)	Operational release and outfall	Discharge point that received effluent from the TA-03 steam plant neutralization tank, the chlorine building, and a former cooling tower (3-58). This outfall served two cooling towers (structures 03-25 and 03-58)	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Reinig, L.P.I415 Report- Chromate Problem," Los Alamos Scientific Laboratory, March 7, 1972. Shaykin, Jerome D. 1968. "Health Protection Appraisal Report, Los Alamos Area Office and the Zia Company, Los Alamos, NM," Los Alamos Scientific Laboratory, December 17-19, 1968 Zia Company. 1972. "Conceptual Design Report for Chemical Reduction System, TA-3 Power Plant, Los Alamos, NM," February 1, 1972	Chromate from drift loss during the early years of operation may be present in soils near the TA-3 power plant (p. TA3-9); Corrosion inhibitors of the blended chromate-phosphate-zinc type were apparently used from 1950 to the mid-1970s. Chromate usage was 35.9 lb per day. Blow-down was at 288,000 gal. per day with hexavalent chromium at levels up to 34 ppm in the discharge. Shaykin (1968) reports that "total chromate analyses of the stream before it disappears averages 10–15 ppm, half of which is estimated to be in the hexavalent or toxic form" (p. TA3-13).	See CEARP 1987, Section "TA3-1-CA-A/I-HW/RW (Facilities)," p. TA3-9 and Section "TA3-6-CA/O-A/I-HW/RW (Outfalls)," p. TA3-12, 3-58 and 3-25 are structure numbers for associated cooling towers
					1990 SWMU Report, Volume 1 of 4 (LA-UR-90-3400)	??	Between the 1950s and 1970s chromates were used to treat cooling water from the steam/electric generating plant (TA-03-22). Drift loss and the cooling water discharge to Sandia Canyon contributed to elevated hexavalent chromium in the surrounding area.	3-58 and 3-25 are structure numbers for associated cooling towers

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-012(b)-00	03-014(q)	Wastewater treatment facility	Power plant holding tank, which received blow-down from the boilers and wastewater from the water treatment area	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Reinig, L.P.I415 Report-Chromate Problem," Los Alamos Scientific Laboratory, March 7, 1972. Shaykin, Jerome D. 1968. "Health Protection Appraisal Report, Los Alamos Area Office and the Zia Company, Los Alamos, NM," Los Alamos Scientific Laboratory, December 17-19, 1968. Shulte, Harry F.1968. "Disposal of Chemical Waste," Los Alamos Scientific Laboratory memorandum to Harold H. Soenke, September 24, 1968. Zia Company. 1972. "Conceptual Design Report for Chemical Reduction System, TA-3 Power Plant, Los Alamos, NM," February 1, 1972	PRS 03-014(q) is a holding tank associated with TA-03-22. Chromate from drift loss during the early years of operation may be present in soils near the TA-03 power plant (p. TA3-9); Corrosion inhibitors of the blended chromate-phosphate-zinc type were apparently used from 1950 to the mid-1970s. Chromate usage was 35.9 lb per day. Blow-down was at 288,000 gal. per day with hexavalent chromium at levels up to 34 ppm in the discharge. Shaykin (1968) reports that "total chromate analyses of the stream before it disappears averages 10–15 ppm, half of which is estimated to be in the hexavalent or toxic form" (p. TA3-13).	See CEARP 1987, Section "TA3-1-CA-A/I-HW/RW (Facilities)," p. TA3-9 and Section "TA3-6-CA/O-A/I-HW/RW (Outfalls)," p. TA3-12

TA[a]	Parent Consolidated Unit	Child PRS[b]	Brief Description	Operation (from PRS database)	Reference	Root Reference (?? = reference unknown)	Chromium-Related Activities	Notes
TA-03	03-012(b)-00	03-045(b)	Industrial or sanitary wastewater treatment		***Same site as 03-012(b); CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2***	Reinig, L.P.I415 Report-Chromate Problem," Los Alamos Scientific Laboratory, March 7, 1972. Shaykin, Jerome D. 1968. "Health Protection Appraisal Report, Los Alamos Area Office and the Zia Company, Los Alamos, NM," Los Alamos Scientific Laboratory, December 17-19, 1968 Zia Company. 1972. "Conceptual Design Report for Chemical Reduction System, TA-3 Power Plant, Los Alamos, NM," February 1, 1972	PRS is a permitted outfall associated with TA-03-22. Chromate from drift loss during the early years of operation may be present in soils near the TA-03 power plant (p. TA-03-9); Corrosion inhibitors of the blended chromate-phosphate-zinc type were apparently used from 1950 to the mid-1970s. Chromate usage was 35.9 lbs. per day. Blow-down was at 288,000 gal. per day with hexavalent chromium at levels up to 34 ppm in the discharge. Shaykin (1968) reports that "total chromate analyses of the stream before it disappears averages 10–15 ppm, half of which is estimated to be in the hexavalent or toxic form" (p. TA3-13).	See CEARP 1987, Section "TA3-1-CA-A/I-HW/RW (Facilities)," p. TA3-9 and Section "TA3-6-CA/O-A/I-HW/RW (Outfalls)," p. TA3-12
TA-03	03-012(b)-00	03-045(c)	Outfall	Former cooling tower, pump house (structures 03-156 and -163) and an inactive outfall (deleted from the NPDES permit on 7/11/95)	CEARP 1987 Phase I: Installation Assessment, Volume 1 of 2 (ERID 08663)	Miller, E.L. 1971 (01088). "Effluent from Plant Cooling Towers," Los Alamos Scientific Laboratory memorandum to C. Christenson, July 30, 1971.	CEARP report (p. TA3-13) states that "There are numerous cooling towers in TA-3 that have blow-down discharges to canyon outfalls. In 1971 the following cooling systems discharging to Sandia Canyon were noted: TA-03-187; TA-03-285; and TA-03-127. Although the chemicals added were reported to be 'biodegradable and nontoxic' (Miller 1971), chromates are known to have been added to cooling tower water between the 1950s and 1970s."	See also CEARP 1987, Section "TA3-1-CA-A/I-HW/RW (Facilities)," p. TA3-9 and Section "TA3-6-CA/O-A/I-HW/RW (Outfalls)," p. TA3-12 3-285 (structure number for associated cooling tower)
					PRS Database	??	This outfall receives effluent from a cooling tower (structure 03-285), which serves the generators that power LANL's computer system. This outfall may have received chromate-treated water.	

[a] TA = Technical area.

[b] PRS = Potential release site.

Appendix 2

Advanced Hydrotest Facility Report and Data
(on CD included with this document)

Appendix 2 includes information from core holes drilled in Mortandad and Sandia canyons for a project conducted in support of the potential Advanced Hydrotest Facility (AHF).

As part of the preliminary characterization for the proposed AHF, three core holes were drilled in 2002 in Mortandad and Sandia canyons to obtain samples from the Otowi Member of the Bandelier Tuff for rock properties testing (Kleinfelder 2002, 91687). The holes were continuously cored from the surface into the Otowi Member with a hollow-stem auger rig. Once the rock-property samples were removed, the core was sampled on approximately 5-ft intervals to 10 ft and approximately every 10 ft thereafter to the bottom of the core. Samples were collected from the Mortandad Canyon cores for anions (bicarbonate, bromide, chloride, nitrate, nitrite, perchlorate, phosphate, oxalate, and sulfate) and cations (aluminum, calcium, iron, potassium, magnesium, manganese, sodium, and silicon). The Sandia Canyon cores will be analyzed as part of this investigation.

Depth profiles were plotted for all three Mortandad Canyon cores using analytical data derived from a deionized water leaching procedure (for more details about the procedure, see Broxton et al. 2001, 71252; LANL 1996, 59118). Leachates were analyzed using ion chromatography for the anions and inductively coupled plasma optical emission spectroscopy for the cations. In situ pore water concentrations were then calculated using the leachate concentrations, gravimetric moisture contents, and bulk densities for the various stratigraphic units. Moisture contents were determined gravimetrically on each sample before the sample was leached.

The complete geotechnical report is included in pdf format on the enclosed CD. The analytical data from pore fluids collected from core and depth profiles are included as Excel tables in electronic format on the enclosed CD.

REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Stewardship–Environmental Remediation and Surveillance (ENV-ERS) Program Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the ENV-ERS Program. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Broxton, D.E., R. Warren, D. Vaniman, B. Newman, A. Crowder, M. Everett, R. Gilkeson, P. Longmire, J. Marin, W. Stone, S. McLin, and D. Rogers, May 2001. “Characterization Well R-12 Completion Report,” Los Alamos National Laboratory report LA-13822-MS, Los Alamos, New Mexico. (Broxton et al. 2001, 71252)

Kleinfelder, Inc., 2002. “Report of Pre-Conceptual Geotechnical Investigations, Advanced Hydrotest Facility Project, TA-53,” Kleinfelder, Inc., report Project Number C59010120, prepared for Los Alamos National Laboratory, New Mexico. (Kleinfelder 2002, 91687)

LANL (Los Alamos National Laboratory), 1996. “Vadose Zone Water Movement at Area G, Los Alamos National Laboratory, TA-54: Interpretations Based on Chloride and Stable Isotope Profiles.” Los Alamos National Laboratory document LA-UR-96-4682, Los Alamos, New Mexico. (LANL 1996, 59118)

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MC-3

Paste New Data in Row 59 Column 1

SAMPLE/ft		DESCRIPTION	H2O content%	Dry wt.	DI Added	date MM/DD/YY
4.5-5.5		MC-3	0.488	50.080	75.000	6/5/05
9.5-10.5		MC-3	0.236	50.000	75.080	6/5/05
14.5-15.5		MC-3	0.238	49.960	75.040	6/5/05
19.5-20.5		MC-3	0.179	50.010	75.110	6/5/05
24.5-25.5		MC-3	1.719	49.960	75.050	6/5/05
29.5-30.5		MC-3	1.195	50.130	75.180	6/5/05
34.5-35.5		MC-3	0.824	50.170	75.210	6/5/05
39.5-40.5		MC-3	0.156	50.000	75.040	6/5/05
44.5-45.5		MC-3	0.472	50.110	75.100	6/5/05
49.5-50.5		MC-3	0.661	50.130	75.140	6/5/05
54.5-55.5		MC-3	0.755	50.130	75.080	6/5/05
59.5-60.5	MC-3		0.112	49.930	74.920	6/5/05
63.5-64.5	MC-3		1.271	50.320	75.300	6/5/05
67.5-68.5	MC-3		0.586	50.060	75.040	6/5/05
76.5-77.5	MC-3		0.492	50.090	75.070	6/5/05
81.5-82.5	MC-3		0.745	50.110	75.120	6/5/05
91.0-92.0	MC-3		0.420	50.040	75.010	6/5/05
100.5-101.5	MC-3		1.117	50.140	75.100	6/5/05
103.0-103.5	MC-3		0.911	50.140	75.120	6/5/05
111.0-112.0	MC-3		0.393	49.980	74.980	6/5/05
118.7-118.9	MC-3		0.422	49.920	75.000	6/5/05
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
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	0	0	0.000	0.000	0.000	1/0/00
	0	0	0.000	0.000	0.000	1/0/00
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H2O conte

SAMPLE/FT	temp ID		DESCR	depthFt	date MMDDYY	ER Req#
CAMO-05-60676	33		MC-3	4.5-5.5	Jun-05	3369S
CAMO-05-60677	34		MC-3	9.5-10.5	Jun-05	3369S
CAMO-05-60678	35		MC-3	14.5-15.5	Jun-05	3369S
CAMO-05-60679	36		MC-3	19.5-20.5	Jun-05	3369S
CAMO-05-60680	37		MC-3	24.5-25.5	Jun-05	3369S
CAMO-05-60681	38		MC-3	29.5-30.5	Jun-05	3369S
CAMO-05-60682	40		MC-3	34.5-35.5	Jun-05	3369S
CAMO-05-60683	41		MC-3	39.5-40.5	Jun-05	3369S
CAMO-05-60684	42		MC-3	44.5-45.5	Jun-05	3369S
CAMO-05-60685	43		MC-3	49.5-50.5	Jun-05	3369S
CAMO-05-60686	44		MC-3	54.5-55.5	Jun-05	3369S
CAMO-05-60687	45		MC-3	59.5-60.5	Jun-05	3369S
CAMO-05-60688	47		MC-3	63.5-64.5	Jun-05	3369S
CAMO-05-60689	48		MC-3	67.5-68.5	Jun-05	3369S
CAMO-05-60690	49		MC-3	76.5-77.5	Jun-05	3369S
CAMO-05-60691	50		MC-3	81.5-82.5	Jun-05	3369S
CAMO-05-60692	51		MC-3	91.0-92.0	Jun-05	3369S
CAMO-05-60693	52		MC-3	100.5-101.5	Jun-05	3369S
CAMO-05-60694	54		MC-3	103.0-103.5	Jun-05	3369S
CAMO-05-60695	55		MC-3	111.0-112.0	Jun-05	3369S
CAMO-05-60696	56		MC-3	118.7-118.9	Jun-05	3369S

Acetate	Al	Br	Ca	Cl	ClO3	ClO4	CO3	F
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
+	0.1763	0.1598	19.9628	1.3221	<0.01	<0.0005	0.0000	0.3242
+	0.4687	0.0913	7.0934	2.2147	<0.01	<0.002	0.0000	0.5185
+	0.7990	0.0925	5.7725	2.9332	<0.01	<0.002	0.0000	0.6295
+	0.5380	0.0777	2.6335	1.2008	<0.01	<0.001	0.0000	0.7792
+	3.0981	0.0512	5.1241	0.8463	<0.01	<0.002	0.0000	1.6844
+	4.1137	0.0740	3.1982	0.7153	<0.01	<0.001	0.0000	1.0283
+	1.4657	0.2116	2.0771	0.6551	<0.01	<0.0005	0.0000	0.8590
+	0.3207	0.0389	1.0448	0.5519	<0.01	<0.0005	0.0000	0.5380
+	1.2417	0.1543	1.6693	0.6749	<0.01	<0.0005	0.0000	0.9397
+	0.8807	0.1121	1.5535	0.5768	<0.01	<0.0005	0.0000	0.8012
-	1.0600	0.1011	1.7872	0.8086	<0.01	<0.001	0.0000	0.9943
+	0.6371	0.0853	0.6293	1.0514	<0.01	<0.0005	0.0000	0.6027
-	0.2399	0.1428	1.1859	0.7370	<0.01	<0.001	0.0000	1.7412
-	0.8135	0.2116	0.5571	0.7835	<0.01	<0.001	0.0000	1.5652
-	0.2611	0.1285	0.3802	0.7072	<0.01	<0.0005	0.0000	1.3548
-	0.5823	0.1128	0.4942	0.7722	<0.01	<0.0005	0.0000	1.5764
-	0.2222	0.1558	0.6215	0.7491	<0.01	<0.0005	0.0000	1.1995
-	0.3600	0.1160	0.9356	1.0292	<0.01	<0.0005	0.0000	1.5398
-	0.7068	0.2041	0.6714	1.1663	<0.01	<0.0005	0.0000	1.7998
-	0.5421	0.0542	0.4432	0.7221	<0.01	<0.0005	0.0000	1.1118
-	0.3628	0.1121	0.8407	1.1440	<0.01	<0.0005	0.0000	1.2642
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d worksheets

nt Measured in accordance with ASTM D2216-90 Weight loss divided by dried sample w

H2O content	Bulk density	H2O	Ag	Acetate	Al	As	B	Ba
%	gm/cm3	gm/gm	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
0.49	---	0.005	---	---	54.1	---	---	---
0.24	---	0.002	---	---	298	---	---	---
0.24	---	0.002	---	---	504	---	---	---
0.18	---	0.002	---	---	451	---	---	---
1.72	---	0.017	---	---	271	---	---	---
1.20	---	0.012	---	---	516	---	---	---
0.82	---	0.008	---	---	267	---	---	---
0.16	---	0.002	---	---	309	---	---	---
0.47	---	0.005	---	---	395	---	---	---
0.66	---	0.007	---	---	200	---	---	---
0.75	---	0.007	---	---	210	---	---	---
0.11	---	0.001	---	---	857	---	---	---
1.27	---	0.013	---	---	28.3	---	---	---
0.59	---	0.006	---	---	208	---	---	---
0.49	---	0.005	---	---	79.6	---	---	---
0.75	---	0.007	---	---	117	---	---	---
0.42	---	0.004	---	---	79.3	---	---	---
1.12	---	0.011	---	---	48.3	---	---	---
0.91	---	0.009	---	---	116	---	---	---
0.39	---	0.004	---	---	207	---	---	---
0.42	---	0.004	---	---	129	---	---	---

Fe	Formate	HCO3	K	Mg	Mn	Na	NO2	NO3
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.1103	+	82.1000	8.2509	3.3684	0.3221	6.8134	<0.01	0.0131
0.2762	+	22.9462	1.8652	0.9633	0.0158	8.4705	<0.01	0.0125
0.4842	+	19.2150	1.7973	0.7349	0.0192	4.6545	<0.01	0.0133
0.3277	+	30.1000	1.4873	0.4799	0.0092	4.6314	<0.01	0.0147
1.8273	+	33.6000	2.6391	1.3903	0.0131	9.6822	<0.01	0.0194
2.4272	+	27.7000	2.4781	1.2917	0.0165	8.6978	<0.01	0.0178
0.8702	+	21.7000	1.3557	0.6450	0.0070	7.4546	<0.01	0.0127
0.2114	+	13.7000	0.6515	0.2350	0.0045	3.9411	<0.01	0.0146
0.7290	+	17.9000	1.5168	0.4785	0.0064	6.4302	<0.01	0.0137
0.5067	+	18.7000	1.5277	0.3832	0.0054	6.4335	<0.01	0.0174
0.6396	-	22.3000	1.6764	0.4185	0.0054	8.0943	<0.01	0.0172
0.2986	+	13.4000	1.1709	0.1622	0.0055	5.9528	<0.01	0.0300
0.0492	-	21.3000	2.4872	0.2372	0.0023	8.1044	<0.01	0.0317
0.2267	-	15.4000	2.6542	0.1422	0.0041	6.4326	<0.01	0.0314
0.0988	-	13.9000	2.1819	0.0971	<0.002	5.8803	<0.01	0.0471
0.2104	-	15.1000	2.7868	0.1558	<0.002	6.0644	<0.01	0.7911
0.0823	-	12.8000	1.8124	0.1680	<0.002	5.4378	<0.01	1.6294
0.1392	-	17.0000	3.0406	0.2463	<0.002	7.0344	0.0800	3.1303
0.3343	-	17.2000	2.6379	0.2150	0.0034	7.2503	<0.01	0.1755
0.3188	-	14.0000	3.6639	0.1658	0.0049	5.0773	<0.01	2.5947
0.1603	-	20.6000	4.2807	0.2348	0.0051	6.7167	<0.01	0.7472
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

weight

Be µg/g	Br µg/g	Ca µg/g	Cd µg/g	Cl µg/g	ClO3 µg/g	ClO4 µg/g	Co µg/g	CO3 µg/g
---	49.1	6132	---	406	<0.1	<0.2	---	---
---	58.1	4514	---	1409	<0.1	<1.3	---	---
---	58.3	3638	---	1849	<0.1	<1.3	---	---
---	65.1	2206	---	1006	<0.1	<0.9	---	---
---	4.47	448	---	74.0	<0.1	<0.2	---	---
---	9.28	401	---	89.8	<0.1	<0.2	---	---
---	38.5	378	---	119	<0.1	<0.1	---	---
---	37.4	1006	---	531	<0.1	<0.5	---	---
---	49.0	530	---	214	<0.1	<0.2	---	---
---	25.4	352	---	131	<0.1	<0.2	---	---
---	20.1	355	---	160	<0.1	<0.2	---	---
---	115	847	---	1414	<0.1	<0.7	---	---
---	16.8	140	---	86.8	<0.1	<0.2	---	---
---	54.1	142	---	200	<0.1	<0.3	---	---
---	39.2	116	---	216	<0.1	<0.2	---	---
---	22.7	99.4	---	155	<0.1	<0.1	---	---
---	55.6	222	---	267	<0.1	<0.2	---	---
---	15.6	125	---	138	<0.1	<0.1	---	---
---	33.6	110	---	192	<0.1	<0.1	---	---
---	20.7	169	---	276	<0.1	<0.2	---	---
---	39.9	299	---	407	<0.1	<0.2	---	---

Oxalate	PO4	Si	SO4
ppm	ppm	ppm	ppm
0.1500	0.2605	20.8590	5.3660
0.0100	1.0087	17.6148	10.9630
<0.01	0.9416	17.3395	2.8398
0.0900	1.2149	16.3973	0.3799
0.1000	0.8333	29.4137	0.7519
0.1000	0.7382	30.3435	0.4450
0.1100	0.7677	24.2760	0.1987
0.1600	0.3987	12.7836	0.0691
0.1500	0.8493	20.4392	0.1434
0.1200	0.8371	23.0705	0.1149
0.0700	0.6934	26.9359	0.1562
<0.01	0.7662	17.4746	0.2366
<0.01	1.6710	29.5961	1.0512
0.0300	1.9056	24.3668	0.8043
0.0100	1.2477	24.3224	0.2808
<0.01	1.4093	27.5962	0.4653
<0.01	0.8010	24.6278	0.7084
<0.01	1.1911	30.7961	0.8849
<0.01	1.6975	28.5344	0.6835
0.0700	0.3689	20.6914	0.6710
<0.01	0.2803	20.9247	0.8540
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000

0.0000 0.0000 0.0000 0.0000

Cr	Cs	Cu	F	Fe	Formate	HCO3	Hg	K
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
---	---	---	100	33.9	---	---	---	2534
---	---	---	330	176	---	---	---	1187
---	---	---	397	305	---	---	---	1133
---	---	---	653	274	---	---	---	1246
---	---	---	147	160	---	---	---	231
---	---	---	129	305	---	---	---	311
---	---	---	156	158	---	---	---	247
---	---	---	518	203	---	---	---	627
---	---	---	299	232	---	---	---	482
---	---	---	182	115	---	---	---	346
---	---	---	197	127	---	---	---	333
---	---	---	811	402	---	---	---	1575
---	---	---	205	5.79	---	---	---	293
---	---	---	400	57.9	---	---	---	678
---	---	---	413	30.1	---	---	---	665
---	---	---	317	42.3	---	---	---	560
---	---	---	428	29.4	---	---	---	647
---	---	---	206	18.7	---	---	---	408
---	---	---	296	55.0	---	---	---	434
---	---	---	424	122	---	---	---	1399
---	---	---	450	57.1	---	---	---	1523

Li	Mg	Mn	Mo	Na	Ni	NO2	NO3	d15N
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	from NO3
---	1035	98.9	---	2093	---	<3	4.02	---
---	613	10.1	---	5390	---	<7	7.94	---
---	463	12.1	---	2934	---	<7	8.40	---
---	402	7.73	---	3880	---	<9	12.3	---
---	122	1.14	---	846	---	<1	1.70	---
---	162	2.07	---	1092	---	<2	2.24	---
---	117	1.27	---	1357	---	<2	2.31	---
---	226	4.35	---	3794	---	<10	14.0	---
---	152	2.03	---	2043	---	<4	4.34	---
---	86.9	1.22	---	1459	---	<3	3.95	---
---	83.0	1.06	---	1606	---	<2	3.40	---
---	218	7.44	---	8009	---	<14	40.4	---
---	27.9	0.27	---	955	---	<2	3.73	---
---	36.4	1.06	---	1644	---	<3	8.04	---
---	29.6	<0.6	---	1793	---	<3	14.4	---
---	31.3	<0.4	---	1219	---	<2	159	---
---	60.0	<0.7	---	1940	---	<4	581	---
---	33.0	<0.3	---	943	---	10.7	420	---
---	35.3	0.55	---	1192	---	<2	28.9	---
---	63.3	1.86	---	1938	---	<4	990	---
---	83.6	1.81	---	2390	---	<4	266	---

OH	Oxalate	Pb	pH	PO4	Rb	Sb	Se	Si
µg/g	µg/g	µg/g	units	µg/g	µg/g	µg/g	µg/g	µg/g
---	46.1	---	---	80.0	---	---	---	6407
---	6.36	---	---	642	---	---	---	11209
---	<7	---	---	593	---	---	---	10928
---	75.4	---	---	1018	---	---	---	13736
---	8.74	---	---	72.8	---	---	---	2571
---	12.5	---	---	92.6	---	---	---	3808
---	20.0	---	---	140	---	---	---	4418
---	154	---	---	384	---	---	---	12307
---	47.7	---	---	270	---	---	---	6495
---	27.2	---	---	190	---	---	---	5231
---	13.9	---	---	138	---	---	---	5344
---	<14	---	---	1031	---	---	---	23510
---	<2	---	---	197	---	---	---	3486
---	7.67	---	---	487	---	---	---	6229
---	3.05	---	---	380	---	---	---	7415
---	<2	---	---	283	---	---	---	5549
---	<4	---	---	286	---	---	---	8787
---	<2	---	---	160	---	---	---	4128
---	<2	---	---	279	---	---	---	4692
---	26.7	---	---	141	---	---	---	7898
---	<4	---	---	99.7	---	---	---	7446

SO3	SO4	Sn	Sr	Th	Ti	Tl	U	V
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
---	1648	---	---	---	---	---	---	---
---	6976	---	---	---	---	---	---	---
---	1790	---	---	---	---	---	---	---
---	318	---	---	---	---	---	---	---
---	65.7	---	---	---	---	---	---	---
---	55.8	---	---	---	---	---	---	---
---	36.2	---	---	---	---	---	---	---
---	66.5	---	---	---	---	---	---	---
---	45.6	---	---	---	---	---	---	---
---	26.1	---	---	---	---	---	---	---
---	31.0	---	---	---	---	---	---	---
---	318	---	---	---	---	---	---	---
---	124	---	---	---	---	---	---	---
---	206	---	---	---	---	---	---	---
---	85.6	---	---	---	---	---	---	---
---	93.6	---	---	---	---	---	---	---
---	253	---	---	---	---	---	---	---
---	119	---	---	---	---	---	---	---
---	112	---	---	---	---	---	---	---
---	256	---	---	---	---	---	---	---
---	304	---	---	---	---	---	---	---

Zn µg/g	Wet wt. gms	Dry wt. gms	flask gms	flask+samp gms	After drying gms	DI added gms	Ag ppm
---	---	50.08	---	---	---	75.00	---
---	---	50.00	---	---	---	75.08	---
---	---	49.96	---	---	---	75.04	---
---	---	50.01	---	---	---	75.11	---
---	---	49.96	---	---	---	75.05	---
---	---	50.13	---	---	---	75.18	---
---	---	50.17	---	---	---	75.21	---
---	---	50.00	---	---	---	75.04	---
---	---	50.11	---	---	---	75.10	---
---	---	50.13	---	---	---	75.14	---
---	---	50.13	---	---	---	75.08	---
---	---	49.93	---	---	---	74.92	---
---	---	50.32	---	---	---	75.30	---
---	---	50.06	---	---	---	75.04	---
---	---	50.09	---	---	---	75.07	---
---	---	50.11	---	---	---	75.12	---
---	---	50.04	---	---	---	75.01	---
---	---	50.14	---	---	---	75.10	---
---	---	50.14	---	---	---	75.12	---
---	---	49.98	---	---	---	74.98	---
---	---	49.92	---	---	---	75.00	---

Acetate	Al	As	B	Ba	Be	Br	Ca	Cd
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
+	0.18	---	---	---	---	0.16	20.0	---
+	0.47	---	---	---	---	0.09	7.09	---
+	0.80	---	---	---	---	0.09	5.77	---
+	0.54	---	---	---	---	0.08	2.63	---
+	3.10	---	---	---	---	0.05	5.12	---
+	4.11	---	---	---	---	0.07	3.20	---
+	1.47	---	---	---	---	0.21	2.08	---
+	0.32	---	---	---	---	0.04	1.04	---
+	1.24	---	---	---	---	0.15	1.67	---
+	0.88	---	---	---	---	0.11	1.55	---
-	1.06	---	---	---	---	0.10	1.79	---
+	0.64	---	---	---	---	0.09	0.63	---
-	0.24	---	---	---	---	0.14	1.19	---
-	0.81	---	---	---	---	0.21	0.56	---
-	0.26	---	---	---	---	0.13	0.38	---
-	0.58	---	---	---	---	0.11	0.49	---
-	0.22	---	---	---	---	0.16	0.62	---
-	0.36	---	---	---	---	0.12	0.94	---
-	0.71	---	---	---	---	0.20	0.67	---
-	0.54	---	---	---	---	0.05	0.44	---
-	0.36	---	---	---	---	0.11	0.84	---

Cl	ClO3	ClO4	Co	CO3	Cr	Cs	Cu	F
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1.32	<0.01	<0.0005	---	0	---	---	---	0.32
2.21	<0.01	<0.002	---	0	---	---	---	0.52
2.93	<0.01	<0.002	---	0	---	---	---	0.63
1.20	<0.01	<0.001	---	0	---	---	---	0.78
0.85	<0.01	<0.002	---	0	---	---	---	1.68
0.72	<0.01	<0.001	---	0	---	---	---	1.03
0.66	<0.01	<0.0005	---	0	---	---	---	0.86
0.55	<0.01	<0.0005	---	0	---	---	---	0.54
0.67	<0.01	<0.0005	---	0	---	---	---	0.94
0.58	<0.01	<0.0005	---	0	---	---	---	0.80
0.81	<0.01	<0.001	---	0	---	---	---	0.99
1.05	<0.01	<0.0005	---	0	---	---	---	0.60
0.74	<0.01	<0.001	---	0	---	---	---	1.74
0.78	<0.01	<0.001	---	0	---	---	---	1.57
0.71	<0.01	<0.0005	---	0	---	---	---	1.35
0.77	<0.01	<0.0005	---	0	---	---	---	1.58
0.75	<0.01	<0.0005	---	0	---	---	---	1.20
1.03	<0.01	<0.0005	---	0	---	---	---	1.54
1.17	<0.01	<0.0005	---	0	---	---	---	1.80
0.72	<0.01	<0.0005	---	0	---	---	---	1.11
1.14	<0.01	<0.0005	---	0	---	---	---	1.26

Fe	Formate	HCO3	Hg	K	Li	Mg	Mn	Mo
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.11	+	82.1	---	8.25	---	3.37	0.32	---
0.28	+	22.9	---	1.87	---	0.96	0.016	---
0.48	+	19.2	---	1.80	---	0.73	0.019	---
0.33	+	30.1	---	1.49	---	0.48	0.009	---
1.83	+	33.6	---	2.64	---	1.39	0.013	---
2.43	+	27.7	---	2.48	---	1.29	0.016	---
0.87	+	21.7	---	1.36	---	0.64	0.007	---
0.21	+	13.7	---	0.65	---	0.23	0.005	---
0.73	+	17.9	---	1.52	---	0.48	0.006	---
0.51	+	18.7	---	1.53	---	0.38	0.005	---
0.64	-	22.3	---	1.68	---	0.42	0.005	---
0.30	+	13.4	---	1.17	---	0.16	0.006	---
0.05	-	21.3	---	2.49	---	0.24	0.002	---
0.23	-	15.4	---	2.65	---	0.14	0.004	---
0.10	-	13.9	---	2.18	---	0.10	<0.002	---
0.21	-	15.1	---	2.79	---	0.16	<0.002	---
0.08	-	12.8	---	1.81	---	0.17	<0.002	---
0.14	-	17.0	---	3.04	---	0.25	<0.002	---
0.33	-	17.2	---	2.64	---	0.21	0.003	---
0.32	-	14.0	---	3.66	---	0.17	0.005	---
0.16	-	20.6	---	4.28	---	0.23	0.005	---

Na	Ni	NO2	NO3	d15N	OH	Oxalate	Pb	pH
ppm	ppm	ppm	ppm	from NO3	ppm	ppm	ppm	units
6.81	---	<0.01	0.01		---	0.15	---	6.79
8.47	---	<0.01	0.01		---	0.01	---	7.25
4.65	---	<0.01	0.01		---	<0.01	---	7.18
4.63	---	<0.01	0.01		---	0.09	---	7.33
9.68	---	<0.01	0.02		---	0.10	---	7.12
8.70	---	<0.01	0.02		---	0.10	---	7.16
7.45	---	<0.01	0.01		---	0.11	---	7.30
3.94	---	<0.01	0.01		---	0.16	---	7.44
6.43	---	<0.01	0.01		---	0.15	---	7.51
6.43	---	<0.01	0.02		---	0.12	---	7.36
8.09	---	<0.01	0.02		---	0.07	---	7.34
5.95	---	<0.01	0.03		---	<0.01	---	7.67
8.10	---	<0.01	0.03		---	<0.01	---	7.31
6.43	---	<0.01	0.03		---	0.03	---	7.53
5.88	---	<0.01	0.05		---	0.01	---	7.35
6.06	---	<0.01	0.79		---	<0.01	---	7.34
5.44	---	<0.01	1.63		---	<0.01	---	7.32
7.03	---	0.08	3.13		---	<0.01	---	7.38
7.25	---	<0.01	0.18		---	<0.01	---	7.54
5.08	---	<0.01	2.59		---	0.07	---	8.27
6.72	---	<0.01	0.75		---	<0.01	---	7.76

PO4	Rb	Sb	Se	Si	SO3	SO4	Sn	Sr
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.26	---	---	---	20.9	---	5.37	---	---
1.01	---	---	---	17.6	---	10.96	---	---
0.94	---	---	---	17.3	---	2.84	---	---
1.21	---	---	---	16.4	---	0.38	---	---
0.83	---	---	---	29.4	---	0.75	---	---
0.74	---	---	---	30.3	---	0.45	---	---
0.77	---	---	---	24.3	---	0.20	---	---
0.40	---	---	---	12.8	---	0.07	---	---
0.85	---	---	---	20.4	---	0.14	---	---
0.84	---	---	---	23.1	---	0.11	---	---
0.69	---	---	---	26.9	---	0.16	---	---
0.77	---	---	---	17.5	---	0.24	---	---
1.67	---	---	---	29.6	---	1.05	---	---
1.91	---	---	---	24.4	---	0.80	---	---
1.25	---	---	---	24.3	---	0.28	---	---
1.41	---	---	---	27.6	---	0.47	---	---
0.80	---	---	---	24.6	---	0.71	---	---
1.19	---	---	---	30.8	---	0.88	---	---
1.70	---	---	---	28.5	---	0.68	---	---
0.37	---	---	---	20.7	---	0.67	---	---
0.28	---	---	---	20.9	---	0.85	---	---

Th ppm	Ti ppm	Tl ppm	U ppm	V ppm	Zn ppm	NH4 ppm	comments	d
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---	---	---	---	---	---	---		
---	---	---	---	---	---	---	Unknown peak @ 5.	
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electronic .ate sent	mail date sent	Ba corr for Na ppm
.93		

"official" bulk densities to use for anion calculations
Most values from Rogers and Gallaher, 1985

Qal	1.42	
Qbo	1.18	
Qbog	1.25	
Qbt1g	1.13	
Qbt1v	1.26	
Qbt2	1.46	
Qbt3	1.25	Used 1.25 nonwelded from R&G, 1.65 for TA-49 welded
Qbt4	1.73	
Qbtsank	1.25	
Qct	1.5	
soil	1.4	
Tb 4	2.96	
Tpf	1.55	

Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Interval (ft)	Interval (m)
0			3.8	
7.6	8	7.8	4.2	1.3
8	8.3	8.15	2.25	0.7
12.2	12.5	12.35	5.85	1.8
19.7	20	19.85	5.55	1.7
23.3	23.6	23.45	4.15	1.3
28	28.3	28.15	3.35	1.0
30	30.3	30.15	6.6	2.0
41.2	41.5	41.35	8.6	2.6
47.2	47.5	47.35	5.2	1.6
51.6	51.9	51.75	5	1.5
57.2	57.5	57.35	4.55	1.4
60.7	61	60.85	3	0.9
63.2	63.5	63.35	3.25	1.0
67.2	67.5	67.35	4	1.2
71.2	71.5	71.35	4.4	1.3
76	76.5	76.25	5.1	1.6
81.2	81.5	81.35	4.9	1.5
86	86.3	86.15	4.1	1.2
89.4	89.7	89.55	3.5	1.1
93	93.3	93.15	6.3	1.9
102	102.3	102.15	6.5	2.0
106	106.3	106.15	6	1.8
114	114.3	114.15	6.75	2.1
119.5	119.8	119.65	4.25	1.3
122.5	122.8	122.65	3.25	1.0
126	126.3	126.15	3.75	1.1
130	130.3	130.15	3.75	1.1
133.5	133.8	133.65	3	0.9
136	136.3	136.15	3.25	1.0
140	140.3	140.15	4	1.2
144	144.3	144.15	3.5	1.1
147	147.3	147.15	3.25	1.0
150.5	150.8	150.65	3.25	1.0
153.5	153.8	153.65	4.15	1.3
158.8	159.1	158.95	5	1.5
163.5	163.8	163.65	4.6	1.4
168	168.3	168.15	4.75	1.4
173	173.3	173.15	30.75	9.4
229.5	229.8	229.65	28.4	8.7
			229.8	

MC-3 Anion Pore Water Concentration Estimates

Depth (ft)	Depth (m)	Br- (mg/L)	Cl- (mg/L)	CLO3- (µg/L)	CLO4- (µg/L)	F- (mg/L)	NO2- (mg/L)	NO3- (mg/L)	Oxalate (mg/L)	PO4--- (mg/L)	SO4-- (mg/L)	Al (mg/L)	Ca (mg/L)	Fe (mg/L)	Depth (m)	HCO3 (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Si (mg/L)
5.00	1.52	49.07	406.10	BD	BD	99.59	BD	4.02	BD	80.01	1648.19	54.15	6131.66	33.89	1.52	25217.39	2534.31	1034.61	98.94	2092.75	6406.94
10.00	3.05	58.12	1409.33	BD	BD	329.94	BD	7.94	BD	641.92	6976.41	298.25	4513.94	175.77	3.05	14602.07	1186.96	613.03	10.08	5390.33	11209.37
15.00	4.57	58.28	1848.71	BD	BD	396.76	BD	8.40	BD	593.48	1789.83	503.59	3638.21	305.14	4.57	12110.50	1132.79	463.15	12.10	2933.56	10928.46
20.00	6.10	65.05	1005.86	BD	BD	652.75	BD	12.32	BD	1017.72	318.20	450.65	2206.03	274.49	6.10	25214.53	1245.87	402.03	7.73	3879.68	13735.92
25.00	7.62	4.47	73.96	BD	BD	147.22	BD	1.70	BD	72.83	65.71	270.78	447.85	159.71	7.62	2936.69	230.66	121.52	1.14	846.24	2570.80
30.00	9.14	9.28	89.77	BD	BD	129.05	BD	2.24	BD	92.63	55.84	516.24	401.34	304.59	9.14	3476.14	310.99	162.09	2.07	1091.51	3807.88
35.00	10.67	38.52	119.23	BD	BD	156.33	BD	2.31	BD	139.73	36.16	266.76	378.03	158.37	10.67	3949.36	246.74	117.38	1.27	1356.73	4418.19
40.00	12.19	37.41	531.34	BD	BD	517.93	BD	14.02	BD	383.84	66.49	308.73	1005.79	203.47	12.19	13188.76	627.19	226.21	4.35	3794.06	12306.59
45.00	13.72	49.04	214.45	BD	BD	298.60	BD	4.34	BD	269.90	45.58	394.59	530.45	231.65	13.72	5688.22	481.99	152.05	2.03	2043.36	6495.13
50.00	15.24	25.42	130.78	BD	BD	181.67	BD	3.95	BD	189.81	26.05	199.69	352.24	114.89	15.24	4240.03	346.40	86.90	1.22	1458.74	5230.99
55	16.764	20.063	160.412	BD	BD	197.25	BD	3.4027	BD	137.5618	30.9858	210.3	354.563	126.89	16.76	4424.031	332.577	83.0256	1.0628	1605.80	5343.74
60	18.288	114.75	1414.48	BD	BD	810.91	BD	40.361	BD	1030.786	318.28	857.15	846.635	401.76	18.29	18027.94	1575.26	218.222	7.4385	8008.72	23509.71
64	19.507	16.819	86.8024	BD	BD	205.07	BD	3.7323	BD	196.8009	123.807	28.252	139.67	5.7892	19.51	2508.635	292.939	27.9366	0.2724	954.50	3485.72
68	20.726	54.088	200.279	BD	BD	400.11	BD	8.0365	BD	487.13	205.599	207.96	142.408	57.937	20.73	3936.625	678.469	36.3539	1.0565	1644.32	6228.76
77	23.47	39.189	215.593	BD	BD	413.02	BD	14.362	BD	380.3935	85.609	79.612	115.912	30.112	23.47	4237.668	665.191	29.5934	BD	1792.72	7415.14
82	24.994	22.685	155.286	BD	BD	316.99	BD	159.09	BD	283.4032	93.5698	117.1	99.3763	42.307	24.99	3036.462	560.399	31.3385	BD	1219.50	5549.33
91.5	27.889	55.579	267.298	BD	BD	427.99	BD	581.39	BD	285.8079	252.78	79.287	221.753	29.361	27.89	4567.137	646.67	59.952	BD	1940.26	8787.37
101	30.785	15.552	137.962	BD	BD	206.41	10.72	419.62	BD	159.666	118.62	48.255	125.418	18.654	30.78	2278.852	407.591	33.019	BD	942.96	4128.22
103.25	31.471	33.558	191.792	BD	BD	295.97	BD	28.864	BD	279.1447	112.401	116.23	110.415	54.974	31.47	2828.505	433.792	35.3495	0.5548	1192.30	4692.43
111.5	33.985	20.686	275.625	BD	BD	424.41	BD	990.42	BD	140.815	256.139	206.92	169.188	121.68	33.99	5343.997	1398.55	63.2942	1.8558	1938.07	7898.19
118.8	36.21	39.897	407.093	BD	BD	449.85	BD	265.88	BD	99.74527	303.876	129.11	299.146	57.05	36.21	7330.234	1523.24	83.5538	1.8072	2390.04	7445.77

BD-below detection

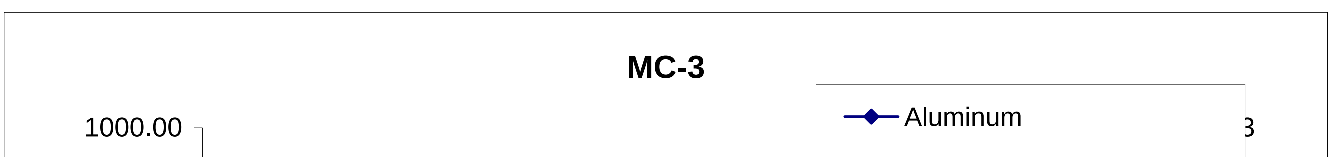
MC-3 Anion Pore Water Concentration Estimates

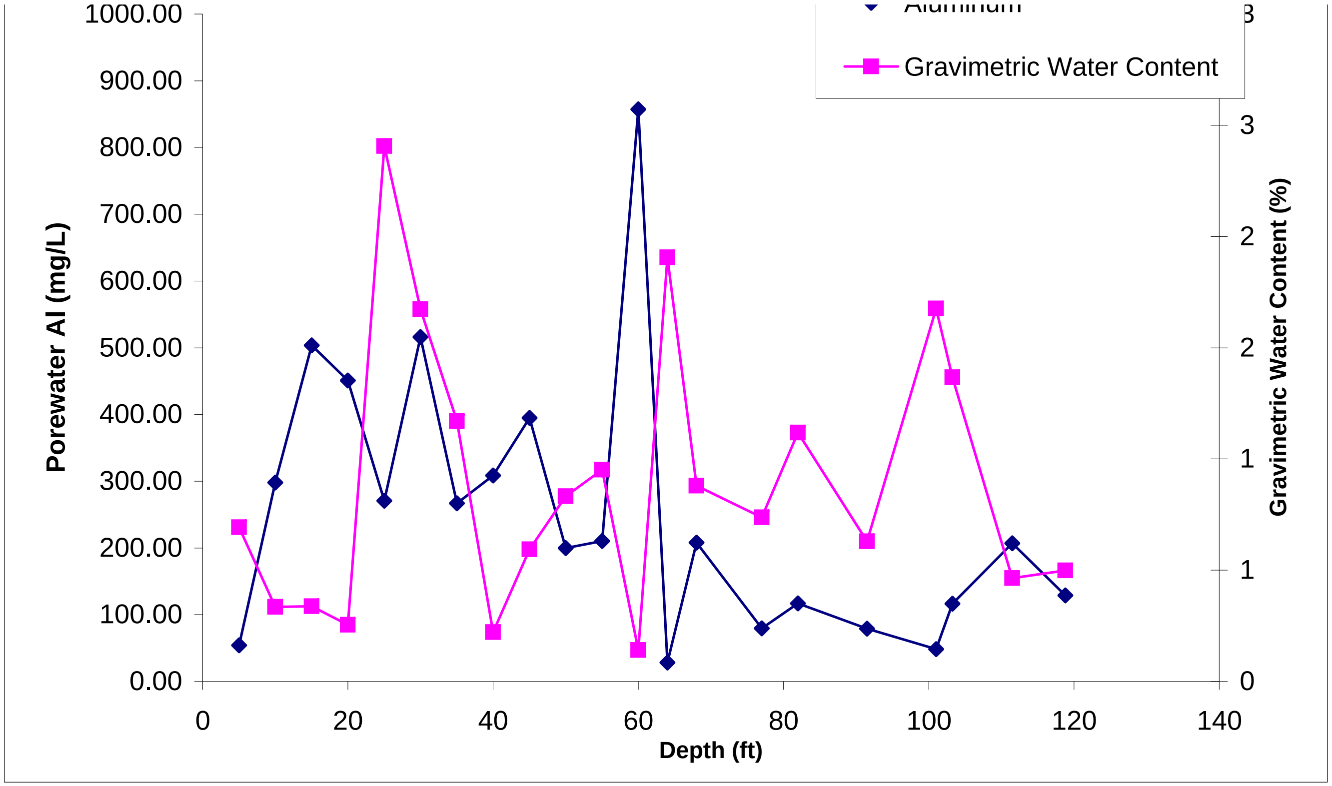
BD-below detection

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Al Leachate (mg/L)	H2O (ml)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692	50.080	0.1763	75.00
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335	50.000	0.4687	75.08
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338	49.960	0.7990	75.04
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255	50.010	0.5380	75.11
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406	49.960	3.0981	75.05
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673	50.130	4.1137	75.18
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170	50.170	1.4657	75.21
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221	50.000	0.3207	75.04
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594	50.110	1.2417	75.10
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833	50.130	0.8807	75.14
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951	50.130	1.0600	75.08
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141	49.930	0.6371	74.92
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906	50.320	0.2399	75.30
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880	50.060	0.8135	75.04
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737	50.090	0.2611	75.07
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118	50.110	0.5823	75.12
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630	50.040	0.2222	75.01
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676	50.140	0.3600	75.10
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367	50.140	0.7068	75.12
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464	49.980	0.5421	74.98
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498	49.920	0.3628	75.00

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994





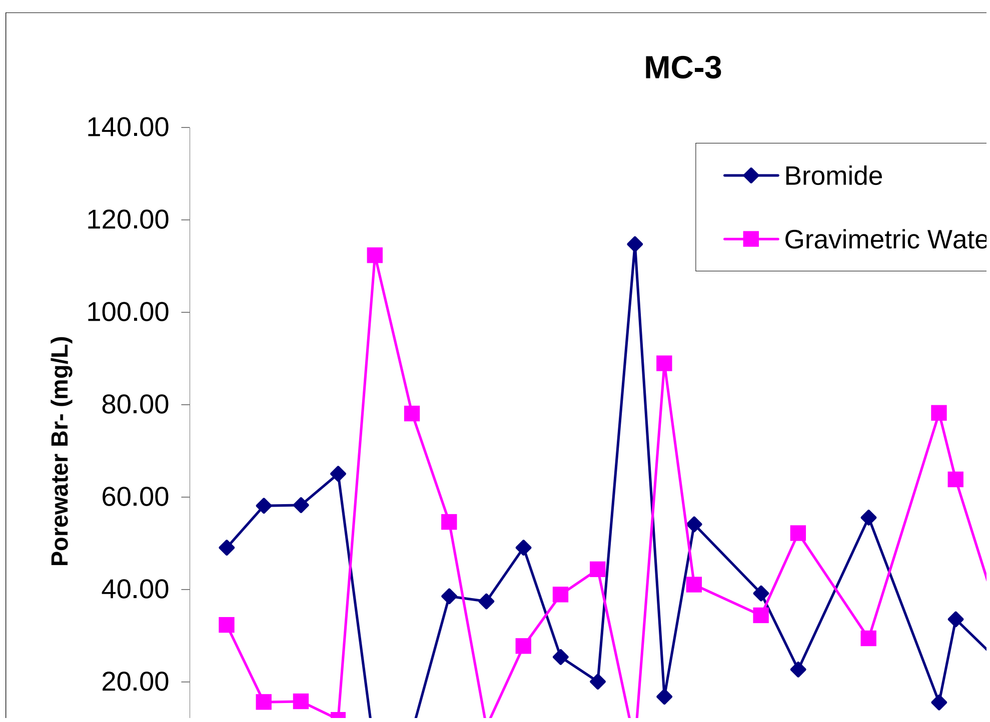
Aluminum
Gravimetric Water Content
Porewater Al (mg/L)
Gravimetric Water Content (%)
Depth (ft)
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0
20
40
60
80
100
120
140
3
3
2
2
1
1
0

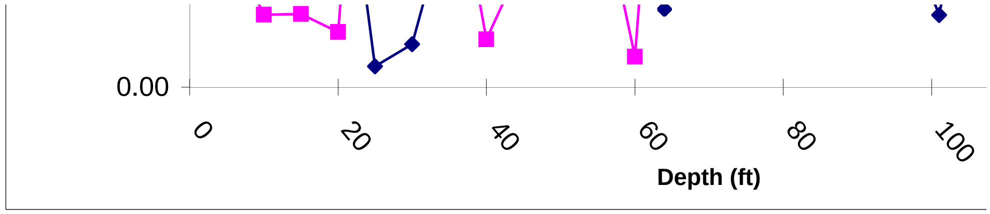
Al µg/g	Pore H2O (L)	Al (mg)	Al PW (mg/L)	Interval (m)	Interval Alswi (g/m2)	Cum. Alswi (g/m2)	Interval θd (m)	Cum θd (m)
0.26	0.00	0.01	54.15	2.286	0.857	0.857	0.016	0.016
0.70	0.00	0.04	298.25	1.524	1.523	2.380	0.005	0.005
1.20	0.00	0.06	503.59	1.524	2.597	4.977	0.005	0.005
0.81	0.00	0.04	450.65	1.524	1.749	6.726	0.004	0.004
4.65	0.00	0.23	270.78	1.524	9.930	16.655	0.037	0.037
6.17	0.00	0.31	516.24	1.524	13.163	29.818	0.025	0.025
2.20	0.00	0.11	266.76	1.524	4.755	34.573	0.018	0.018
0.48	0.00	0.02	308.73	1.524	1.042	35.615	0.003	0.003
1.86	0.00	0.09	394.59	1.524	3.574	39.189	0.009	0.009
1.32	0.00	0.07	199.69	1.524	2.535	41.723	0.013	0.013
1.59	0.00	0.08	210.30	1.524	3.049	44.772	0.014	0.014
0.96	0.00	0.05	857.15	1.372	1.652	46.424	0.002	0.002
0.36	0.00	0.02	28.25	1.219	0.656	47.081	0.023	0.023
1.22	0.00	0.06	207.96	1.981	3.624	50.705	0.017	0.017
0.39	0.00	0.02	79.61	2.134	1.253	51.957	0.016	0.016
0.87	0.00	0.04	117.10	2.210	2.894	54.851	0.025	0.025
0.33	0.00	0.02	79.29	2.896	1.447	56.298	0.018	0.018
0.54	0.00	0.03	48.25	1.829	1.479	57.777	0.031	0.031
1.06	0.00	0.05	116.23	1.524	2.421	60.197	0.021	0.021
0.81	0.00	0.04	206.92	2.469	2.369	62.566	0.011	0.011
0.55	0.00	0.03	129.11	1.082	0.696	63.262	0.005	0.005

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994
milliters

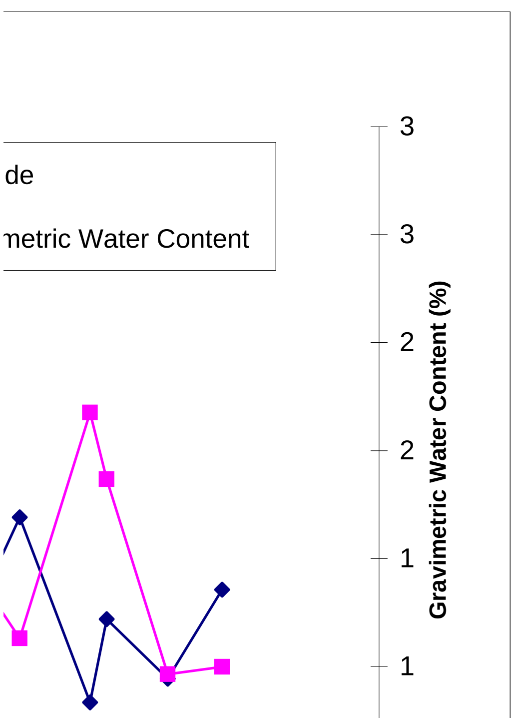


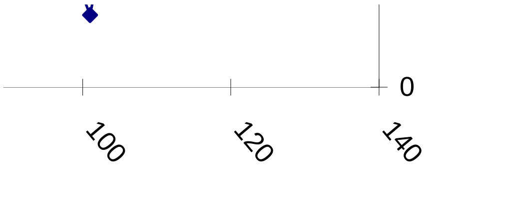


0.00
0
20
40
60
80
100
Depth (ft)

θv (%)	Tuff Dry wt. (g)	Br Leachate (mg/L)	H2O (ml)	Br- µg/g	Pore H2O (L)	Br- (mg)	Br- PW (mg/L)	Interval (m)
0.692	50.080	0.160	75.00	0.24	0.00	0.01	49.07	2.286
0.335	50.000	0.091	75.08	0.14	0.00	0.01	58.12	1.524
0.338	49.960	0.092	75.04	0.14	0.00	0.01	58.28	1.524
0.255	50.010	0.078	75.11	0.12	0.00	0.01	65.05	1.524
2.406	49.960	0.051	75.05	0.08	0.00	0.00	4.47	1.524
1.673	50.130	0.074	75.18	0.11	0.00	0.01	9.28	1.524
1.170	50.170	0.212	75.21	0.32	0.00	0.02	38.52	1.524
0.221	50.000	0.039	75.04	0.06	0.00	0.00	37.41	1.524
0.594	50.110	0.154	75.10	0.23	0.00	0.01	49.04	1.524
0.833	50.130	0.112	75.14	0.17	0.00	0.01	25.42	1.524
0.951	50.130	0.101	75.08	0.15	0.00	0.01	20.06	1.524
0.141	49.930	0.085	74.92	0.13	0.00	0.01	114.75	1.372
1.906	50.320	0.143	75.30	0.21	0.00	0.01	16.82	1.219
0.880	50.060	0.212	75.04	0.32	0.00	0.02	54.09	1.981
0.737	50.090	0.129	75.07	0.19	0.00	0.01	39.19	2.134
1.118	50.110	0.113	75.12	0.17	0.00	0.01	22.68	2.210
0.630	50.040	0.156	75.01	0.23	0.00	0.01	55.58	2.896
1.676	50.140	0.116	75.10	0.17	0.00	0.01	15.55	1.829
1.367	50.140	0.204	75.12	0.31	0.00	0.02	33.56	1.524
0.464	49.980	0.054	74.98	0.08	0.00	0.00	20.69	2.469
0.498	49.920	0.112	75.00	0.17	0.00	0.01	39.90	1.082

The formul
=(((RC[-15]





0
100
120
140

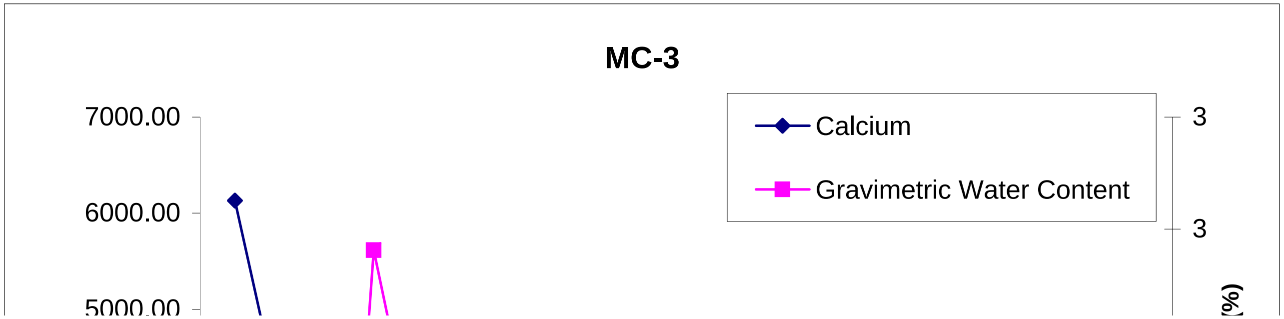
Interval Brswi (g/m2)	Cum. Brswi (g/m2)	Interval qd (m)	Cum qd (m)
0.777	0.777	0.016	0.016
0.297	1.073	0.005	0.021
0.301	1.374	0.005	0.026
0.252	1.626	0.004	0.030
0.164	1.790	0.037	0.067
0.237	2.027	0.025	0.092
0.687	2.714	0.018	0.110
0.126	2.840	0.003	0.113
0.444	3.284	0.009	0.122
0.323	3.607	0.013	0.135
0.291	3.898	0.014	0.150
0.221	4.119	0.002	0.152
0.391	4.510	0.023	0.175
0.943	5.452	0.017	0.192
0.617	6.069	0.016	0.208
0.561	6.629	0.025	0.233
1.014	7.643	0.018	0.251
0.477	8.120	0.031	0.282
0.699	8.819	0.021	0.302
0.237	9.056	0.011	0.314
0.215	9.271	0.005	0.319

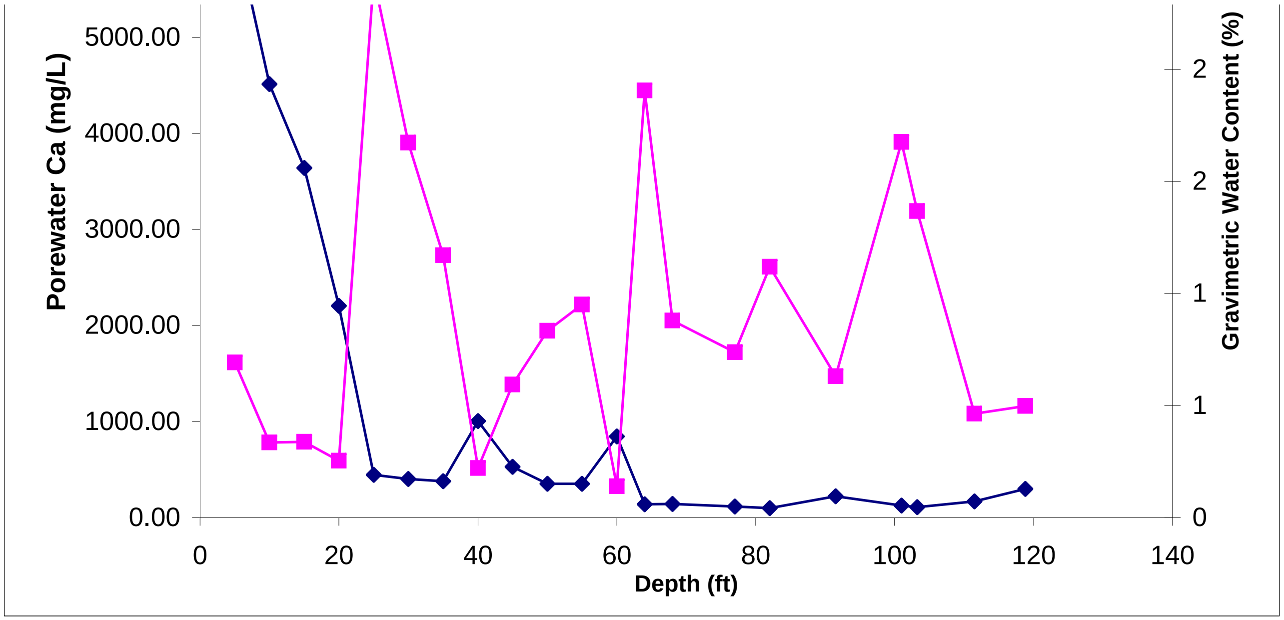
a below goes in the last row of column 17
]-R[-1]C[-14])/2)+(RC[-14]-RC[-15]))*0.3048

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Ca Leachate (mg/L)	H2O (ml)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692	50.080	19.9628	75.00
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335	50.000	7.0934	75.08
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338	49.960	5.7725	75.04
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255	50.010	2.6335	75.11
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406	49.960	5.1241	75.05
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673	50.130	3.1982	75.18
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170	50.170	2.0771	75.21
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221	50.000	1.0448	75.04
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594	50.110	1.6693	75.10
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833	50.130	1.5535	75.14
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951	50.130	1.7872	75.08
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141	49.930	0.6293	74.92
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906	50.320	1.1859	75.30
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880	50.060	0.5571	75.04
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737	50.090	0.3802	75.07
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118	50.110	0.4942	75.12
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630	50.040	0.6215	75.01
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676	50.140	0.9356	75.10
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367	50.140	0.6714	75.12
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464	49.980	0.4432	74.98
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498	49.920	0.8407	75.00

ensity from Rogers and Gallaher 1985
lk density from DB Stephens 1994





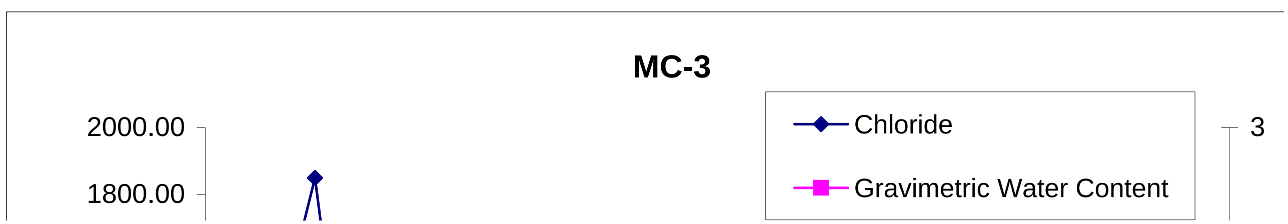
Porewater Ca (mg/L)
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
0
20
40
60
80
100
120
140
Depth (ft)
Gravimetric Water Content (%)
2
2
1
1
0

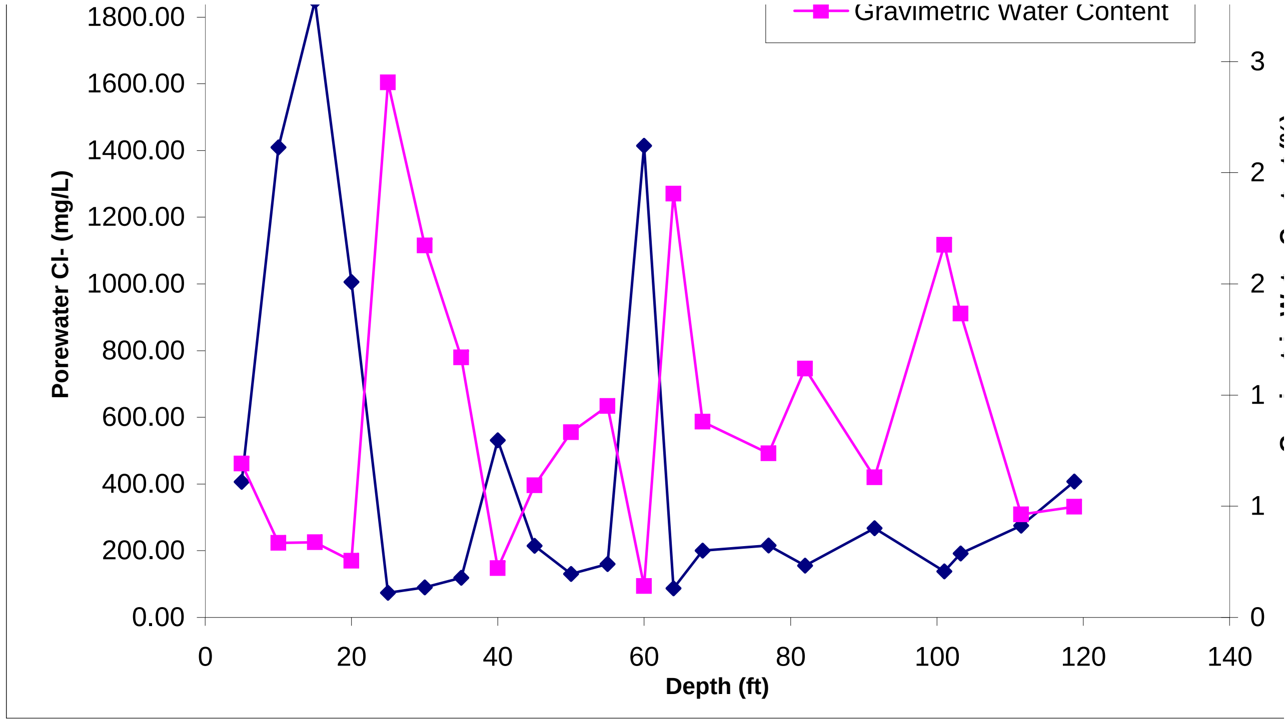
Ca µg/g	Pore H2O (L)	Ca (mg)	Ca PW (mg/L)	Interval (m)	Interval Caswi (g/m2)	Cum. Caswi (g/m2)	Interval θd (m)	Cum θd (m)
29.90	0.00	1.50	6131.66	2.286	97.047	97.047	0.016	0.016
10.65	0.00	0.53	4513.94	1.524	23.050	120.098	0.005	0.021
8.67	0.00	0.43	3638.21	1.524	18.763	138.861	0.005	0.026
3.96	0.00	0.20	2206.03	1.524	8.559	147.420	0.004	0.030
7.70	0.00	0.38	447.85	1.524	16.423	163.844	0.037	0.067
4.80	0.00	0.24	401.34	1.524	10.233	174.077	0.025	0.092
3.11	0.00	0.16	378.03	1.524	6.739	180.815	0.018	0.110
1.57	0.00	0.08	1005.79	1.524	3.393	184.209	0.003	0.113
2.50	0.00	0.13	530.45	1.524	4.804	189.013	0.009	0.122
2.33	0.00	0.12	352.24	1.524	4.471	193.484	0.013	0.135
2.68	0.00	0.13	354.56	1.524	5.140	198.624	0.014	0.150
0.94	0.00	0.05	846.63	1.372	1.632	200.256	0.002	0.152
1.77	0.00	0.09	139.67	1.219	3.245	203.501	0.023	0.175
0.84	0.00	0.04	142.41	1.981	2.482	205.983	0.017	0.192
0.57	0.00	0.03	115.91	2.134	1.824	207.806	0.016	0.208
0.74	0.00	0.04	99.38	2.210	2.456	210.262	0.025	0.233
0.93	0.00	0.05	221.75	2.896	4.046	214.309	0.018	0.251
1.40	0.00	0.07	125.42	1.829	3.844	218.153	0.031	0.282
1.01	0.00	0.05	110.41	1.524	2.300	220.452	0.021	0.302
0.66	0.00	0.03	169.19	2.469	1.937	222.389	0.011	0.314
1.26	0.00	0.06	299.15	1.082	1.613	224.002	0.005	0.319

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Cl Leachate (mg/L)	H2O (ml)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692	50.080	1.322	75.00
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335	50.000	2.215	75.08
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338	49.960	2.933	75.04
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255	50.010	1.201	75.11
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406	49.960	0.846	75.05
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673	50.130	0.715	75.18
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170	50.170	0.655	75.21
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221	50.000	0.552	75.04
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594	50.110	0.675	75.10
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833	50.130	0.577	75.14
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951	50.130	0.809	75.08
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141	49.930	1.051	74.92
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906	50.320	0.737	75.30
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880	50.060	0.783	75.04
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737	50.090	0.707	75.07
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118	50.110	0.772	75.12
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630	50.040	0.749	75.01
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676	50.140	1.029	75.10
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367	50.140	1.166	75.12
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464	49.980	0.722	74.98
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498	49.920	1.144	75.00

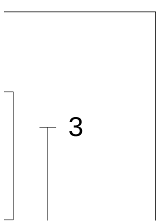
Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

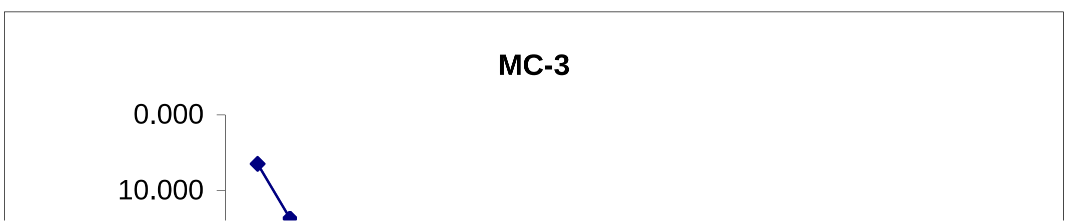


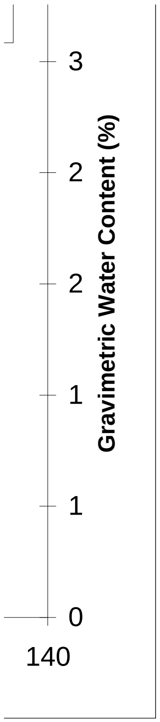


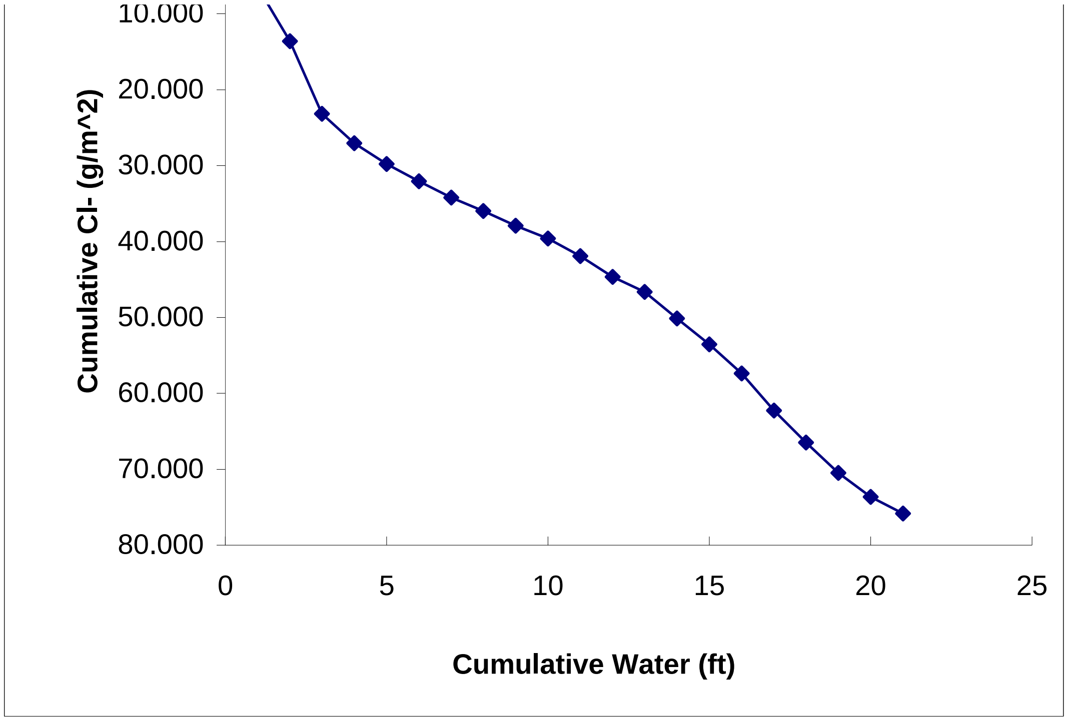
Gravimetric Water Content
Porewater Cl- (mg/L)
Depth (ft)
0.00
200.00
400.00
600.00
800.00
1000.00
1200.00
1400.00
1600.00
1800.00
0
20
40
60
80
100
120
140
0
1
1
2
2
3

Cl- µg/g	Pore H2O (L)	Cl- (mg)	Cl- PW (mg/L)	Interval (m)	Interval Clswi (g/m2)	Cum. Clswi (g/m2)	Interval θd (m)	Cum θd (m)
1.98	0.00	0.10	406.10	2.286	6.427	6.427	0.016	0.016
3.33	0.00	0.17	1409.33	1.524	7.197	13.624	0.005	0.021
4.41	0.00	0.22	1848.71	1.524	9.534	23.159	0.005	0.026
1.80	0.00	0.09	1005.86	1.524	3.903	27.061	0.004	0.030
1.27	0.00	0.06	73.96	1.524	2.712	29.774	0.037	0.067
1.07	0.00	0.05	89.77	1.524	2.289	32.063	0.025	0.092
0.98	0.00	0.05	119.23	1.524	2.125	34.188	0.018	0.110
0.83	0.00	0.04	531.34	1.524	1.793	35.980	0.003	0.113
1.01	0.00	0.05	214.45	1.524	1.942	37.923	0.009	0.122
0.86	0.00	0.04	130.78	1.524	1.660	39.583	0.013	0.135
1.21	0.00	0.06	160.41	1.524	2.325	41.908	0.014	0.150
1.58	0.00	0.08	1414.48	1.372	2.726	44.635	0.002	0.152
1.10	0.00	0.06	86.80	1.219	2.017	46.652	0.023	0.175
1.17	0.00	0.06	200.28	1.981	3.490	50.142	0.017	0.192
1.06	0.00	0.05	215.59	2.134	3.392	53.534	0.016	0.208
1.16	0.00	0.06	155.29	2.210	3.837	57.371	0.025	0.233
1.12	0.00	0.06	267.30	2.896	4.877	62.248	0.018	0.251
1.54	0.00	0.08	137.96	1.829	4.229	66.477	0.031	0.282
1.75	0.00	0.09	191.79	1.524	3.994	70.471	0.021	0.302
1.08	0.00	0.05	275.62	2.469	3.156	73.627	0.011	0.314
1.72	0.00	0.09	407.09	1.082	2.195	75.822	0.005	0.319






3
2
2
1
1
0
140
Gravimetric Water Content (%)

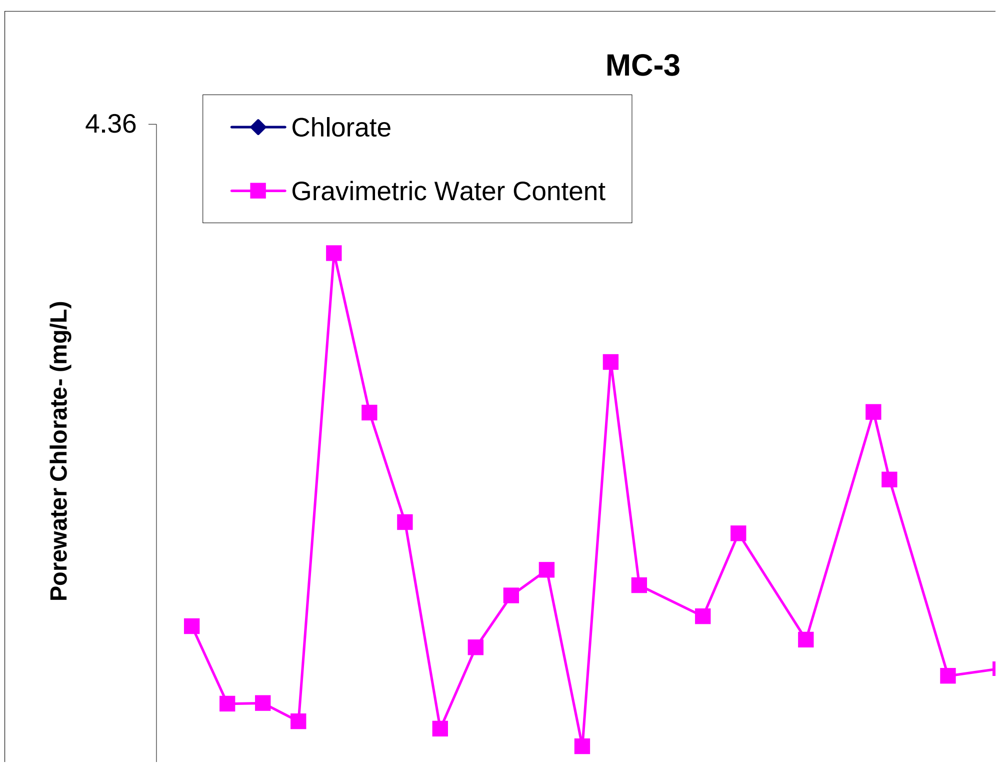

10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
Cumulative Cl- (g/m^2)
0
5
10
15
20
25
Cumulative Water (ft)

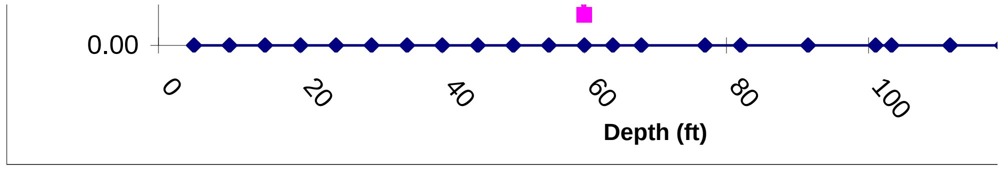
MC-3 Flux and Residence Times							
Depth (m)	Unit	Soil Depth	All Data	flux 1	flux 2		
1.52	Qal		406.10	406.10		406.10	
3.05	Qal		1409.33	1409.33		1409.33	
4.57	Qal		1848.71	1848.71		1848.71	
6.10	Qal		1005.86		1005.86	1005.86	
7.62	soil	7.62	73.96		73.96	73.96	
9.14	soil	9.144	89.77		89.77	89.77	
10.67	Qal		119.23		119.23	119.23	
12.19	Qal		531.34		531.34	531.34	
13.72	Qbt1v		214.45		214.45	214.45	
15.24	Qbt1v		130.78		130.78	130.78	
16.76	Qbt1v		160.41		160.41	160.41	
18.29	Qbt1v		1414.48		1414.48	1414.48	
19.51	Qct		86.80		86.80	86.80	
20.73	Qct		200.28		200.28	200.28	
23.47	Qct		215.59		215.59	215.59	
24.99	Qct		155.29		155.29	155.29	
27.89	Qct		267.30		267.30	267.30	
30.78	Qct		137.96		137.96	137.96	
31.47	Qct		191.79		191.79	191.79	
33.99	Qbo		275.62		275.62	275.62	
36.21	Qbo		407.09		407.09	407.09	
Average			444.86	1221.38	315.45	444.9	
Flux (m)			0.00024	0.00009	0.00034	0.00024	
Flux (cm)			0.024	0.009	0.034	0.024	
Deepest Residence time			707	years			
Soil Zone Residence Time (7.62cm)			59.9	years			
These fluxes assume Area G precip and are correct							
Precip Rate							
0.37	m/yr						

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

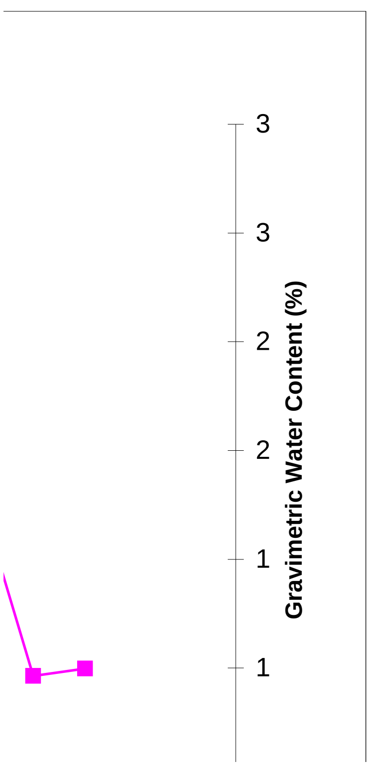
Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

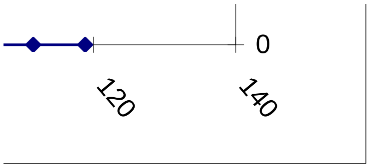




0.00
0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	ClO3 Leachate (mg/L)	H2O (ml)	ClO3- µg/g	Pore H2O (L)	ClO3- (mg)	ClO3- PW (mg/L)	ClO3- (mg/L)	Interval (m)
50.080	<0.01	75.00	0.00	0.00	0.00	0.00	0.000	2.286
50.000	<0.01	75.08	0.00	0.00	0.00	0.00	0.000	1.524
49.960	<0.01	75.04	0.00	0.00	0.00	0.00	0.000	1.524
50.010	<0.01	75.11	0.00	0.00	0.00	0.00	0.000	1.524
49.960	<0.01	75.05	0.00	0.00	0.00	0.00	0.000	1.524
50.130	<0.01	75.18	0.00	0.00	0.00	0.00	0.000	1.524
50.170	<0.01	75.21	0.00	0.00	0.00	0.00	0.000	1.524
50.000	<0.01	75.04	0.00	0.00	0.00	0.00	0.000	1.524
50.110	<0.01	75.10	0.00	0.00	0.00	0.00	0.000	1.524
50.130	<0.01	75.14	0.00	0.00	0.00	0.00	0.000	1.524
50.130	<0.01	75.08	0.00	0.00	0.00	0.00	0.000	1.524
49.930	<0.01	74.92	0.00	0.00	0.00	0.00	0.000	1.372
50.320	<0.01	75.30	0.00	0.00	0.00	0.00	0.000	1.219
50.060	<0.01	75.04	0.00	0.00	0.00	0.00	0.000	1.981
50.090	<0.01	75.07	0.00	0.00	0.00	0.00	0.000	2.134
50.110	<0.01	75.12	0.00	0.00	0.00	0.00	0.000	2.210
50.040	<0.01	75.01	0.00	0.00	0.00	0.00	0.000	2.896
50.140	<0.01	75.10	0.00	0.00	0.00	0.00	0.000	1.829
50.140	<0.01	75.12	0.00	0.00	0.00	0.00	0.000	1.524
49.980	<0.01	74.98	0.00	0.00	0.00	0.00	0.000	2.469
49.920	<0.01	75.00	0.00	0.00	0.00	0.00	0.000	1.082




0
120
140

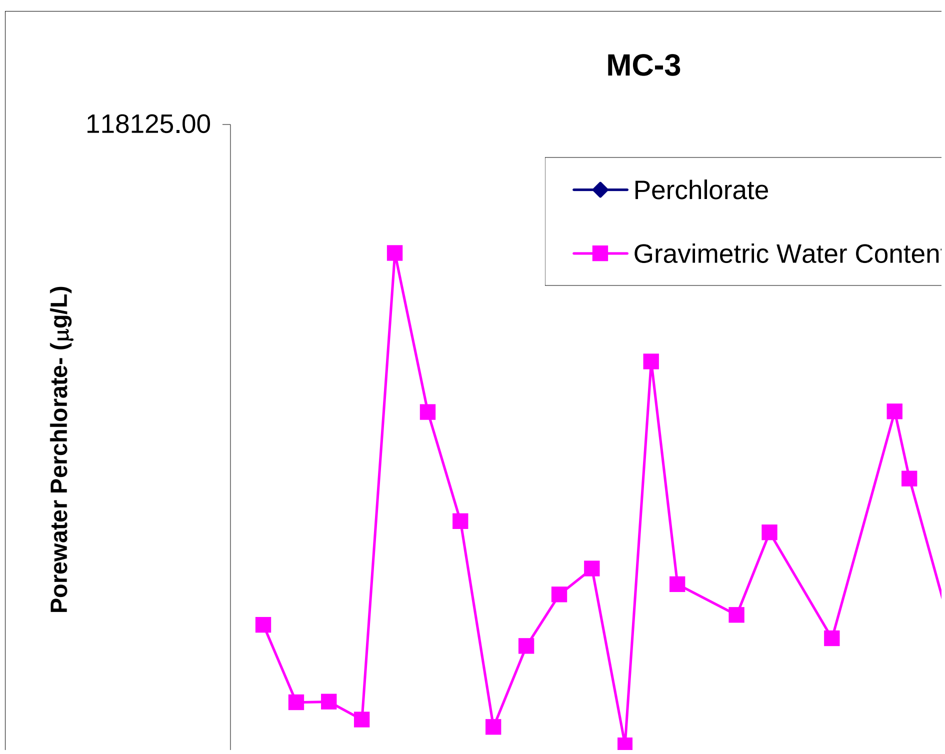
Interval ClO3swi (g/m2)	Cum. ClO3swi (g/m2)	Interval θd (m)	Cum θd (m)
0.000	0.000	0.016	0.02
0.000	0.000	0.021	0.04
0.000	0.000	0.026	0.06
0.000	0.000	0.030	0.09
0.000	0.000	0.067	0.16
0.000	0.000	0.092	0.25
0.000	0.000	0.110	0.36
0.000	0.000	0.113	0.47
0.000	0.000	0.122	0.60
0.000	0.000	0.135	0.73
0.000	0.000	0.150	0.88
0.000	0.000	0.152	1.03
0.000	0.000	0.175	1.21
0.000	0.000	0.192	1.40
0.000	0.000	0.208	1.61
0.000	0.000	0.233	1.84
0.000	0.000	0.251	2.09
0.000	0.000	0.282	2.37
0.000	0.000	0.302	2.68
0.000	0.000	0.314	
0.000	0.000	0.319	

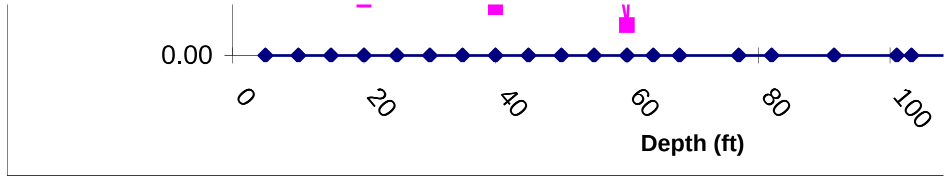
MC-3

Based on Prelim Stratigraphy

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

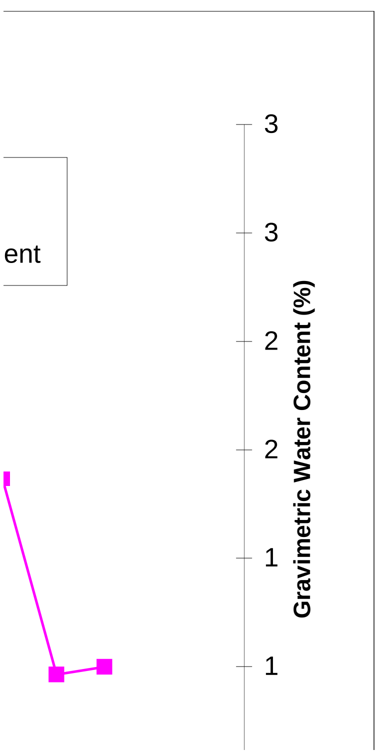


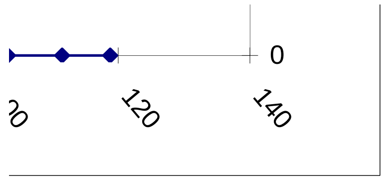


0.00
0
20
40
60
80
100
Depth (ft)

ıinary
/

Tuff Dry wt. (g)	ClO4 Leachate (mg/L)	H2O (ml)	ClO4- µg/g	Pore H2O (L)	ClO4- (mg)	ClO4- PW (mg/L)	ClO4- (mg/L)	Interval (m)
50.080	<0.0005	75.00	0.00	0.00	0.00	0.00	0.000	2.286
50.000	<0.002	75.08	0.00	0.00	0.00	0.00	0.000	1.524
49.960	<0.002	75.04	0.00	0.00	0.00	0.00	0.000	1.524
50.010	<0.001	75.11	0.00	0.00	0.00	0.00	0.000	1.524
49.960	<0.002	75.05	0.00	0.00	0.00	0.00	0.000	1.524
50.130	<0.001	75.18	0.00	0.00	0.00	0.00	0.000	1.524
50.170	<0.0005	75.21	0.00	0.00	0.00	0.00	0.000	1.524
50.000	<0.0005	75.04	0.00	0.00	0.00	0.00	0.000	1.524
50.110	<0.0005	75.10	0.00	0.00	0.00	0.00	0.000	1.524
50.130	<0.0005	75.14	0.00	0.00	0.00	0.00	0.000	1.524
50.130	<0.001	75.08	0.00	0.00	0.00	0.00	0.000	1.524
49.930	<0.0005	74.92	0.00	0.00	0.00	0.00	0.000	1.372
50.320	<0.001	75.30	0.00	0.00	0.00	0.00	0.000	1.219
50.060	<0.001	75.04	0.00	0.00	0.00	0.00	0.000	1.981
50.090	<0.0005	75.07	0.00	0.00	0.00	0.00	0.000	2.134
50.110	<0.0005	75.12	0.00	0.00	0.00	0.00	0.000	2.210
50.040	<0.0005	75.01	0.00	0.00	0.00	0.00	0.000	2.896
50.140	<0.0005	75.10	0.00	0.00	0.00	0.00	0.000	1.829
50.140	<0.0005	75.12	0.00	0.00	0.00	0.00	0.000	1.524
49.980	<0.0005	74.98	0.00	0.00	0.00	0.00	0.000	2.469
49.920	<0.0005	75.00	0.00	0.00	0.00	0.00	0.000	1.082



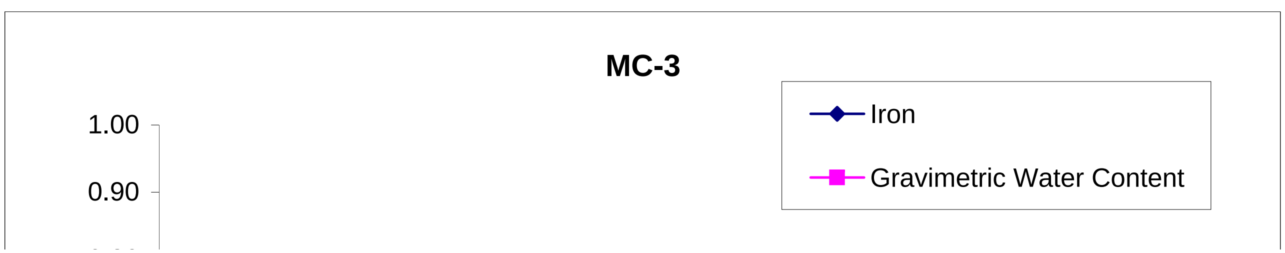

0
20
120
140

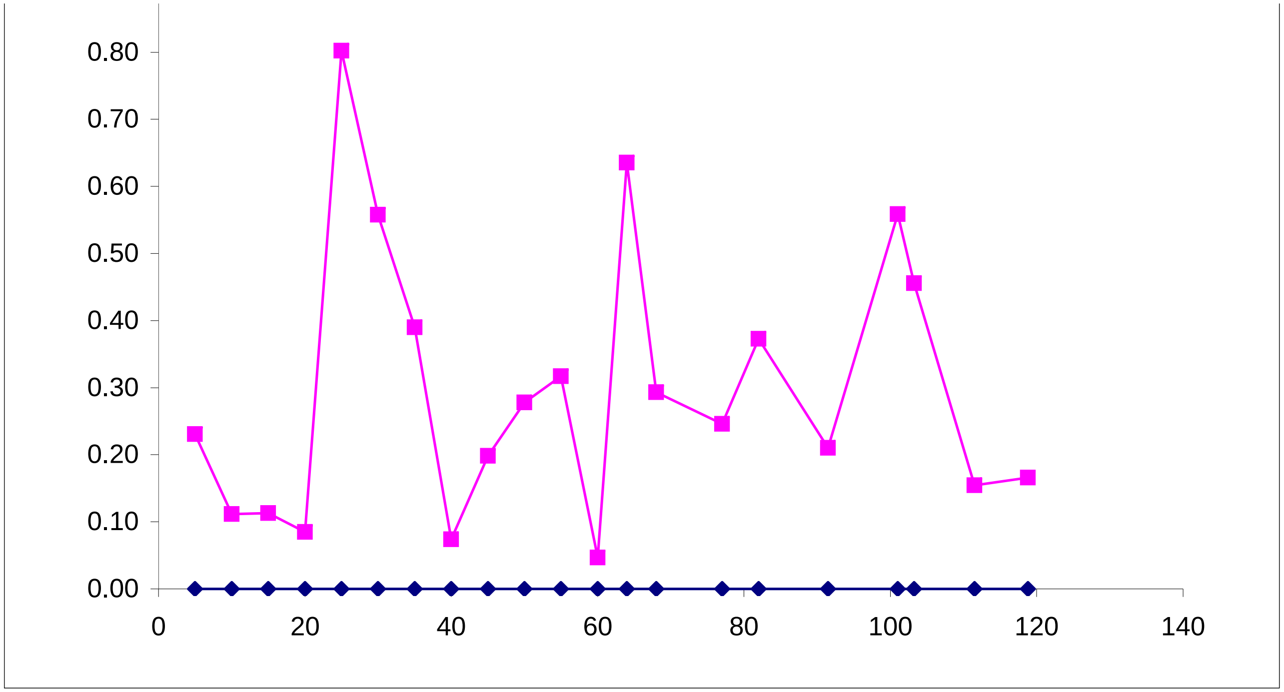
Interval ClO4swi (g/m2)	Cum. ClO4swi (g/m2)	Interval θd (m)	Cum θd (m)
0.000	0.000	0.016	0.02
0.000	0.000	0.021	0.04
0.000	0.000	0.026	0.06
0.000	0.000	0.030	0.09
0.000	0.000	0.067	0.16
0.000	0.000	0.092	0.25
0.000	0.000	0.110	0.36
0.000	0.000	0.113	0.47
0.000	0.000	0.122	0.60
0.000	0.000	0.135	0.73
0.000	0.000	0.150	0.88
0.000	0.000	0.152	1.03
0.000	0.000	0.175	1.21
0.000	0.000	0.192	1.40
0.000	0.000	0.208	1.61
0.000	0.000	0.233	1.84
0.000	0.000	0.251	2.09
0.000	0.000	0.282	2.37
0.000	0.000	0.302	2.68
0.000	0.000	0.314	
0.000	0.000	0.319	

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	CO3 Leachate (mg/L)	H2O (ml)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692	50.080	0.000	75.00
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335	50.000	0.000	75.08
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338	49.960	0.000	75.04
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255	50.010	0.000	75.11
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406	49.960	0.000	75.05
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673	50.130	0.000	75.18
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170	50.170	0.000	75.21
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221	50.000	0.000	75.04
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594	50.110	0.000	75.10
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833	50.130	0.000	75.14
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951	50.130	0.000	75.08
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141	49.930	0.000	74.92
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906	50.320	0.000	75.30
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880	50.060	0.000	75.04
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737	50.090	0.000	75.07
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118	50.110	0.000	75.12
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630	50.040	0.000	75.01
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676	50.140	0.000	75.10
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367	50.140	0.000	75.12
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464	49.980	0.000	74.98
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498	49.920	0.000	75.00

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994




0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
20
40
60
80
100
120
140

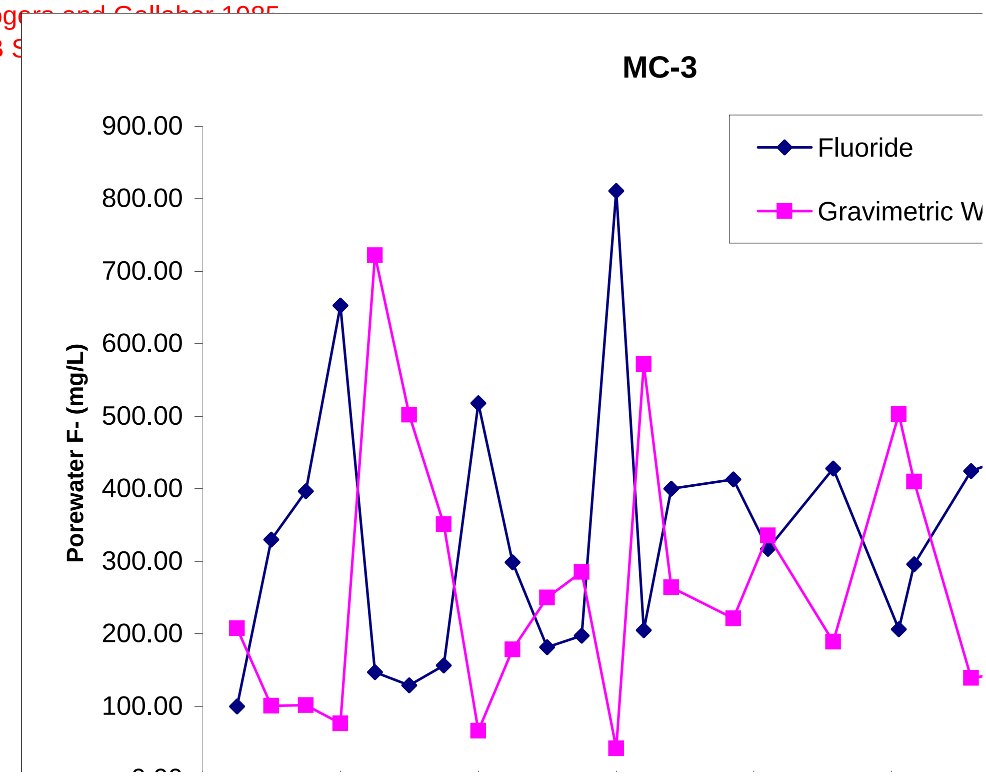
CO3 µg/g	Pore H2O (L)	CO3 (mg)	CO3 PW (mg/L)	Interval (m)	Interval CO3swi (g/m2)	Cum. CO3swi (g/m2)	Interval θd (m)	Cum θd (m)
0.00	0.00	0.00	0.00	2.286	0.000	0.000	0.016	0.016
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.005	0.021
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.005	0.026
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.004	0.030
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.037	0.067
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.025	0.092
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.018	0.110
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.003	0.113
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.009	0.122
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.013	0.135
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.014	0.150
0.00	0.00	0.00	0.00	1.372	0.000	0.000	0.002	0.152
0.00	0.00	0.00	0.00	1.219	0.000	0.000	0.023	0.175
0.00	0.00	0.00	0.00	1.981	0.000	0.000	0.017	0.192
0.00	0.00	0.00	0.00	2.134	0.000	0.000	0.016	0.208
0.00	0.00	0.00	0.00	2.210	0.000	0.000	0.025	0.233
0.00	0.00	0.00	0.00	2.896	0.000	0.000	0.018	0.251
0.00	0.00	0.00	0.00	1.829	0.000	0.000	0.031	0.282
0.00	0.00	0.00	0.00	1.524	0.000	0.000	0.021	0.302
0.00	0.00	0.00	0.00	2.469	0.000	0.000	0.011	0.314
0.00	0.00	0.00	0.00	1.082	0.000	0.000	0.005	0.319

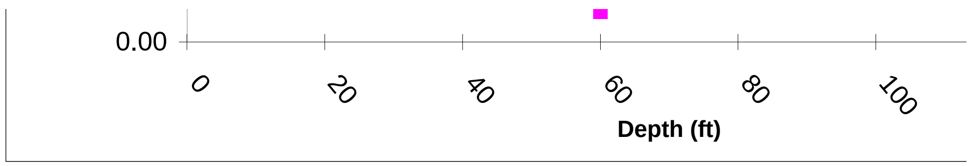
MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

Note:Tuff Bulk density from Rog

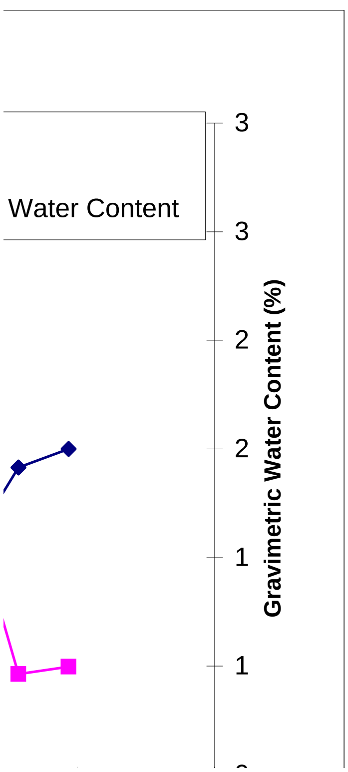
Note:Soil Bulk density from DB S

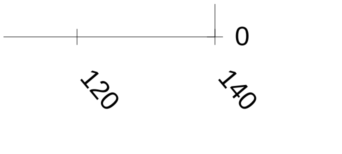




0.00
0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	F Leachate (mg/L)	H2O (ml)	F- µg/g	Pore H2O (L)	F- (mg)	F- PW (mg/L)	Interval (m)	Interval Fswi (g/m2)
50.080	0.324	75.00	0.49	0.00	0.02	99.59	2.286	1.576
50.000	0.518	75.08	0.78	0.00	0.04	329.94	1.524	1.685
49.960	0.630	75.04	0.95	0.00	0.05	396.76	1.524	2.046
50.010	0.779	75.11	1.17	0.00	0.06	652.75	1.524	2.533
49.960	1.684	75.05	2.53	0.00	0.13	147.22	1.524	5.399
50.130	1.028	75.18	1.54	0.00	0.08	129.05	1.524	3.290
50.170	0.859	75.21	1.29	0.00	0.06	156.33	1.524	2.787
50.000	0.538	75.04	0.81	0.00	0.04	517.93	1.524	1.747
50.110	0.940	75.10	1.41	0.00	0.07	298.60	1.524	2.704
50.130	0.801	75.14	1.20	0.00	0.06	181.67	1.524	2.306
50.130	0.994	75.08	1.49	0.00	0.07	197.25	1.524	2.859
49.930	0.603	74.92	0.90	0.00	0.05	810.91	1.372	1.563
50.320	1.741	75.30	2.61	0.00	0.13	205.07	1.219	4.765
50.060	1.565	75.04	2.35	0.00	0.12	400.11	1.981	6.973
50.090	1.355	75.07	2.03	0.00	0.10	413.02	2.134	6.498
50.110	1.576	75.12	2.36	0.00	0.12	316.99	2.210	7.833
50.040	1.200	75.01	1.80	0.00	0.09	427.99	2.896	7.810
50.140	1.540	75.10	2.31	0.00	0.12	206.41	1.829	6.327
50.140	1.800	75.12	2.70	0.00	0.14	295.97	1.524	6.164
49.980	1.112	74.98	1.67	0.00	0.08	424.41	2.469	4.859
49.920	1.264	75.00	1.90	0.00	0.09	449.85	1.082	2.425




0
120
140

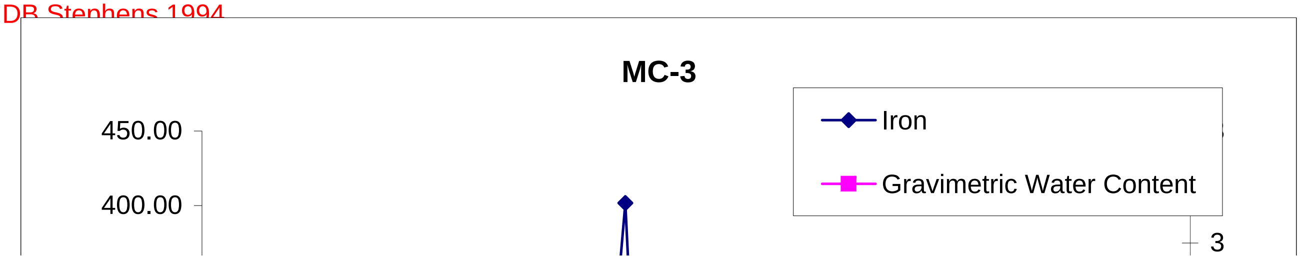
Cum. Fswi (g/m2)	Interval θd (m)	Cum θd (m)
1.576	0.016	0.016
3.261	0.005	0.021
5.307	0.005	0.026
7.840	0.004	0.030
13.239	0.037	0.067
16.529	0.025	0.092
19.316	0.018	0.110
21.063	0.003	0.113
23.767	0.009	0.122
26.073	0.013	0.135
28.933	0.014	0.150
30.496	0.002	0.152
35.261	0.023	0.175
42.234	0.017	0.192
48.732	0.016	0.208
56.565	0.025	0.233
64.374	0.018	0.251
70.701	0.031	0.282
76.865	0.021	0.302
81.725	0.011	0.314
84.150	0.005	0.319

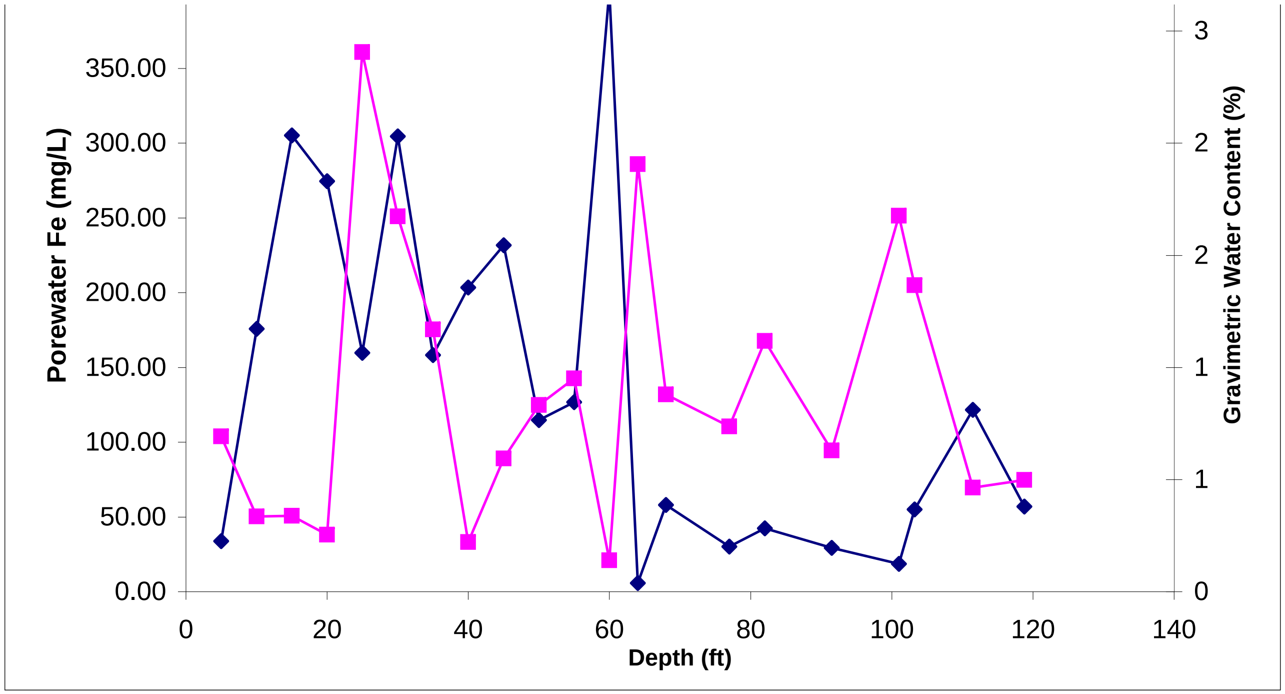
MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Fe Leachate (mg/L)	H2O (ml)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692	50.080	0.110	75.00
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335	50.000	0.276	75.08
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338	49.960	0.484	75.04
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255	50.010	0.328	75.11
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406	49.960	1.827	75.05
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673	50.130	2.427	75.18
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170	50.170	0.870	75.21
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221	50.000	0.211	75.04
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594	50.110	0.729	75.10
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833	50.130	0.507	75.14
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951	50.130	0.640	75.08
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141	49.930	0.299	74.92
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906	50.320	0.049	75.30
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880	50.060	0.227	75.04
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737	50.090	0.099	75.07
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118	50.110	0.210	75.12
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630	50.040	0.082	75.01
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676	50.140	0.139	75.10
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367	50.140	0.334	75.12
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464	49.980	0.319	74.98
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498	49.920	0.160	75.00

Note:Tuff Bulk density from Rogers and Gallaher 1985

Note:Soil Bulk density from DB Stephens 1994



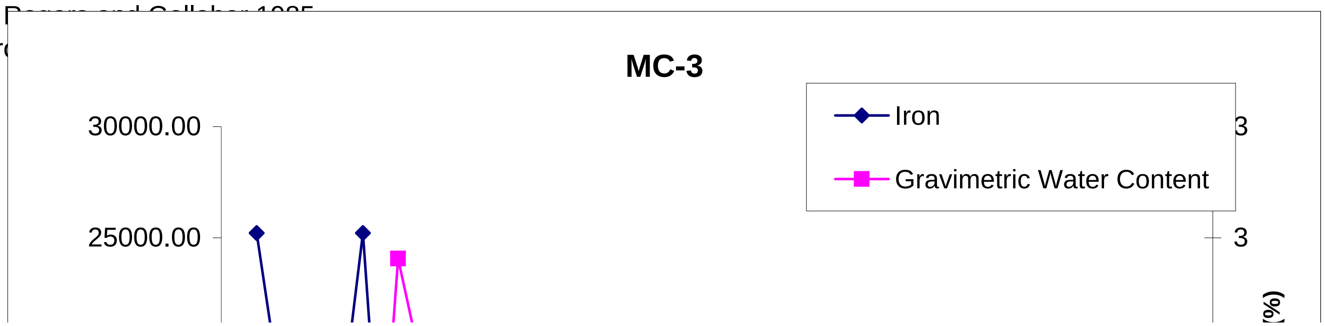

Porewater Fe (mg/L)
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Gravimetric Water Content (%)
3
2
2
1
1
0
0
20
40
60
80
100
120
140
Depth (ft)

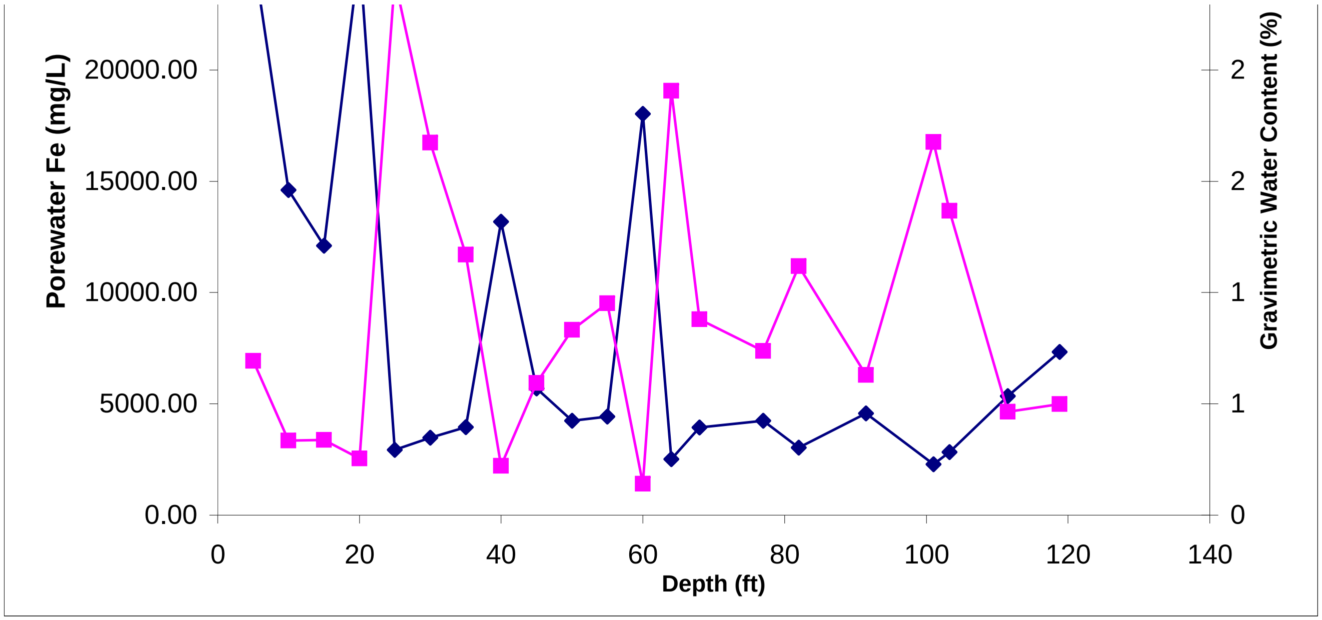
Fe µg/g	Pore H2O (L)	Fe (mg)	Fe PW (mg/L)	Interval (m)	Interval Feswi (g/m2)	Cum. Feswi (g/m2)	Interval θd (m)	Cum θd (m)
0.17	0.00	0.01	33.89	2.286	0.536	0.536	0.016	0.016
0.41	0.00	0.02	175.77	1.524	0.898	1.434	0.005	0.021
0.73	0.00	0.04	305.14	1.524	1.574	3.008	0.005	0.026
0.49	0.00	0.02	274.49	1.524	1.065	4.073	0.004	0.030
2.74	0.00	0.14	159.71	1.524	5.857	9.929	0.037	0.067
3.64	0.00	0.18	304.59	1.524	7.766	17.696	0.025	0.092
1.30	0.00	0.07	158.37	1.524	2.823	20.519	0.018	0.110
0.32	0.00	0.02	203.47	1.524	0.686	21.205	0.003	0.113
1.09	0.00	0.05	231.65	1.524	2.098	23.303	0.009	0.122
0.76	0.00	0.04	114.89	1.524	1.458	24.761	0.013	0.135
0.96	0.00	0.05	126.89	1.524	1.840	26.601	0.014	0.150
0.45	0.00	0.02	401.76	1.372	0.774	27.375	0.002	0.152
0.07	0.00	0.00	5.79	1.219	0.135	27.510	0.023	0.175
0.34	0.00	0.02	57.94	1.981	1.010	28.519	0.017	0.192
0.15	0.00	0.01	30.11	2.134	0.474	28.993	0.016	0.208
0.32	0.00	0.02	42.31	2.210	1.045	30.039	0.025	0.233
0.12	0.00	0.01	29.36	2.896	0.536	30.574	0.018	0.251
0.21	0.00	0.01	18.65	1.829	0.572	31.146	0.031	0.282
0.50	0.00	0.03	54.97	1.524	1.145	32.291	0.021	0.302
0.48	0.00	0.02	121.68	2.469	1.393	33.684	0.011	0.314
0.24	0.00	0.01	57.05	1.082	0.308	33.992	0.005	0.319

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	HCO3 Leachate (mg/L)	H2O (ml)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692	50.080	82.100	75.00
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335	50.000	22.946	75.08
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338	49.960	19.215	75.04
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255	50.010	30.100	75.11
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406	49.960	33.600	75.05
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673	50.130	27.700	75.18
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170	50.170	21.700	75.21
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221	50.000	13.700	75.04
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594	50.110	17.900	75.10
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833	50.130	18.700	75.14
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951	50.130	22.300	75.08
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141	49.930	13.400	74.92
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906	50.320	21.300	75.30
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880	50.060	15.400	75.04
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737	50.090	13.900	75.07
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118	50.110	15.100	75.12
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630	50.040	12.800	75.01
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676	50.140	17.000	75.10
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367	50.140	17.200	75.12
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464	49.980	14.000	74.98
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498	49.920	20.600	75.00

ensity from
k density fr





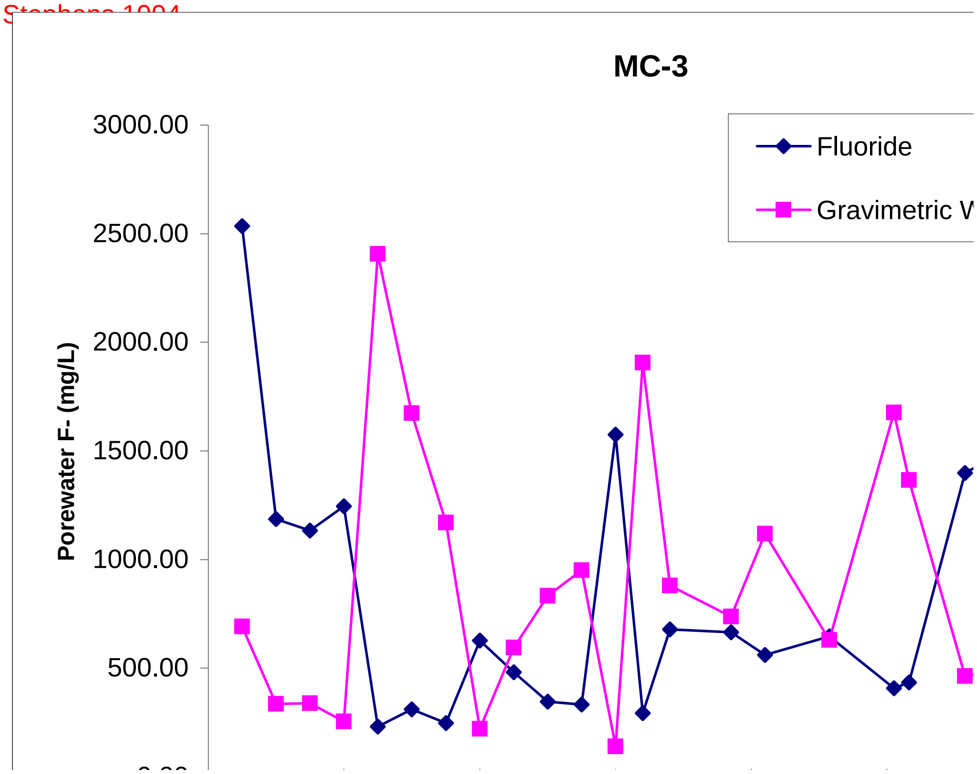
Porewater Fe (mg/L)
20000.00
15000.00
10000.00
5000.00
0.00
Gravimetric Water Content (%)
2
2
1
1
0
0
20
40
60
80
100
120
140
Depth (ft)

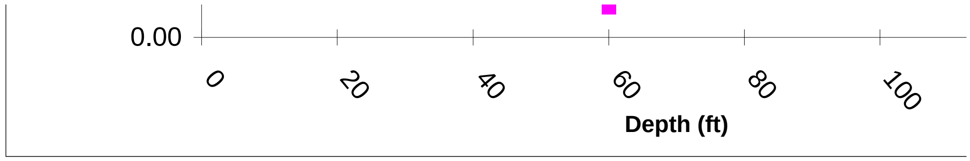
HCO3 µg/g	Pore H2O (L)	HCO3 (mg)	HCO3 PW (mg/L)	Interval (m)	Interval HCO3swi (g/m2)	Cum. HCO3swi (g/m2)	Interval θd (m)	Cum θd (m)
122.95	0.00	6.16	25217.39	2.286	399.121	399.121	0.016	0.016
34.46	0.00	1.72	14602.07	1.524	74.565	473.687	0.005	0.021
28.86	0.00	1.44	12110.50	1.524	62.457	536.144	0.005	0.026
45.21	0.00	2.26	25214.53	1.524	97.832	633.976	0.004	0.030
50.47	0.00	2.52	2936.69	1.524	107.691	741.667	0.037	0.067
41.54	0.00	2.08	3476.14	1.524	88.633	830.301	0.025	0.092
32.53	0.00	1.63	3949.36	1.524	70.399	900.699	0.018	0.110
20.56	0.00	1.03	13188.76	1.524	44.496	945.195	0.003	0.113
26.83	0.00	1.34	5688.22	1.524	51.514	996.709	0.009	0.122
28.03	0.00	1.41	4240.03	1.524	53.823	1050.532	0.013	0.135
33.40	0.00	1.67	4424.03	1.524	64.134	1114.666	0.014	0.150
20.11	0.00	1.00	18027.94	1.372	34.749	1149.415	0.002	0.152
31.87	0.00	1.60	2508.64	1.219	58.291	1207.705	0.023	0.175
23.08	0.00	1.16	3936.62	1.981	68.603	1276.308	0.017	0.192
20.83	0.00	1.04	4237.67	2.134	66.671	1342.979	0.016	0.208
22.64	0.00	1.13	3036.46	2.210	75.033	1418.012	0.025	0.233
19.19	0.00	0.96	4567.14	2.896	83.338	1501.350	0.018	0.251
25.46	0.00	1.28	2278.85	1.829	69.849	1571.199	0.031	0.282
25.77	0.00	1.29	2828.51	1.524	58.908	1630.107	0.021	0.302
21.00	0.00	1.05	5344.00	2.469	61.187	1691.294	0.011	0.314
30.95	0.00	1.55	7330.23	1.082	39.517	1730.811	0.005	0.319

MC-3

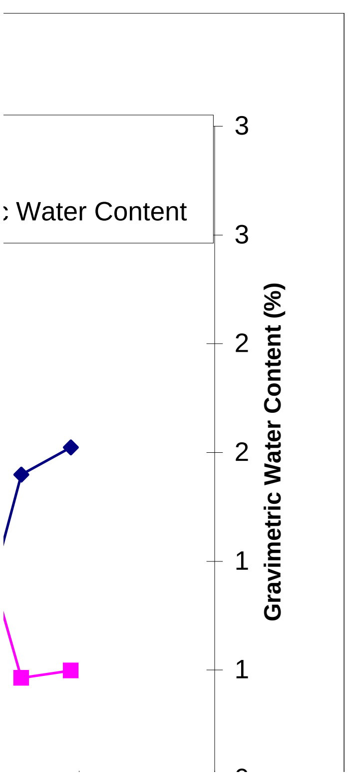
Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θ_g (%)	ρ_b* (g/cm3)	θ_v (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

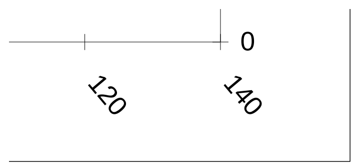
Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994




0.00
0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	K Leachate (mg/L)	H2O (ml)	K µg/g	Pore H2O (L)	K (mg)	K PW (mg/L)	Interval (m)	Interval Kswi (g/m2)
50.080	8.251	75.00	12.36	0.00	0.62	2534.31	2.286	40.111
50.000	1.865	75.08	2.80	0.00	0.14	1186.96	1.524	6.061
49.960	1.797	75.04	2.70	0.00	0.13	1132.79	1.524	5.842
50.010	1.487	75.11	2.23	0.00	0.11	1245.87	1.524	4.834
49.960	2.639	75.05	3.96	0.00	0.20	230.66	1.524	8.458
50.130	2.478	75.18	3.72	0.00	0.19	310.99	1.524	7.929
50.170	1.356	75.21	2.03	0.00	0.10	246.74	1.524	4.398
50.000	0.652	75.04	0.98	0.00	0.05	627.19	1.524	2.116
50.110	1.517	75.10	2.27	0.00	0.11	481.99	1.524	4.365
50.130	1.528	75.14	2.29	0.00	0.11	346.40	1.524	4.397
50.130	1.676	75.08	2.51	0.00	0.13	332.58	1.524	4.821
49.930	1.171	74.92	1.76	0.00	0.09	1575.26	1.372	3.036
50.320	2.487	75.30	3.72	0.00	0.19	292.94	1.219	6.807
50.060	2.654	75.04	3.98	0.00	0.20	678.47	1.981	11.824
50.090	2.182	75.07	3.27	0.00	0.16	665.19	2.134	10.465
50.110	2.787	75.12	4.18	0.00	0.21	560.40	2.210	13.848
50.040	1.812	75.01	2.72	0.00	0.14	646.67	2.896	11.800
50.140	3.041	75.10	4.55	0.00	0.23	407.59	1.829	12.493
50.140	2.638	75.12	3.95	0.00	0.20	433.79	1.524	9.034
49.980	3.664	74.98	5.50	0.00	0.27	1398.55	2.469	16.013
49.920	4.281	75.00	6.43	0.00	0.32	1523.24	1.082	8.212



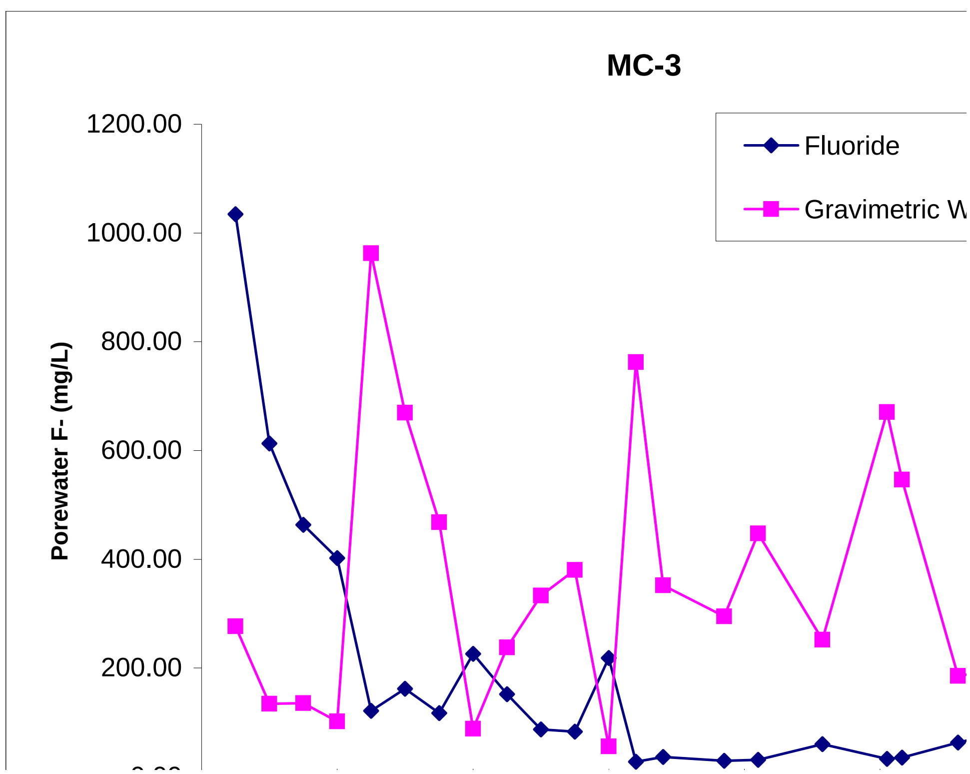

0
120
140

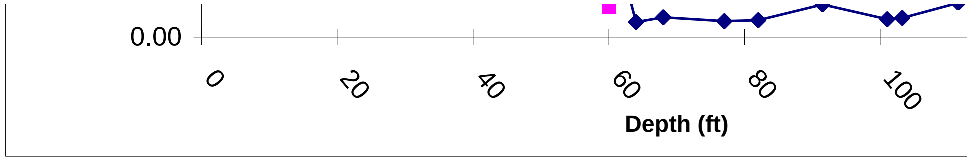
Cum. Kswi (g/m2)	Interval θd (m)	Cum θd (m)
40.111	0.016	0.016
46.172	0.005	0.021
52.014	0.005	0.026
56.848	0.004	0.030
65.307	0.037	0.067
73.236	0.025	0.092
77.634	0.018	0.110
79.750	0.003	0.113
84.115	0.009	0.122
88.513	0.013	0.135
93.334	0.014	0.150
96.370	0.002	0.152
103.177	0.023	0.175
115.001	0.017	0.192
125.466	0.016	0.208
139.314	0.025	0.233
151.114	0.018	0.251
163.607	0.031	0.282
172.641	0.021	0.302
188.654	0.011	0.314
196.866	0.005	0.319

MC-3

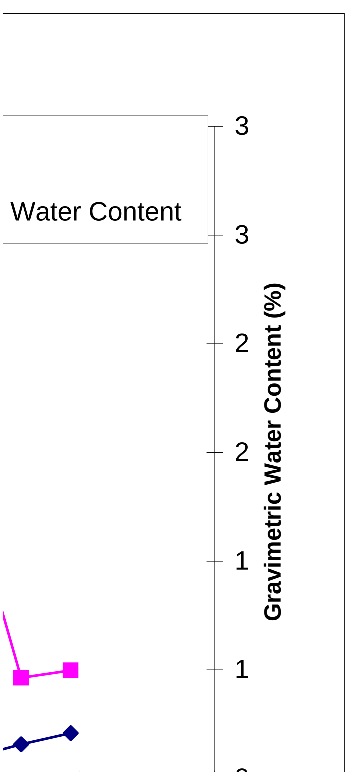
Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

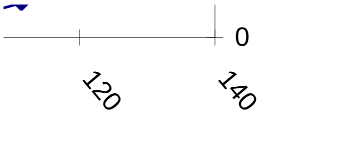
Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994




0.00
0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	Mg Leachate (mg/L)	H2O (ml)	Mg µg/g	Pore H2O (L)	Mg (mg)	Mg PW (mg/L)	Interval (m)	Interval Mgswi (g/m2)
50.080	3.368	75.00	5.04	0.00	0.25	1034.61	2.286	16.375
50.000	0.963	75.08	1.45	0.00	0.07	613.03	1.524	3.130
49.960	0.735	75.04	1.10	0.00	0.06	463.15	1.524	2.389
50.010	0.480	75.11	0.72	0.00	0.04	402.03	1.524	1.560
49.960	1.390	75.05	2.09	0.00	0.10	121.52	1.524	4.456
50.130	1.292	75.18	1.94	0.00	0.10	162.09	1.524	4.133
50.170	0.645	75.21	0.97	0.00	0.05	117.38	1.524	2.092
50.000	0.235	75.04	0.35	0.00	0.02	226.21	1.524	0.763
50.110	0.478	75.10	0.72	0.00	0.04	152.05	1.524	1.377
50.130	0.383	75.14	0.57	0.00	0.03	86.90	1.524	1.103
50.130	0.419	75.08	0.63	0.00	0.03	83.03	1.524	1.204
49.930	0.162	74.92	0.24	0.00	0.01	218.22	1.372	0.421
50.320	0.237	75.30	0.35	0.00	0.02	27.94	1.219	0.649
50.060	0.142	75.04	0.21	0.00	0.01	36.35	1.981	0.634
50.090	0.097	75.07	0.15	0.00	0.01	29.59	2.134	0.466
50.110	0.156	75.12	0.23	0.00	0.01	31.34	2.210	0.774
50.040	0.168	75.01	0.25	0.00	0.01	59.95	2.896	1.094
50.140	0.246	75.10	0.37	0.00	0.02	33.02	1.829	1.012
50.140	0.215	75.12	0.32	0.00	0.02	35.35	1.524	0.736
49.980	0.166	74.98	0.25	0.00	0.01	63.29	2.469	0.725
49.920	0.235	75.00	0.35	0.00	0.02	83.55	1.082	0.450



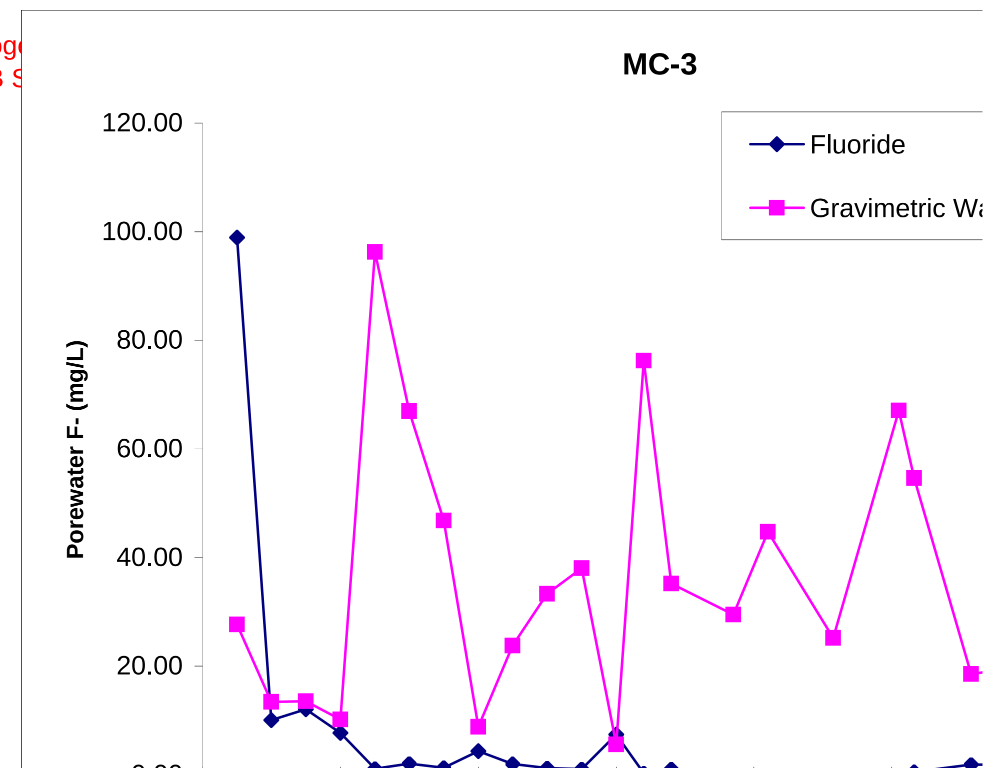

0
120
140

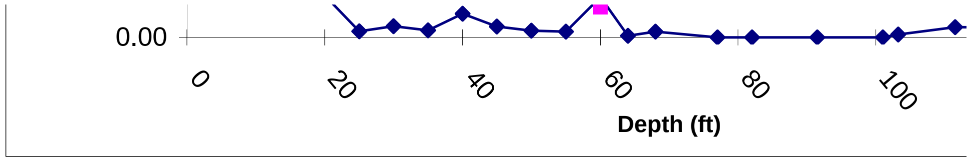
Cum. Mgswi (g/m2)	Interval θd (m)	Cum θd (m)
16.375	0.016	0.016
19.505	0.005	0.021
21.894	0.005	0.026
23.454	0.004	0.030
27.910	0.037	0.067
32.043	0.025	0.092
34.135	0.018	0.110
34.899	0.003	0.113
36.276	0.009	0.122
37.379	0.013	0.135
38.582	0.014	0.150
39.003	0.002	0.152
39.652	0.023	0.175
40.286	0.017	0.192
40.751	0.016	0.208
41.526	0.025	0.233
42.619	0.018	0.251
43.632	0.031	0.282
44.368	0.021	0.302
45.092	0.011	0.314
45.543	0.005	0.319

MC-3

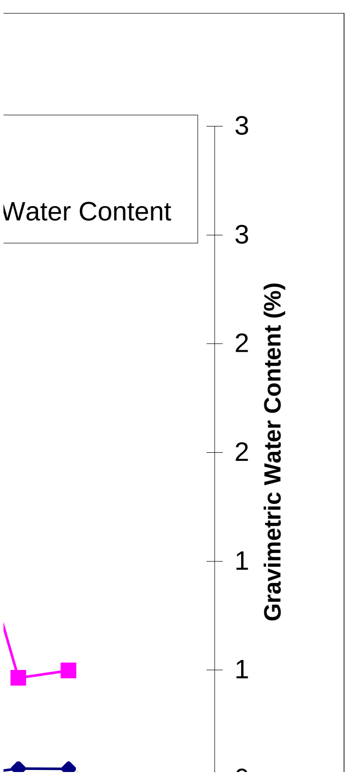
Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

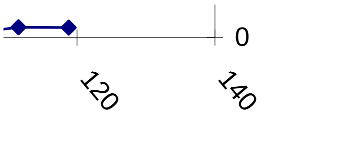
Note:Tuff Bulk density from Rog
Note:Soil Bulk density from DB S




0.00
0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	Mn Leachate (mg/L)	H2O (ml)	Mn µg/g	Pore H2O (L)	Mn (mg)	Mn PW (mg/L)	Interval (m)	Interval Mnswi (g/m2)
50.080	0.322	75.00	0.48	0.00	0.02	98.94	2.286	1.566
50.000	0.016	75.08	0.02	0.00	0.00	10.08	1.524	0.051
49.960	0.019	75.04	0.03	0.00	0.00	12.10	1.524	0.062
50.010	0.009	75.11	0.01	0.00	0.00	7.73	1.524	0.030
49.960	0.013	75.05	0.02	0.00	0.00	1.14	1.524	0.042
50.130	0.016	75.18	0.02	0.00	0.00	2.07	1.524	0.053
50.170	0.007	75.21	0.01	0.00	0.00	1.27	1.524	0.023
50.000	0.005	75.04	0.01	0.00	0.00	4.35	1.524	0.015
50.110	0.006	75.10	0.01	0.00	0.00	2.03	1.524	0.018
50.130	0.005	75.14	0.01	0.00	0.00	1.22	1.524	0.016
50.130	0.005	75.08	0.01	0.00	0.00	1.06	1.524	0.015
49.930	0.006	74.92	0.01	0.00	0.00	7.44	1.372	0.014
50.320	0.002	75.30	0.00	0.00	0.00	0.27	1.219	0.006
50.060	0.004	75.04	0.01	0.00	0.00	1.06	1.981	0.018
50.090	<0.002	75.07	0.00	0.00	0.00	0.00	2.134	0.000
50.110	<0.002	75.12	0.00	0.00	0.00	0.00	2.210	0.000
50.040	<0.002	75.01	0.00	0.00	0.00	0.00	2.896	0.000
50.140	<0.002	75.10	0.00	0.00	0.00	0.00	1.829	0.000
50.140	0.003	75.12	0.01	0.00	0.00	0.55	1.524	0.012
49.980	0.005	74.98	0.01	0.00	0.00	1.86	2.469	0.021
49.920	0.005	75.00	0.01	0.00	0.00	1.81	1.082	0.010




0
120
140

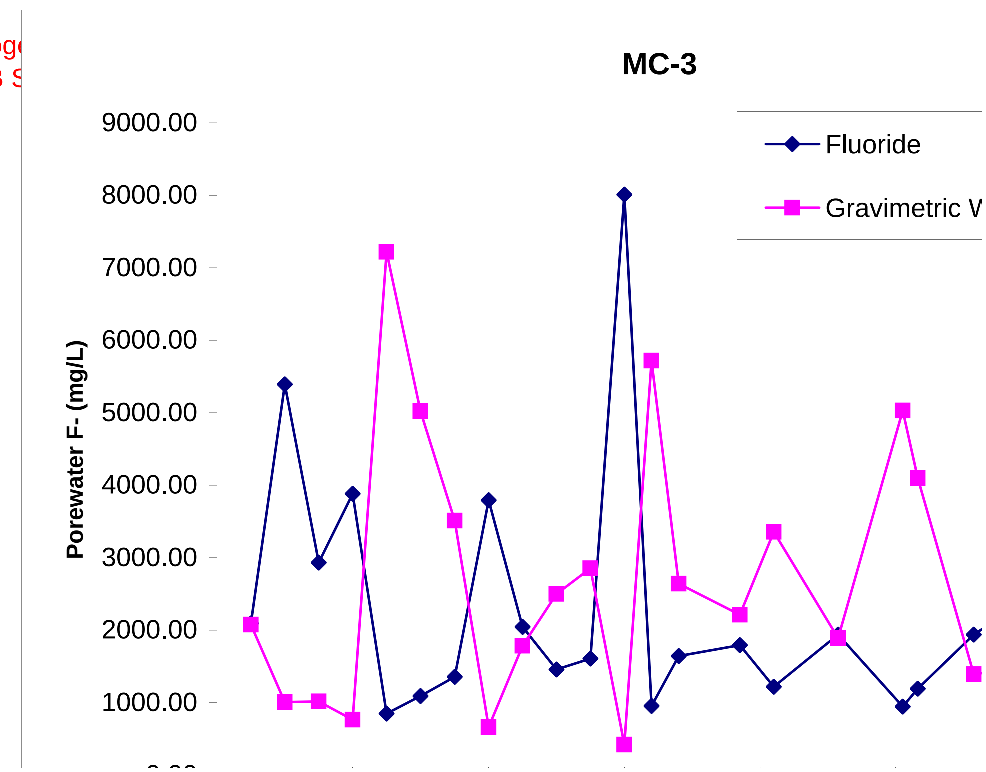
Cum. Mnswi (g/m2)	Interval θd (m)	Cum θd (m)
1.566	0.016	0.016
1.617	0.005	0.021
1.680	0.005	0.026
1.710	0.004	0.030
1.752	0.037	0.067
1.804	0.025	0.092
1.827	0.018	0.110
1.842	0.003	0.113
1.860	0.009	0.122
1.876	0.013	0.135
1.891	0.014	0.150
1.905	0.002	0.152
1.912	0.023	0.175
1.930	0.017	0.192
1.930	0.016	0.208
1.930	0.025	0.233
1.930	0.018	0.251
1.930	0.031	0.282
1.942	0.021	0.302
1.963	0.011	0.314
1.973	0.005	0.319

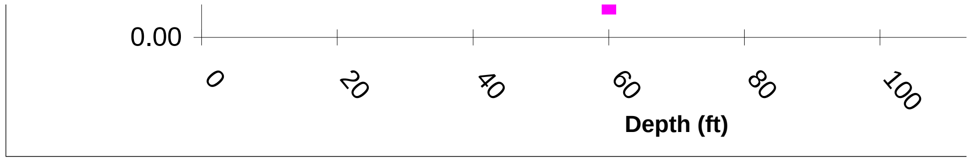
MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

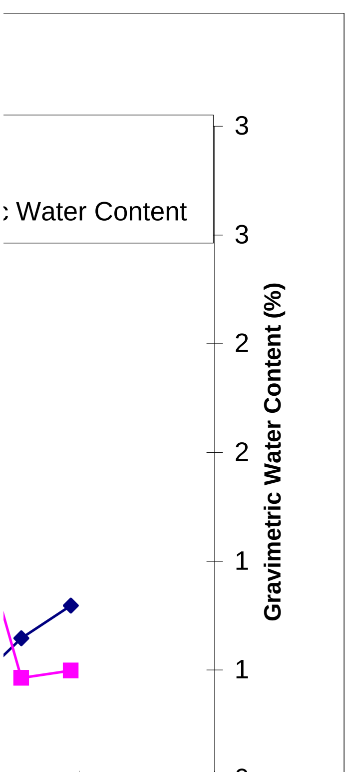
Note:Tuff Bulk density from Rog

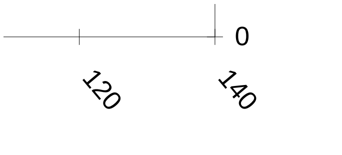
Note:Soil Bulk density from DB S




0.00
0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	Na Leachate (mg/L)	H2O (ml)	Na µg/g	Pore H2O (L)	Na (mg)	Na PW (mg/L)	Interval (m)	Interval Naswi (g/m2)
50.080	6.813	75.00	10.20	0.00	0.51	2092.75	2.286	33.122
50.000	8.471	75.08	12.72	0.00	0.64	5390.33	1.524	27.526
49.960	4.654	75.04	6.99	0.00	0.35	2933.56	1.524	15.129
50.010	4.631	75.11	6.96	0.00	0.35	3879.68	1.524	15.053
49.960	9.682	75.05	14.54	0.00	0.73	846.24	1.524	31.032
50.130	8.698	75.18	13.04	0.00	0.65	1091.51	1.524	27.831
50.170	7.455	75.21	11.18	0.00	0.56	1356.73	1.524	24.184
50.000	3.941	75.04	5.91	0.00	0.30	3794.06	1.524	12.800
50.110	6.430	75.10	9.64	0.00	0.48	2043.36	1.524	18.505
50.130	6.434	75.14	9.64	0.00	0.48	1458.74	1.524	18.517
50.130	8.094	75.08	12.12	0.00	0.61	1605.80	1.524	23.279
49.930	5.953	74.92	8.93	0.00	0.45	8008.72	1.372	15.437
50.320	8.104	75.30	12.13	0.00	0.61	954.50	1.219	22.179
50.060	6.433	75.04	9.64	0.00	0.48	1644.32	1.981	28.655
50.090	5.880	75.07	8.81	0.00	0.44	1792.72	2.134	28.205
50.110	6.064	75.12	9.09	0.00	0.46	1219.50	2.210	30.135
50.040	5.438	75.01	8.15	0.00	0.41	1940.26	2.896	35.404
50.140	7.034	75.10	10.54	0.00	0.53	942.96	1.829	28.903
50.140	7.250	75.12	10.86	0.00	0.54	1192.30	1.524	24.832
49.980	5.077	74.98	7.62	0.00	0.38	1938.07	2.469	22.190
49.920	6.717	75.00	10.09	0.00	0.50	2390.04	1.082	12.884



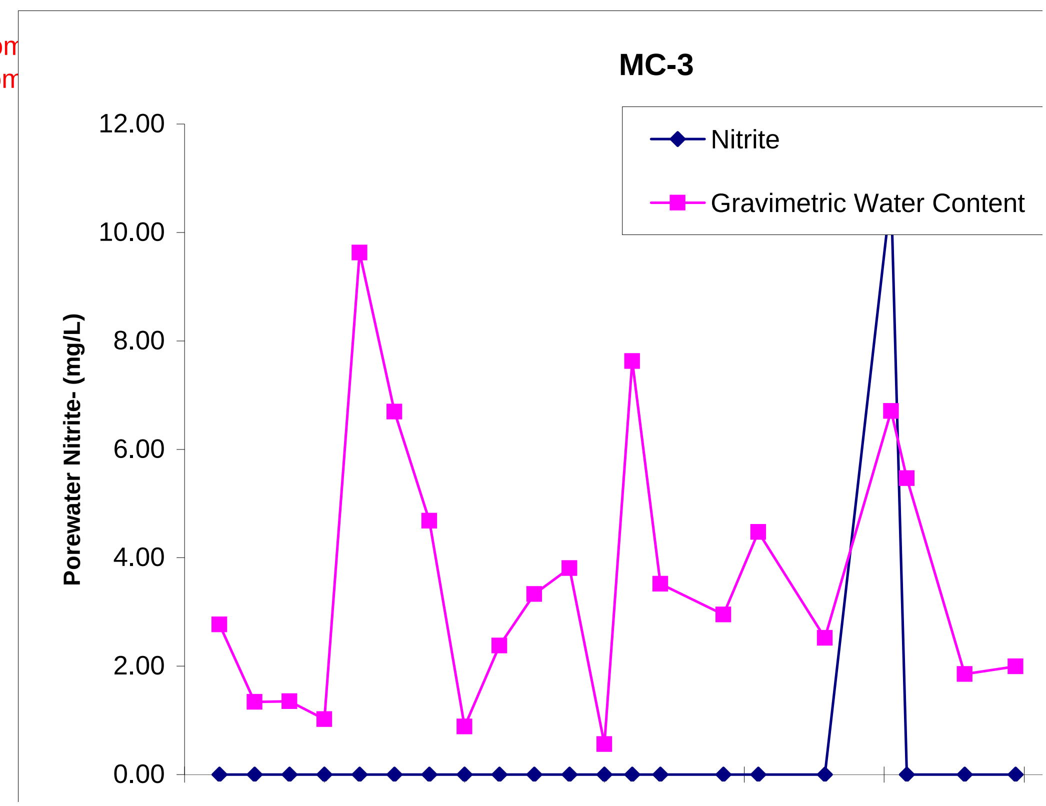

0
120
140

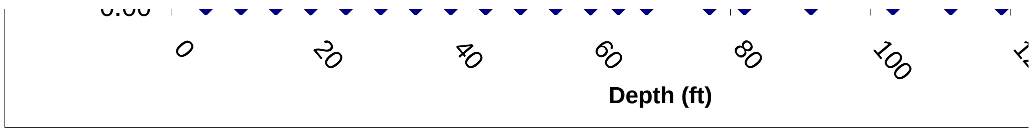
Cum. Naswi (g/m2)	Interval θd (m)	Cum θd (m)
33.122	0.016	0.016
60.648	0.005	0.021
75.777	0.005	0.026
90.830	0.004	0.030
121.863	0.037	0.067
149.694	0.025	0.092
173.878	0.018	0.110
186.678	0.003	0.113
205.183	0.009	0.122
223.701	0.013	0.135
246.979	0.014	0.150
262.416	0.002	0.152
284.595	0.023	0.175
313.250	0.017	0.192
341.455	0.016	0.208
371.590	0.025	0.233
406.994	0.018	0.251
435.897	0.031	0.282
460.728	0.021	0.302
482.919	0.011	0.314
495.803	0.005	0.319

MC-3

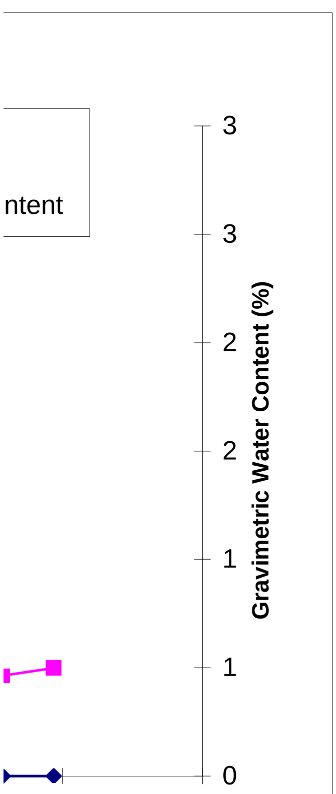
Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

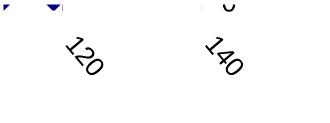
Note:Tuff Bulk density from
Note:Soil Bulk density from




0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	NO2 Leachate (mg/L)	H2O (ml)	NO2- µg/g	Pore H2O (L)	NO2- (mg)	NO2- (mg/L)	Interval (m)	Interval NO2swi (g/m2)
50.080	<0.01	75.00	0.00	0.00	0.00	0.00	2.286	0.000
50.000	<0.01	75.08	0.00	0.00	0.00	0.00	1.524	0.000
49.960	<0.01	75.04	0.00	0.00	0.00	0.00	1.524	0.000
50.010	<0.01	75.11	0.00	0.00	0.00	0.00	1.524	0.000
49.960	<0.01	75.05	0.00	0.00	0.00	0.00	1.524	0.000
50.130	<0.01	75.18	0.00	0.00	0.00	0.00	1.524	0.000
50.170	<0.01	75.21	0.00	0.00	0.00	0.00	1.524	0.000
50.000	<0.01	75.04	0.00	0.00	0.00	0.00	1.524	0.000
50.110	<0.01	75.10	0.00	0.00	0.00	0.00	1.524	0.000
50.130	<0.01	75.14	0.00	0.00	0.00	0.00	1.524	0.000
50.130	<0.01	75.08	0.00	0.00	0.00	0.00	1.524	0.000
49.930	<0.01	74.92	0.00	0.00	0.00	0.00	1.372	0.000
50.320	<0.01	75.30	0.00	0.00	0.00	0.00	1.219	0.000
50.060	<0.01	75.04	0.00	0.00	0.00	0.00	1.981	0.000
50.090	<0.01	75.07	0.00	0.00	0.00	0.00	2.134	0.000
50.110	<0.01	75.12	0.00	0.00	0.00	0.00	2.210	0.000
50.040	<0.01	75.01	0.00	0.00	0.00	0.00	2.896	0.000
50.140	0.080	75.10	0.12	0.00	0.01	10.72	1.829	0.329
50.140	<0.01	75.12	0.00	0.00	0.00	0.00	1.524	0.000
49.980	<0.01	74.98	0.00	0.00	0.00	0.00	2.469	0.000
49.920	<0.01	75.00	0.00	0.00	0.00	0.00	1.082	0.000



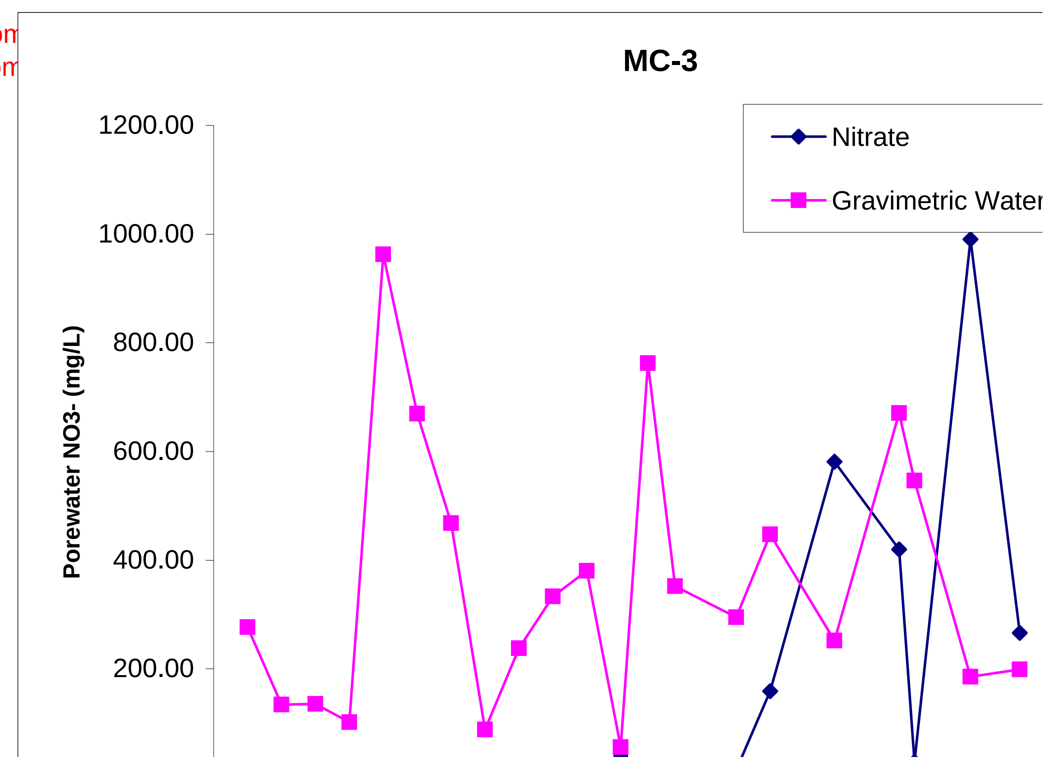

120
140

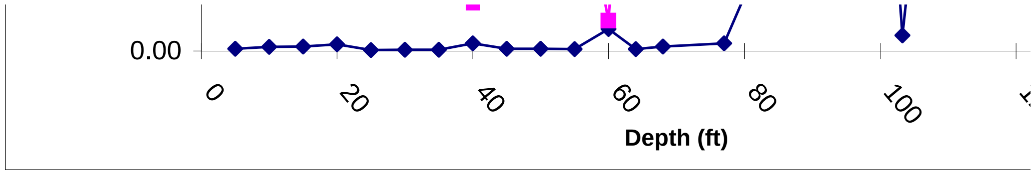
Cum. NO2swi (g/m2)	Interval θd (m)	Cum θd (m)
0.000	0.016	0.016
0.000	0.005	0.021
0.000	0.005	0.026
0.000	0.004	0.030
0.000	0.037	0.067
0.000	0.025	0.092
0.000	0.018	0.110
0.000	0.003	0.113
0.000	0.009	0.122
0.000	0.013	0.135
0.000	0.014	0.150
0.000	0.002	0.152
0.000	0.023	0.175
0.000	0.017	0.192
0.000	0.016	0.208
0.000	0.025	0.233
0.000	0.018	0.251
0.329	0.031	0.282
0.329	0.021	0.302
0.329	0.011	0.314
0.329	0.005	0.319

MC-3

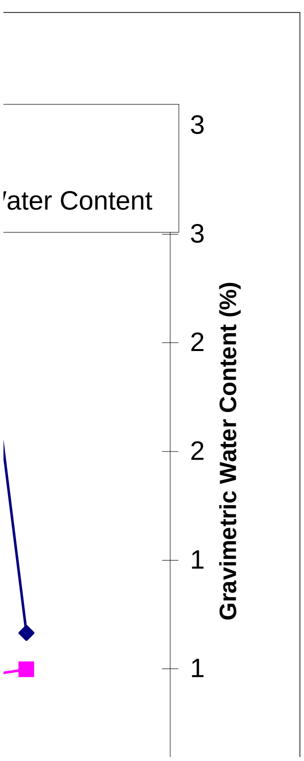
Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

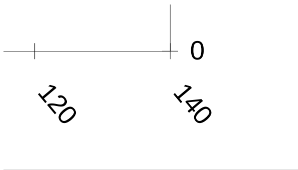
Note:Tuff Bulk density from
Note:Soil Bulk density from




0.00
0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	NO3 Leachate (mg/L)	H2O (ml)	NO3- µg/g	Pore H2O (L)	NO3- (mg)	NO3- (mg/L)	Interval (m)	Interval NO3swi (g/m2)
50.080	0.013	75.00	0.02	0.00	0.00	4.02	2.286	0.064
50.000	0.012	75.08	0.02	0.00	0.00	7.94	1.524	0.041
49.960	0.013	75.04	0.02	0.00	0.00	8.40	1.524	0.043
50.010	0.015	75.11	0.02	0.00	0.00	12.32	1.524	0.048
49.960	0.019	75.05	0.03	0.00	0.00	1.70	1.524	0.062
50.130	0.018	75.18	0.03	0.00	0.00	2.24	1.524	0.057
50.170	0.013	75.21	0.02	0.00	0.00	2.31	1.524	0.041
50.000	0.015	75.04	0.02	0.00	0.00	14.02	1.524	0.047
50.110	0.014	75.10	0.02	0.00	0.00	4.34	1.524	0.039
50.130	0.017	75.14	0.03	0.00	0.00	3.95	1.524	0.050
50.130	0.017	75.08	0.03	0.00	0.00	3.40	1.524	0.049
49.930	0.030	74.92	0.05	0.00	0.00	40.36	1.372	0.078
50.320	0.032	75.30	0.05	0.00	0.00	3.73	1.219	0.087
50.060	0.031	75.04	0.05	0.00	0.00	8.04	1.981	0.140
50.090	0.047	75.07	0.07	0.00	0.00	14.36	2.134	0.226
50.110	0.791	75.12	1.19	0.00	0.06	159.09	2.210	3.931
50.040	1.629	75.01	2.44	0.00	0.12	581.39	2.896	10.609
50.140	3.130	75.10	4.69	0.00	0.24	419.62	1.829	12.862
50.140	0.176	75.12	0.26	0.00	0.01	28.86	1.524	0.601
49.980	2.595	74.98	3.89	0.00	0.19	990.42	2.469	11.340
49.920	0.747	75.00	1.12	0.00	0.06	265.88	1.082	1.433




0
120
140

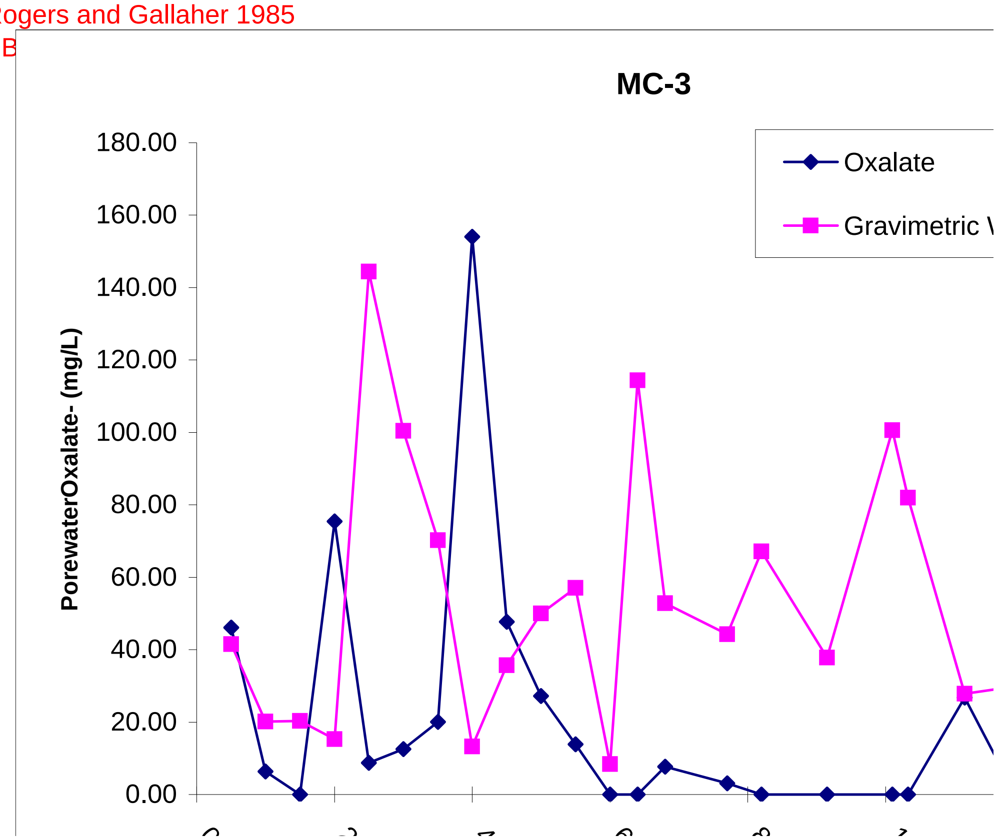
Cum. NO3swi (g/m2)	Interval θd (m)	Cum θd (m)
0.064	0.016	0.016
0.168	0.005	0.021
0.379	0.005	0.026
0.805	0.004	0.030
0.868	0.037	0.067
0.925	0.025	0.092
0.966	0.018	0.110
1.013	0.003	0.113
1.052	0.009	0.122
1.103	0.013	0.135
1.152	0.014	0.150
1.230	0.002	0.152
1.316	0.023	0.175
1.456	0.017	0.192
1.682	0.016	0.208
5.614	0.025	0.233
16.222	0.018	0.251
29.084	0.031	0.282
29.685	0.021	0.302
41.025	0.011	0.314
42.459	0.005	0.319

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

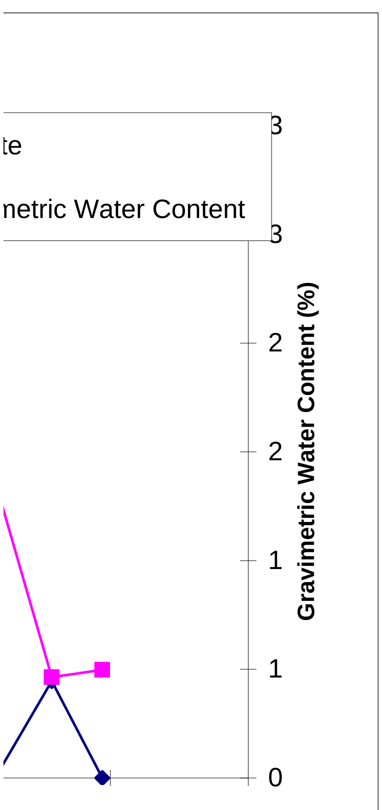
Note:Tuff Bulk density from Rogers and Gallaher 1985

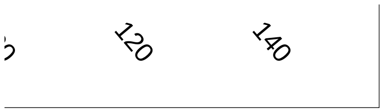
Note:Soil Bulk density from DB




0
20
40
60
80
100
Depth (ft)

Tuff Dry wt. (g)	OXA Leachate (mg/L)	H2O (mL)	OXA- µg/g	Pore H2O (L)	OXA- (mg)	OXA- (mg/L)	Interval (m)	Interval OXAswi (g/m2)
50.080	0.150	75.00	0.22	0.00	0.01	46.07	2.286	0.729
50.000	0.010	75.08	0.02	0.00	0.00	6.36	1.524	0.032
49.960	<0.01	75.04	0.00	0.00	0.00	0.00	1.524	0.000
50.010	0.090	75.11	0.14	0.00	0.01	75.39	1.524	0.293
49.960	0.100	75.05	0.15	0.00	0.01	8.74	1.524	0.321
50.130	0.100	75.18	0.15	0.00	0.01	12.55	1.524	0.320
50.170	0.110	75.21	0.16	0.00	0.01	20.02	1.524	0.357
50.000	0.160	75.04	0.24	0.00	0.01	154.03	1.524	0.520
50.110	0.150	75.10	0.22	0.00	0.01	47.67	1.524	0.432
50.130	0.120	75.14	0.18	0.00	0.01	27.21	1.524	0.345
50.130	0.070	75.08	0.10	0.00	0.01	13.89	1.524	0.201
49.930	<0.01	74.92	0.00	0.00	0.00	0.00	1.372	0.000
50.320	<0.01	75.30	0.00	0.00	0.00	0.00	1.219	0.000
50.060	0.030	75.04	0.04	0.00	0.00	7.67	1.981	0.134
50.090	0.010	75.07	0.01	0.00	0.00	3.05	2.134	0.048
50.110	<0.01	75.12	0.00	0.00	0.00	0.00	2.210	0.000
50.040	<0.01	75.01	0.00	0.00	0.00	0.00	2.896	0.000
50.140	<0.01	75.10	0.00	0.00	0.00	0.00	1.829	0.000
50.140	<0.01	75.12	0.00	0.00	0.00	0.00	1.524	0.000
49.980	0.070	74.98	0.11	0.00	0.01	26.72	2.469	0.306
49.920	<0.01	75.00	0.00	0.00	0.00	0.00	1.082	0.000



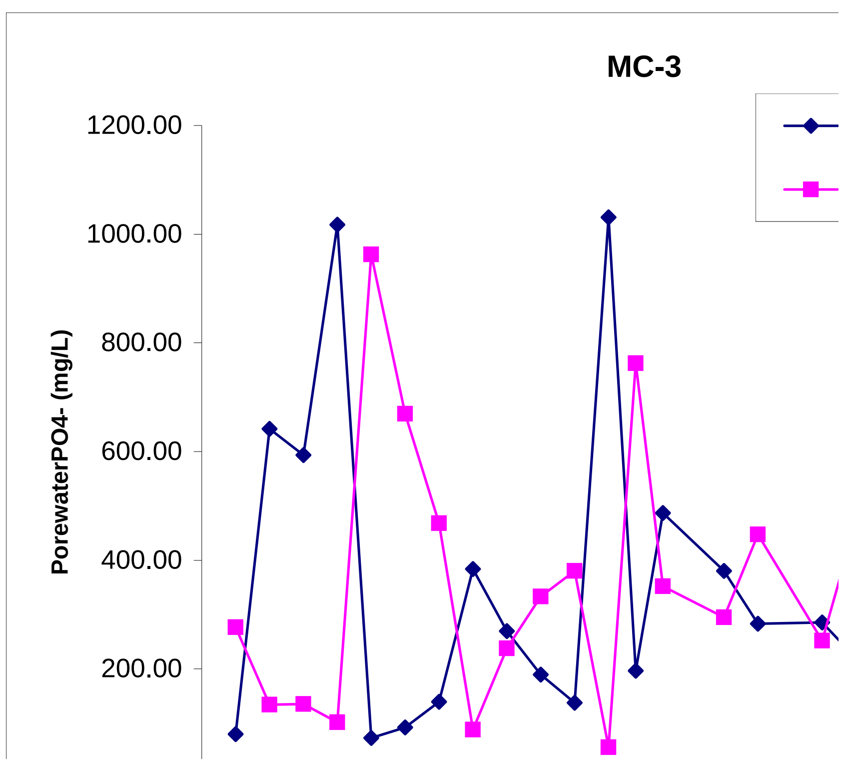

120
140

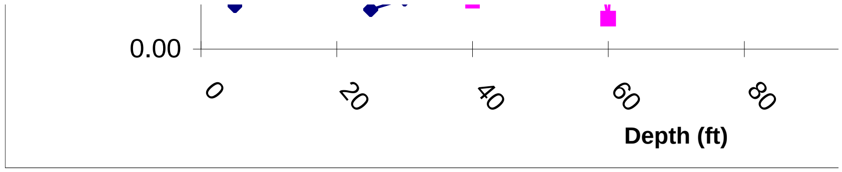
Cum. OXAswi (g/m2)	Interval θd (m)	Cum θd (m)
0.729	0.016	0.016
0.762	0.005	0.021
0.762	0.005	0.026
1.054	0.004	0.030
1.375	0.037	0.067
1.695	0.025	0.092
2.052	0.018	0.110
2.571	0.003	0.113
3.003	0.009	0.122
3.348	0.013	0.135
3.550	0.014	0.150
3.550	0.002	0.152
3.550	0.023	0.175
3.683	0.017	0.192
3.731	0.016	0.208
3.731	0.025	0.233
3.731	0.018	0.251
3.731	0.031	0.282
3.731	0.021	0.302
4.037	0.011	0.314
4.037	0.005	0.319

MC-3

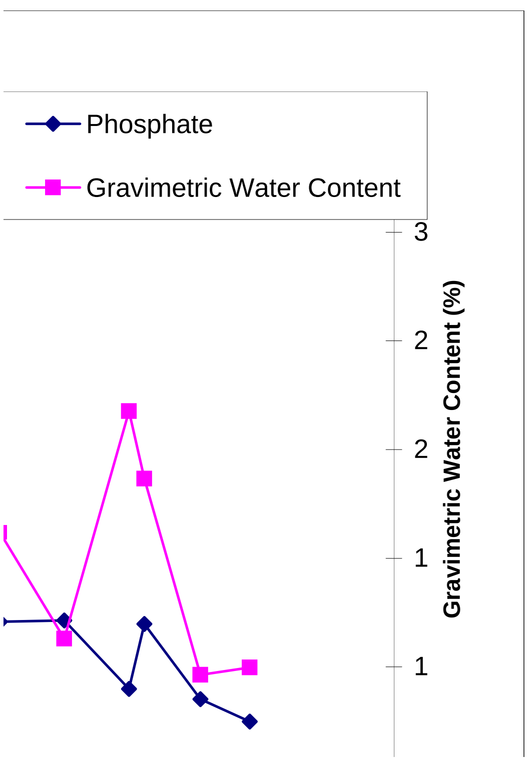
Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

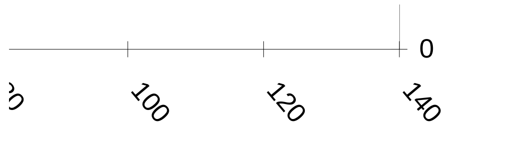
sity from Rogers and Gallaher 1985
density from DB Stephens 1994




0.00
0
20
40
60
80
Depth (ft)

Tuff Dry wt. (g)	PO4 Leachate (mg/L)	H2O (mL)	PO4- µg/g	Pore H2O (L)	PO4- (mg)	PO4- (mg/L)	Interval (m)	Interval PO4swi (g/m2)
50.080	0.261	75.00	0.39	0.00	0.02	80.01	2.286	1.266
50.000	1.009	75.08	1.51	0.00	0.08	641.92	1.524	3.278
49.960	0.942	75.04	1.41	0.00	0.07	593.48	1.524	3.061
50.010	1.215	75.11	1.82	0.00	0.09	1017.72	1.524	3.949
49.960	0.833	75.05	1.25	0.00	0.06	72.83	1.524	2.671
50.130	0.738	75.18	1.11	0.00	0.06	92.63	1.524	2.362
50.170	0.768	75.21	1.15	0.00	0.06	139.73	1.524	2.491
50.000	0.399	75.04	0.60	0.00	0.03	383.84	1.524	1.295
50.110	0.849	75.10	1.27	0.00	0.06	269.90	1.524	2.444
50.130	0.837	75.14	1.25	0.00	0.06	189.81	1.524	2.409
50.130	0.693	75.08	1.04	0.00	0.05	137.56	1.524	1.994
49.930	0.766	74.92	1.15	0.00	0.06	1030.79	1.372	1.987
50.320	1.671	75.30	2.50	0.00	0.13	196.80	1.219	4.573
50.060	1.906	75.04	2.86	0.00	0.14	487.13	1.981	8.489
50.090	1.248	75.07	1.87	0.00	0.09	380.39	2.134	5.985
50.110	1.409	75.12	2.11	0.00	0.11	283.40	2.210	7.003
50.040	0.801	75.01	1.20	0.00	0.06	285.81	2.896	5.215
50.140	1.191	75.10	1.78	0.00	0.09	159.67	1.829	4.894
50.140	1.697	75.12	2.54	0.00	0.13	279.14	1.524	5.814
49.980	0.369	74.98	0.55	0.00	0.03	140.81	2.469	1.612
49.920	0.280	75.00	0.42	0.00	0.02	99.75	1.082	0.538





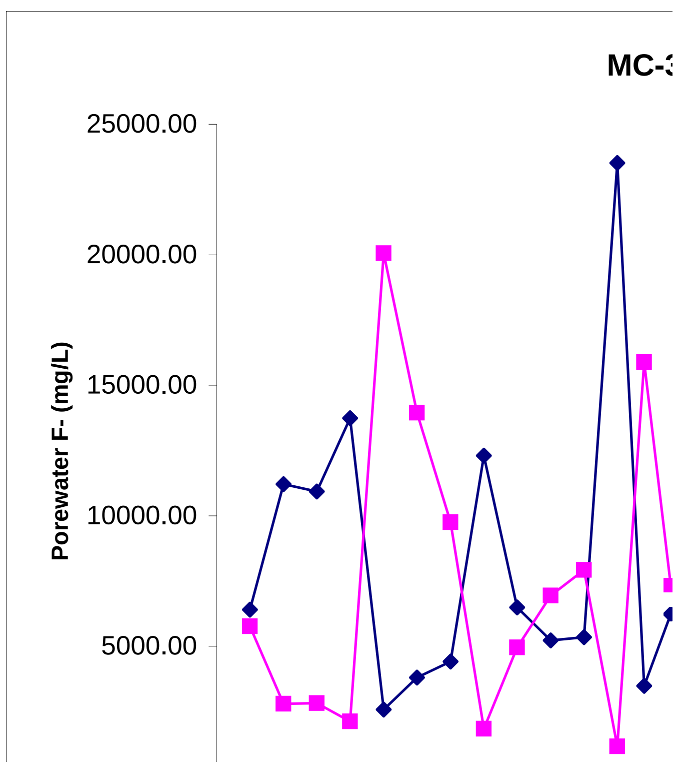
0
100
120
140

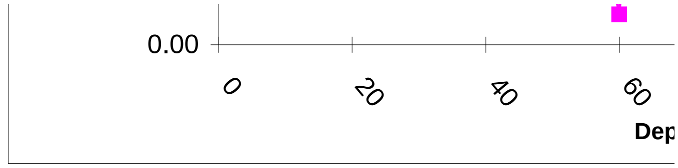
Cum. PO4swi (g/m2)	Interval θd (m)	Cum θd (m)
1.266	0.016	0.016
4.544	0.005	0.021
7.605	0.005	0.026
11.554	0.004	0.030
14.225	0.037	0.067
16.587	0.025	0.092
19.077	0.018	0.110
20.372	0.003	0.113
22.817	0.009	0.122
25.226	0.013	0.135
27.220	0.014	0.150
29.207	0.002	0.152
33.780	0.023	0.175
42.269	0.017	0.192
48.254	0.016	0.208
55.257	0.025	0.233
60.472	0.018	0.251
65.366	0.031	0.282
71.180	0.021	0.302
72.792	0.011	0.314
73.330	0.005	0.319

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

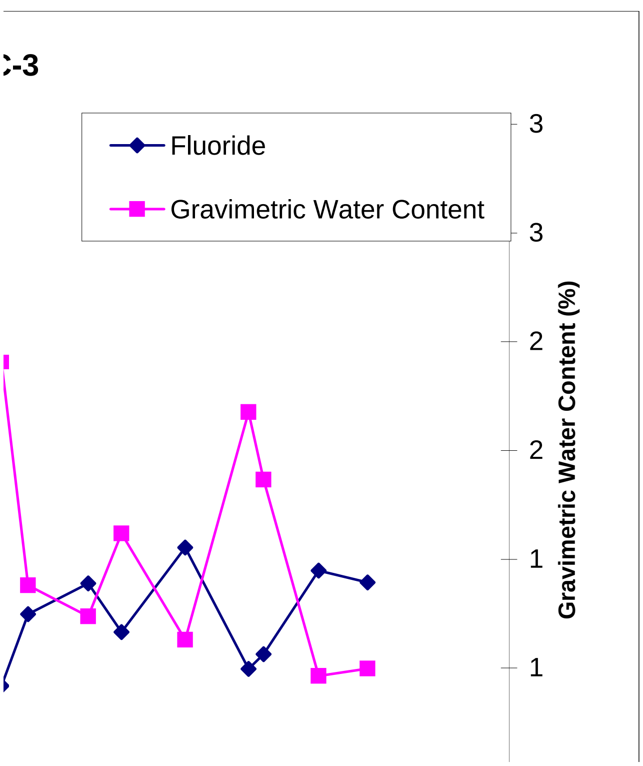
Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

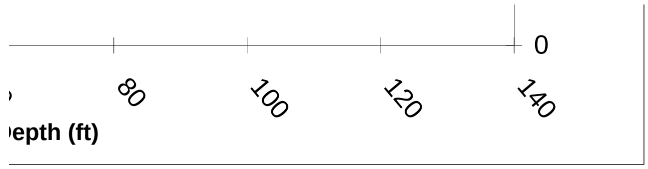




0.00
0
20
40
60
Dep

Tuff Dry wt. (g)	Si Leachate (mg/L)	H2O (ml)	Si µg/g	Pore H2O (L)	Si (mg)	Si PW (mg/L)	Interval (m)	Interval Siswi (g/m2)
50.080	20.859	75.00	31.24	0.00	1.56	6406.94	2.286	101.404
50.000	17.615	75.08	26.45	0.00	1.32	11209.37	1.524	57.241
49.960	17.340	75.04	26.04	0.00	1.30	10928.46	1.524	56.361
50.010	16.397	75.11	24.63	0.00	1.23	13735.92	1.524	53.295
49.960	29.414	75.05	44.19	0.00	2.21	2570.80	1.524	94.274
50.130	30.343	75.18	45.51	0.00	2.28	3807.88	1.524	97.092
50.170	24.276	75.21	36.39	0.00	1.83	4418.19	1.524	78.756
50.000	12.784	75.04	19.19	0.00	0.96	12306.59	1.524	41.519
50.110	20.439	75.10	30.63	0.00	1.53	6495.13	1.524	58.821
50.130	23.070	75.14	34.58	0.00	1.73	5230.99	1.524	66.403
50.130	26.936	75.08	40.34	0.00	2.02	5343.74	1.524	77.467
49.930	17.475	74.92	26.22	0.00	1.31	23509.71	1.372	45.315
50.320	29.596	75.30	44.29	0.00	2.23	3485.72	1.219	80.994
50.060	24.367	75.04	36.53	0.00	1.83	6228.76	1.981	108.547
50.090	24.322	75.07	36.45	0.00	1.83	7415.14	2.134	116.661
50.110	27.596	75.12	41.37	0.00	2.07	5549.33	2.210	137.128
50.040	24.628	75.01	36.92	0.00	1.85	8787.37	2.896	160.345
50.140	30.796	75.10	46.13	0.00	2.31	4128.22	1.829	126.534
50.140	28.534	75.12	42.75	0.00	2.14	4692.43	1.524	97.727
49.980	20.691	74.98	31.04	0.00	1.55	7898.19	2.469	90.432
49.920	20.925	75.00	31.44	0.00	1.57	7445.77	1.082	40.139



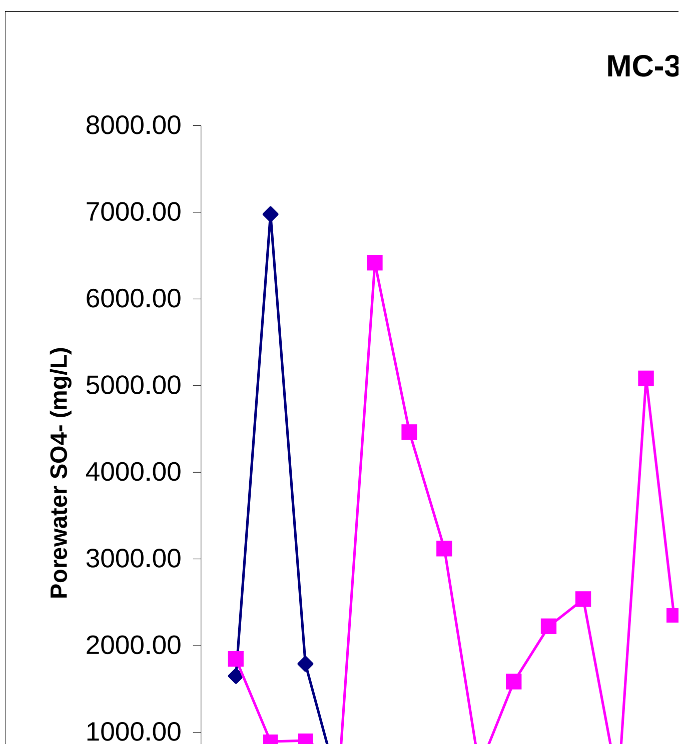

0
80
100
120
140
epth (ft)

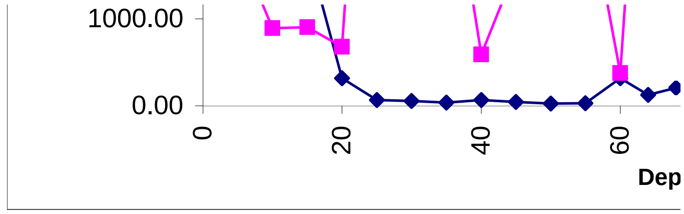
Cum. Siswi (g/m2)	Interval θd (m)	Cum θd (m)
101.404	0.016	0.016
158.645	0.005	0.021
215.006	0.005	0.026
268.301	0.004	0.030
362.575	0.037	0.067
459.667	0.025	0.092
538.422	0.018	0.110
579.942	0.003	0.113
638.763	0.009	0.122
705.166	0.013	0.135
782.632	0.014	0.150
827.947	0.002	0.152
908.942	0.023	0.175
1017.489	0.017	0.192
1134.150	0.016	0.208
1271.278	0.025	0.233
1431.623	0.018	0.251
1558.158	0.031	0.282
1655.885	0.021	0.302
1746.317	0.011	0.314
1786.456	0.005	0.319

MC-3

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
4.5-5.5	4.5	5.5	5.00	1.52	Qal	0.488	1.420	0.692
9.5-10.5	9.5	10.5	10.00	3.05	Qal	0.236	1.420	0.335
14.5-15.5	14.5	15.5	15.00	4.57	Qal	0.238	1.420	0.338
19.5-20.5	19.5	20.5	20.00	6.10	Qal	0.179	1.420	0.255
24.5-25.5	24.5	25.5	25.00	7.62	soil	1.719	1.400	2.406
29.5-30.5	29.5	30.5	30.00	9.14	soil	1.195	1.400	1.673
34.5-35.5	34.5	35.5	35.00	10.67	Qal	0.824	1.420	1.170
39.5-40.5	39.5	40.5	40.00	12.19	Qal	0.156	1.420	0.221
44.5-45.5	44.5	45.5	45.00	13.72	Qbt1v	0.472	1.260	0.594
49.5-50.5	49.5	50.5	50.00	15.24	Qbt1v	0.661	1.260	0.833
54.5-55.5	54.5	55.5	55.00	16.76	Qbt1v	0.755	1.260	0.951
59.5-60.5	59.5	60.5	60.00	18.29	Qbt1v	0.112	1.260	0.141
63.5-64.5	63.5	64.5	64.00	19.51	Qct	1.271	1.500	1.906
67.5-68.5	67.5	68.5	68.00	20.73	Qct	0.586	1.500	0.880
76.5-77.5	76.5	77.5	77.00	23.47	Qct	0.492	1.500	0.737
81.5-82.5	81.5	82.5	82.00	24.99	Qct	0.745	1.500	1.118
91.0-92.0	91.0	92.0	91.50	27.89	Qct	0.420	1.500	0.630
100.5-101.5	100.5	101.5	101.00	30.78	Qct	1.117	1.500	1.676
103.0-103.5	103.0	103.5	103.25	31.47	Qct	0.911	1.500	1.367
111.0-112.0	111.0	112.0	111.50	33.99	Qbo	0.393	1.180	0.464
118.7-118.9	118.7	118.9	118.80	36.21	Qbo	0.422	1.180	0.498

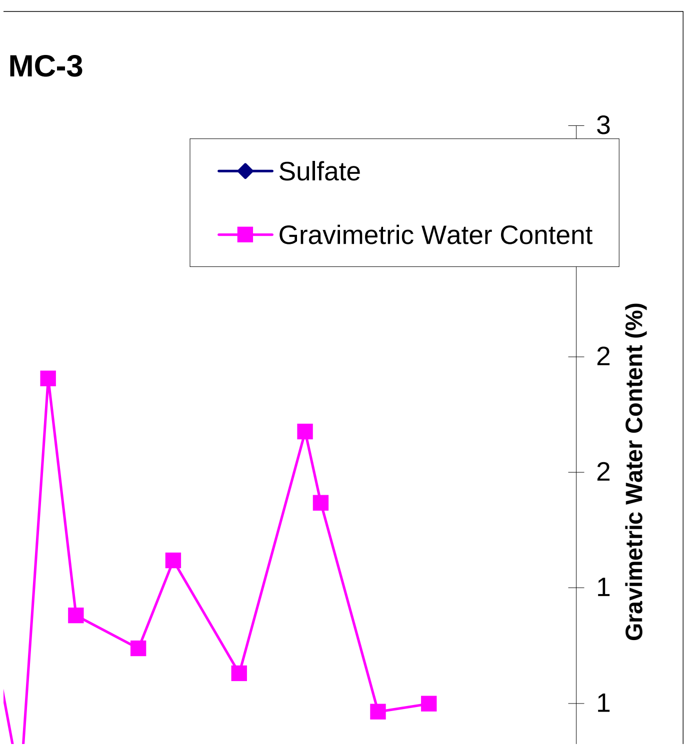
Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

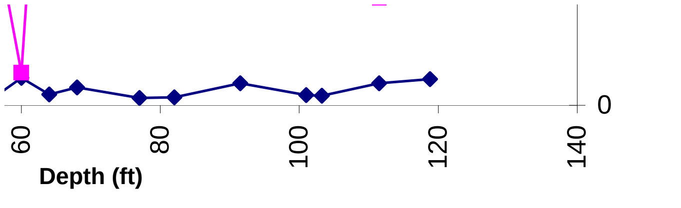




1000.00
0.00
0
20
40
60
Dep

Tuff Dry wt. (g)	SO4 Leachate (mg/L)	H2O (mL)	SO4- µg/g	Pore H2O (L)	SO4- (mg)	SO4- (mg/L)	Interval (m)	Interval SO4swi (g/m2)
50.080	5.366	75.00	8.04	0.00	0.40	1648.19	2.286	26.086
50.000	10.963	75.08	16.46	0.00	0.82	6976.41	1.524	35.625
49.960	2.840	75.04	4.27	0.00	0.21	1789.83	1.524	9.231
50.010	0.380	75.11	0.57	0.00	0.03	318.20	1.524	1.235
49.960	0.752	75.05	1.13	0.00	0.06	65.71	1.524	2.410
50.130	0.445	75.18	0.67	0.00	0.03	55.84	1.524	1.424
50.170	0.199	75.21	0.30	0.00	0.01	36.16	1.524	0.645
50.000	0.069	75.04	0.10	0.00	0.01	66.49	1.524	0.224
50.110	0.143	75.10	0.21	0.00	0.01	45.58	1.524	0.413
50.130	0.115	75.14	0.17	0.00	0.01	26.05	1.524	0.331
50.130	0.156	75.08	0.23	0.00	0.01	30.99	1.524	0.449
49.930	0.237	74.92	0.35	0.00	0.02	318.28	1.372	0.613
50.320	1.051	75.30	1.57	0.00	0.08	123.81	1.219	2.877
50.060	0.804	75.04	1.21	0.00	0.06	205.60	1.981	3.583
50.090	0.281	75.07	0.42	0.00	0.02	85.61	2.134	1.347
50.110	0.465	75.12	0.70	0.00	0.03	93.57	2.210	2.312
50.040	0.708	75.01	1.06	0.00	0.05	252.78	2.896	4.613
50.140	0.885	75.10	1.33	0.00	0.07	118.62	1.829	3.636
50.140	0.684	75.12	1.02	0.00	0.05	112.40	1.524	2.341
49.980	0.671	74.98	1.01	0.00	0.05	256.14	2.469	2.933
49.920	0.854	75.00	1.28	0.00	0.06	303.88	1.082	1.638





0
60
80
100
120
140
Depth (ft)

Cum. SO4swi (g/m2)	Interval θd (m)	Cum θd (m)
26.086	0.016	0.016
61.711	0.005	0.021
70.942	0.005	0.026
72.177	0.004	0.030
74.586	0.037	0.067
76.010	0.025	0.092
76.655	0.018	0.110
76.879	0.003	0.113
77.292	0.009	0.122
77.623	0.013	0.135
78.072	0.014	0.150
78.685	0.002	0.152
81.562	0.023	0.175
85.145	0.017	0.192
86.492	0.016	0.208
88.804	0.025	0.233
93.417	0.018	0.251
97.053	0.031	0.282
99.393	0.021	0.302
102.326	0.011	0.314
103.964	0.005	0.319

MC-2 **Paste New Data in Row 59 Column 1**

SAMPLE/ft	DESCRIPTION	H2O content%	Dry wt.	DI Added	date MM/DD/YY
2.5-3.5	MC-2	0.577	50.020	75.260	6/5/05
7.5-8.5	MC-2	0.326	49.980	75.230	6/5/05
17.5-18.5	MC-2	1.695	50.240	75.240	6/5/05
27.5-28.5	MC-2	1.064	50.170	75.200	6/5/05
47.5-48.5	MC-2	2.973	50.250	75.190	6/5/05
57.5-58.5	MC-2	2.111	50.120	75.210	6/5/05
91.5-92.0	MC-2	10.857	49.990	75.020	6/5/05
106.0-107.0	MC-2	0.349	49.980	75.050	6/5/05
124.0-124.5	MC-2	0.486	49.970	74.960	6/5/05
161.2-161.5	MC-2	0.579	50.000	75.000	6/5/05
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00

0	0	0.000	0.000	0.000	1/0/00

Save the file with a different name. After pasting data Ctrl-Shift U runs th

H2O conte:

	temp			date	ER
SAMPLE/FT	ID	DESCR	depthFt	MMDDYY	Req#
CAMO-05-60666	22	MC-2	2.5-3.5	Jun-05	3369S
CAMO-05-60667	23	MC-2	7.5-8.5	Jun-05	3369S
CAMO-05-60668	24	MC-2	17.5-18.5	Jun-05	3369S
CAMO-05-60669	25	MC-2	27.5-28.5	Jun-05	3369S
CAMO-05-60670	26	MC-2	47.5-48.5	Jun-05	3369S
CAMO-05-60671	27	MC-2	57.5-58.5	Jun-05	3369S
CAMO-05-60672	29	MC-2	91.5-92.0	Jun-05	3369S
CAMO-05-60673	30	MC-2	106.0-107.0	Jun-05	3369S
CAMO-05-60674	31	MC-2	124.0-124.5	Jun-05	3369S
CAMO-05-60675	32	MC-2	161.2-161.5	Jun-05	3369S

Acetate	Al	Br	Ca	Cl	ClO3	ClO4	CO3	F
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
+	0.0322	0.1943	25.4031	1.0174	<0.01	<0.005	0.0000	0.2087
+	0.2432	0.1398	14.5876	1.1161	<0.01	<0.005	0.0000	0.2475
+	0.6220	0.2820	11.8022	0.7825	<0.01	<0.005	0.0000	2.0568
+	0.1110	0.1661	15.6559	3.1244	<0.01	<0.005	0.0000	1.1131
+	0.8907	0.1927	7.7943	2.7140	<0.01	<0.005	0.0000	0.7422
+	2.0114	0.1455	2.1660	0.9678	<0.01	<0.001	0.0000	1.2883
-	0.1960	0.0914	1.3037	1.0279	<0.01	<0.001	0.0000	1.0839
-	0.3489	0.0726	0.6402	0.6556	<0.01	<0.001	0.0000	1.3493
+	0.2602	0.2002	3.3600	0.5925	<0.01	<0.001	0.0000	0.5751
+	0.2996	0.1477	3.9237	0.6256	<0.01	<0.002	0.0000	0.9399
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ıe Update Macro and prints the desired worksheet:

nt Measured in accordance with ASTM D2216-90 Weight loss divided by dried sample w

H2O content %	Bulk density gm/cm3	H2O gm/gm	Ag µg/g	Acetate µg/g	Al µg/g	As µg/g	B µg/g	Ba µg/g
0.58	---	0.006	---	---	8.39	---	---	---
0.33	---	0.003	---	---	112	---	---	---
1.69	---	0.017	---	---	55.0	---	---	---
1.06	---	0.011	---	---	15.6	---	---	---
2.97	---	0.029	---	---	44.8	---	---	---
2.11	---	0.021	---	---	143	---	---	---
10.86	---	0.098	---	---	2.71	---	---	---
0.35	---	0.003	---	---	150	---	---	---
0.49	---	0.005	---	---	80.4	---	---	---
0.58	---	0.006	---	---	77.7	---	---	---

Fe	Formate	HCO3	K	Mg	Mn	Na	NO2	NO3
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.0473	+	80.0000	6.5306	4.4525	0.7400	5.8762	10.4000	1.6588
0.1389	+	51.0000	4.6132	2.7199	0.3421	5.1606	4.6400	3.7537
0.3420	+	51.6000	2.0869	1.7993	0.0049	8.4088	<0.01	0.0159
0.0584	+	67.5000	2.9154	2.4643	0.0051	9.7426	<0.01	0.0146
0.4519	+	42.5000	4.2833	1.4271	0.0066	9.5089	<0.01	0.0167
0.8959	+	16.2667	2.4876	0.5766	0.0079	7.0477	<0.01	0.0220
0.0928	-	9.9125	3.3880	0.2196	0.0066	5.7249	<0.01	0.0136
0.3166	-	10.2683	1.5880	0.1497	0.0090	4.9734	<0.01	0.4438
0.1045	+	12.6067	15.5775	0.6043	0.0207	9.5077	0.3200	<0.01
0.1032	+	21.1467	13.4403	0.7176	0.0113	10.7493	0.1400	0.0141
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

weight

Be	Br	Ca	Cd	Cl	ClO3	ClO4	Co	CO3
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
---	50.6	6622	---	265	<0.1	<1.3	---	---
---	64.6	6743	---	516	<0.1	<2.3	---	---
---	24.9	1043	---	69.1	<0.1	<0.5	---	---
---	23.4	2205	---	440	<0.1	<0.8	---	---
---	9.70	392	---	137	<0.1	<0.3	---	---
---	10.3	154	---	68.8	<0.1	<0.1	---	---
---	1.26	18.0	---	14.2	<0.1	<0.02	---	---
---	31.2	275	---	282	<0.1	<0.5	---	---
---	61.8	1038	---	183	<0.1	<0.3	---	---
---	38.3	1017	---	162	<0.1	<0.6	---	---

Oxalate	PO4	Si	SO4
ppm	ppm	ppm	ppm
0.1300	0.3407	19.0057	8.8391
0.0400	0.6885	15.6350	4.9665
0.1200	0.8607	27.0463	4.1046
0.1600	1.7626	22.7549	5.6523
<0.01	2.4705	25.7992	3.7508
0.0300	2.5660	25.0199	1.6347
0.3200	0.6991	18.6909	0.5730
<0.01	4.0991	15.0839	0.8271
0.3600	0.1703	18.7756	2.0462
0.3100	0.1695	22.9691	1.2001
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000

0.0000	0.0000	0.0000	0.0000

Cr	Cs	Cu	F	Fe	Formate	HCO3	Hg	K
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
---	---	---	54.4	12.3	---	---	---	1702
---	---	---	114	64.2	---	---	---	2132
---	---	---	182	30.2	---	---	---	184
---	---	---	157	8.22	---	---	---	411
---	---	---	37.4	22.7	---	---	---	216
---	---	---	91.6	63.7	---	---	---	177
---	---	---	15.0	1.28	---	---	---	46.8
---	---	---	580	136	---	---	---	683
---	---	---	178	32.3	---	---	---	4811
---	---	---	244	26.8	---	---	---	3485

Li	Mg	Mn	Mo	Na	Ni	NO2	NO3	d15N
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	from NO3
---	1161	193	---	1532	---	2711	432	---
---	1257	158	---	2385	---	2145	1735	---
---	159	0.43	---	743	---	<1	1.41	---
---	347	0.71	---	1372	---	<2	2.05	---
---	71.8	0.33	---	479	---	<1	0.84	---
---	41.0	0.56	---	501	---	<1	1.56	---
---	3.04	0.09	---	79.1	---	<0.2	0.19	---
---	64.3	3.85	---	2138	---	<5	191	---
---	187	6.38	---	2936	---	98.8	<3	---
---	186	2.92	---	2787	---	36.3	3.66	---

OH	Oxalate	Pb	pH	PO4	Rb	Sb	Se	Si
µg/g	µg/g	µg/g	units	µg/g	µg/g	µg/g	µg/g	µg/g
---	33.9	---	---	88.8	---	---	---	4954
---	18.5	---	---	318	---	---	---	7227
---	10.6	---	---	76.1	---	---	---	2390
---	22.5	---	---	248	---	---	---	3205
---	<1	---	---	124	---	---	---	1299
---	2.13	---	---	182	---	---	---	1778
---	4.42	---	---	9.66	---	---	---	258
---	<5	---	---	1762	---	---	---	6485
---	111	---	---	52.6	---	---	---	5798
---	80.4	---	---	43.9	---	---	---	5955

SO3	SO4	Sn	Sr	Th	Ti	Tl	U	V
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
---	2304	---	---	---	---	---	---	---
---	2296	---	---	---	---	---	---	---
---	363	---	---	---	---	---	---	---
---	796	---	---	---	---	---	---	---
---	189	---	---	---	---	---	---	---
---	116	---	---	---	---	---	---	---
---	7.92	---	---	---	---	---	---	---
---	356	---	---	---	---	---	---	---
---	632	---	---	---	---	---	---	---
---	311	---	---	---	---	---	---	---

Zn µg/g	Wet wt. gms	Dry wt. gms	flask gms	flask+samp gms	After drying gms	DI added gms	Ag ppm
---	---	50.02	---	---	---	75.26	---
---	---	49.98	---	---	---	75.23	---
---	---	50.24	---	---	---	75.24	---
---	---	50.17	---	---	---	75.20	---
---	---	50.25	---	---	---	75.19	---
---	---	50.12	---	---	---	75.21	---
---	---	49.99	---	---	---	75.02	---
---	---	49.98	---	---	---	75.05	---
---	---	49.97	---	---	---	74.96	---
---	---	50.00	---	---	---	75.00	---

Acetate	Al	As	B	Ba	Be	Br	Ca	Cd
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
+	0.032	---	---	---	---	0.19	25.4	---
+	0.24	---	---	---	---	0.14	14.6	---
+	0.62	---	---	---	---	0.28	11.8	---
+	0.11	---	---	---	---	0.17	15.7	---
+	0.89	---	---	---	---	0.19	7.79	---
+	2.01	---	---	---	---	0.15	2.17	---
-	0.20	---	---	---	---	0.09	1.30	---
-	0.35	---	---	---	---	0.07	0.64	---
+	0.26	---	---	---	---	0.20	3.36	---
+	0.30	---	---	---	---	0.15	3.92	---

Cl	ClO3	ClO4	Co	CO3	Cr	Cs	Cu	F
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1.02	<0.01	<0.005	---	0	---	---	---	0.21
1.12	<0.01	<0.005	---	0	---	---	---	0.25
0.78	<0.01	<0.005	---	0	---	---	---	2.06
3.12	<0.01	<0.005	---	0	---	---	---	1.11
2.71	<0.01	<0.005	---	0	---	---	---	0.74
0.97	<0.01	<0.001	---	0	---	---	---	1.29
1.03	<0.01	<0.001	---	0	---	---	---	1.08
0.66	<0.01	<0.001	---	0	---	---	---	1.35
0.59	<0.01	<0.001	---	0	---	---	---	0.58
0.63	<0.01	<0.002	---	0	---	---	---	0.94

Fe	Formate	HCO3	Hg	K	Li	Mg	Mn	Mo
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.05	+	80.0	---	6.53	---	4.45	0.74	---
0.14	+	51.0	---	4.61	---	2.72	0.34	---
0.34	+	51.6	---	2.09	---	1.80	0.005	---
0.06	+	67.5	---	2.92	---	2.46	0.005	---
0.45	+	42.5	---	4.28	---	1.43	0.007	---
0.90	+	16.3	---	2.49	---	0.58	0.008	---
0.09	-	9.9	---	3.39	---	0.22	0.007	---
0.32	-	10.3	---	1.59	---	0.15	0.009	---
0.10	+	12.6	---	15.6	---	0.60	0.021	---
0.10	+	21.1	---	13.4	---	0.72	0.011	---

Na	Ni	NO2	NO3	d15N	OH	Oxalate	Pb	pH
ppm	ppm	ppm	ppm	from NO3	ppm	ppm	ppm	units
5.88	---	10.4	1.66		---	0.13	---	6.30
5.16	---	4.64	3.75		---	0.04	---	6.50
8.41	---	<0.01	0.02		---	0.12	---	7.40
9.74	---	<0.01	0.01		---	0.16	---	7.34
9.51	---	<0.01	0.02		---	<0.01	---	7.22
7.05	---	<0.01	0.02		---	0.03	---	7.51
5.72	---	<0.01	0.01		---	0.32	---	7.79
4.97	---	<0.01	0.44		---	<0.01	---	7.40
9.51	---	0.32	<0.01		---	0.36	---	7.25
10.7	---	0.14	0.01		---	0.31	---	7.49

PO4	Rb	Sb	Se	Si	SO3	SO4	Sn	Sr
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.34	---	---	---	19.0	---	8.84	---	---
0.69	---	---	---	15.6	---	4.97	---	---
0.86	---	---	---	27.0	---	4.10	---	---
1.76	---	---	---	22.8	---	5.65	---	---
2.47	---	---	---	25.8	---	3.75	---	---
2.57	---	---	---	25.0	---	1.63	---	---
0.70	---	---	---	18.7	---	0.57	---	---
4.10	---	---	---	15.1	---	0.83	---	---
0.17	---	---	---	18.8	---	2.05	---	---
0.17	---	---	---	23.0	---	1.20	---	---

Th	Ti	Tl	U	V	Zn	NH4	
ppm	ppm	ppm	ppm	ppm	ppm	ppm	comments d
---	---	---	---	---	---	---	Unknown peak @ 6.
---	---	---	---	---	---	---	
---	---	---	---	---	---	---	
---	---	---	---	---	---	---	
---	---	---	---	---	---	---	
---	---	---	---	---	---	---	
---	---	---	---	---	---	---	Unknown peak @ 5.
---	---	---	---	---	---	---	
---	---	---	---	---	---	---	Unknown peak @ 5.
---	---	---	---	---	---	---	Unknown peak @ 5.

electro nic .ate sent	mail date sent	Ba corr for Na ppm
.05		
.82		
.82		
.82		

MC-2

Iso_Depth (ft)	d18O	dD_Depth (ft)	dD
9.9	-10.980	9.9	-80.950
9.9		9.9	-81.265
20.3	-9.766	20.3	-77.504
30.7	-8.971	30.7	-75.947
30.7	-9.025	30.7	-75.561
30.7		30.7	-74.705
30.7		30.7	-77.218
30.7		30.7	-76.622
30.7		30.7	-76.436
40.0	-10.914	40.0	-82.640
40.0	-10.926	40.0	
50.1	-13.250	50.1	-91.588
50.1	-13.540	50.1	
62.4	-12.583	62.4	-83.844
62.4		62.4	-83.848
75.0	-9.937	75.0	-76.838
90.3	-11.281	90.3	-77.809
100.1	-10.709	100.1	-82.438
125.3	-8.766	125.3	-79.194
150.1	-10.972	150.1	-78.688
175.3	-10.532	175.3	-74.305
200.3	-9.683	200.3	-71.724
200.3		200.3	-71.488
225.3	-10.193	225.3	-78.126
225.3	-10.242	225.3	
250.3	-9.784	250.3	-74.048
275.8	-11.276	275.8	-79.850
300.1	-11.691	300.1	-79.895
349.9	-11.621	349.9	-82.619
394.9	-10.951	394.9	-79.077

Sample Number			Depth Range	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)
GW01-04-52716	GW01-04-	ok	9.0-10.8	9.0	10.8	9.9	3.0
GW01-04-52716	GW01-04-	ok	9.0-10.8	9.0	10.8	9.9	3.0
GW01-04-52717	GW01-04-	ok	19.0-21.5	19.0	21.5	20.3	6.2
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52719	GW01-04-	ok	39.0-40.9	39.0	40.9	40.0	12.2
GW01-04-52719	GW01-04-	ok	39.0-40.9	39.0	40.9	40.0	12.2
GW01-04-52720	GW01-04-	ok	49.0-51.1	49.0	51.1	50.1	15.3
GW01-04-52720	GW01-04-	ok	49.0-51.1	49.0	51.1	50.1	15.3
GW01-04-52731	GW01-04-	ok	61.0-63.7	61.0	63.7	62.4	19.0
GW01-04-52731	GW01-04-	ok	61.0-63.7	61.0	63.7	62.4	19.0
GW01-04-52721	GW01-04-	ok	74.0-76.0	74.0	76.0	75.0	22.9
GW01-04-52732	GW01-04-	ok	89.0-91.5	89.0	91.5	90.3	27.5
GW01-04-52722	GW01-04-	ok	99.0-101.1	99.0	101.1	100.1	30.5
GW01-04-52723	GW01-04-	ok	124.0-126.6	124.0	126.6	125.3	38.2
GW01-04-52724	GW01-04-	ok	149.0-151.2	149.0	151.2	150.1	45.8
GW01-04-52725	GW01-04-	ok	174.0-176.5	174.0	176.5	175.3	53.4
GW01-04-52726	GW01-04-	ok	199.0-201.5	199.0	201.5	200.3	61.0
GW01-04-52726	GW01-04-	ok	199.0-201.5	199.0	201.5	200.3	61.0
GW01-04-52727	GW01-04-	ok	224.0-226.5	224.0	226.5	225.3	68.7
GW01-04-52727	GW01-04-	ok	224.0-226.5	224.0	226.5	225.3	68.7
GW01-04-52728	GW01-04-	ok	249.0-251.5	249.0	251.5	250.3	76.3
GW01-04-52729	GW01-04-	ok	275.0-276.5	275.0	276.5	275.8	84.0
GW01-04-52730	GW01-04-	ok	299.0-301.2	299.0	301.2	300.1	91.5
GW01-04-52733	GW01-04-	ok	349.0-350.8	349.0	350.8	349.9	106.6
GW01-04-52734	GW01-04-	ok	394.0-395.8	394.0	395.8	394.9	120.4

0.487934

0.79658

δ 18O	s.d.	δ D	s.d.
-10.980	0.141	-80.950	0.279
		-81.265	0.187
-9.766	0.176	-77.504	0.117
-8.971	0.056	-75.947	0.312
-9.025	0.097	-75.561	0.410
		-74.705	0.393
		-77.218	0.255
		-76.622	0.251
		-76.436	0.174
-10.914	0.141	-82.640	0.119
-10.926	0.168		
-13.250	0.167	-91.588	0.379
-13.540	0.155		
-12.583	0.130	-83.844	0.192
		-83.848	0.171
-9.937	0.141	-76.838	0.163
-11.281	0.154	-77.809	0.187
-10.709	0.142	-82.438	0.155
-8.766	0.089	-79.194	0.240
-10.972	0.168	-78.688	0.290
-10.532	0.156	-74.305	0.178
-9.683	0.107	-71.724	0.230
		-71.488	0.208
-10.193	0.134	-78.126	0.222
-10.242	0.305		
-9.784	0.108	-74.048	0.313
-11.276	0.143	-79.850	0.187
-11.691	0.084	-79.895	0.196
-11.621	0.144	-82.619	0.197
-10.951	0.135	-79.077	0.309

"official" bulk densities to use for anion calculations
Most values from Rogers and Gallaher, 1985

Qal	1.42	
Qbo	1.18	
Qbog	1.25	
Qbt1g	1.13	
Qbt1v	1.26	
Qbt2	1.46	
Qbt3	1.25	Used 1.25 nonwelded from R&G, 1.65 for TA-49 welded
Qbt4	1.73	
Qbtsank	1.25	
Qct	1.5	
soil	1.4	
Tb 4	2.96	
Tpf	1.55	

Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Interval (ft)	Interval (m)
0			3.8	
7.6	8	7.8	4.2	1.3
8	8.3	8.15	2.25	0.7
12.2	12.5	12.35	5.85	1.8
19.7	20	19.85	5.55	1.7
23.3	23.6	23.45	4.15	1.3
28	28.3	28.15	3.35	1.0
30	30.3	30.15	6.6	2.0
41.2	41.5	41.35	8.6	2.6
47.2	47.5	47.35	5.2	1.6
51.6	51.9	51.75	5	1.5
57.2	57.5	57.35	4.55	1.4
60.7	61	60.85	3	0.9
63.2	63.5	63.35	3.25	1.0
67.2	67.5	67.35	4	1.2
71.2	71.5	71.35	4.4	1.3
76	76.5	76.25	5.1	1.6
81.2	81.5	81.35	4.9	1.5
86	86.3	86.15	4.1	1.2
89.4	89.7	89.55	3.5	1.1
93	93.3	93.15	6.3	1.9
102	102.3	102.15	6.5	2.0
106	106.3	106.15	6	1.8
114	114.3	114.15	6.75	2.1
119.5	119.8	119.65	4.25	1.3
122.5	122.8	122.65	3.25	1.0
126	126.3	126.15	3.75	1.1
130	130.3	130.15	3.75	1.1
133.5	133.8	133.65	3	0.9
136	136.3	136.15	3.25	1.0
140	140.3	140.15	4	1.2
144	144.3	144.15	3.5	1.1
147	147.3	147.15	3.25	1.0
150.5	150.8	150.65	3.25	1.0
153.5	153.8	153.65	4.15	1.3
158.8	159.1	158.95	5	1.5
163.5	163.8	163.65	4.6	1.4
168	168.3	168.15	4.75	1.4
173	173.3	173.15	30.75	9.4
229.5	229.8	229.65	28.4	8.7
			229.8	

MC-2 Anion Pore Water Concentration Estimates

Depth (ft)	Depth (m)	Br- (mg/L)	Cl- (mg/L)	CLO3- (µg/L)	CLO4- (µg/L)	F- (mg/L)	NO2- (mg/L)	NO3- (mg/L)	Oxalate (mg/L)	PO4--- (mg/L)	SO4-- (mg/L)	Al (mg/L)	Ca (mg/L)	Fe (mg/L)
3.00	0.91	50.64	265.21	BD	BD	54.41	2710.94	432.38	BD	88.80	2304.06	8.39	6621.77	12.33
8.00	2.44	64.64	515.94	BD	BD	114.41	2144.86	1735.14	BD	318.27	2295.77	112.43	6743.17	64.18
18.00	5.49	24.92	69.15	BD	BD	181.77	BD	1.41	BD	76.07	362.75	54.97	1043.02	30.22
28.00	8.53	23.39	440.06	BD	BD	156.78	BD	2.05	BD	248.26	796.12	15.63	2205.11	8.22
48.00	14.63	9.70	136.61	BD	BD	37.36	BD	0.84	BD	124.35	188.79	44.83	392.31	22.74
58.00	17.68	10.34	68.78	BD	BD	91.56	BD	1.56	BD	182.36	116.17	142.95	153.93	63.67
91.75	27.97	1.26	14.21	BD	BD	14.98	BD	0.19	BD	9.66	7.92	2.71	18.02	1.28
106.50	32.46	31.22	281.86	BD	BD	580.05	BD	190.79	BD	1762.22	355.55	149.98	275.20	136.11
124.25	37.87	61.84	182.97	BD	BD	177.60	98.83	BD	BD	52.59	631.94	80.37	1037.67	32.28
161.35	49.18	38.30	162.21	BD	BD	243.69	36.30	3.66	BD	43.95	311.16	77.69	1017.29	26.76

BD-below detection

MC-2 Anion Pore Water Concentration Estimates

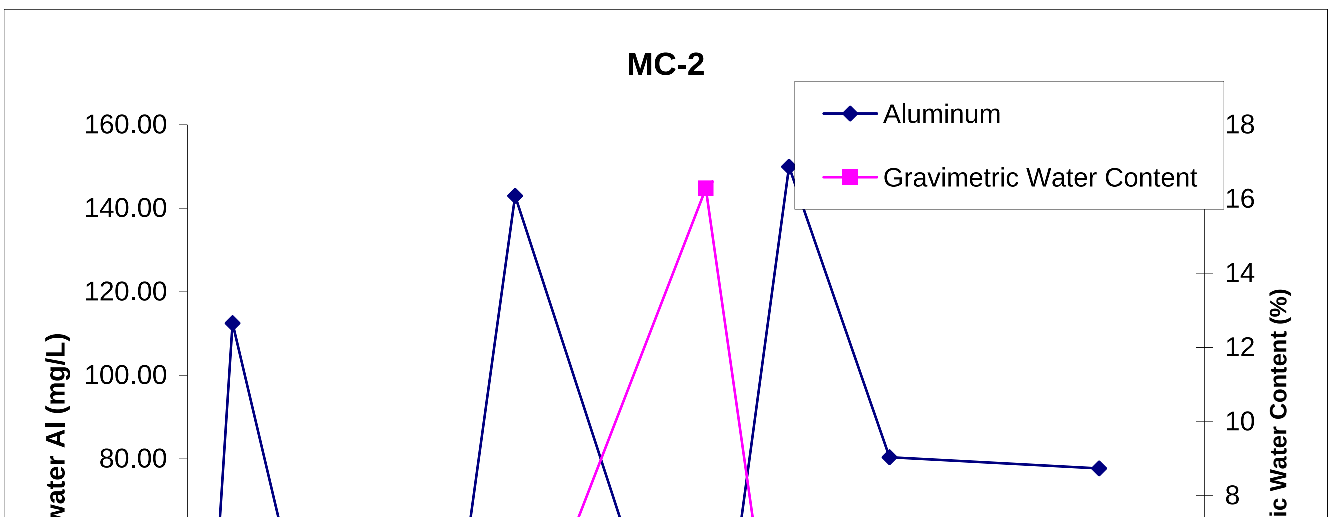
Depth (m)	HCO3 (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Si (mg/L)
0.91	20853.41	1702.32	1160.62	192.90	1531.75	4954.18
2.44	23574.96	2132.48	1257.29	158.12	2385.49	7227.33
5.49	4560.15	184.43	159.01	0.43	743.12	2390.22
8.53	9507.28	410.64	347.10	0.71	1372.23	3204.99
14.63	2139.16	215.59	71.83	0.33	478.62	1298.56
17.68	1156.05	176.79	40.98	0.56	500.87	1778.14
27.97	137.01	46.83	3.04	0.09	79.13	258.34
32.46	4414.35	682.69	64.34	3.85	2138.06	6484.56
37.87	3893.34	4810.81	186.64	6.38	2936.29	5798.50
49.18	5482.69	3484.67	186.04	2.92	2786.98	5955.20

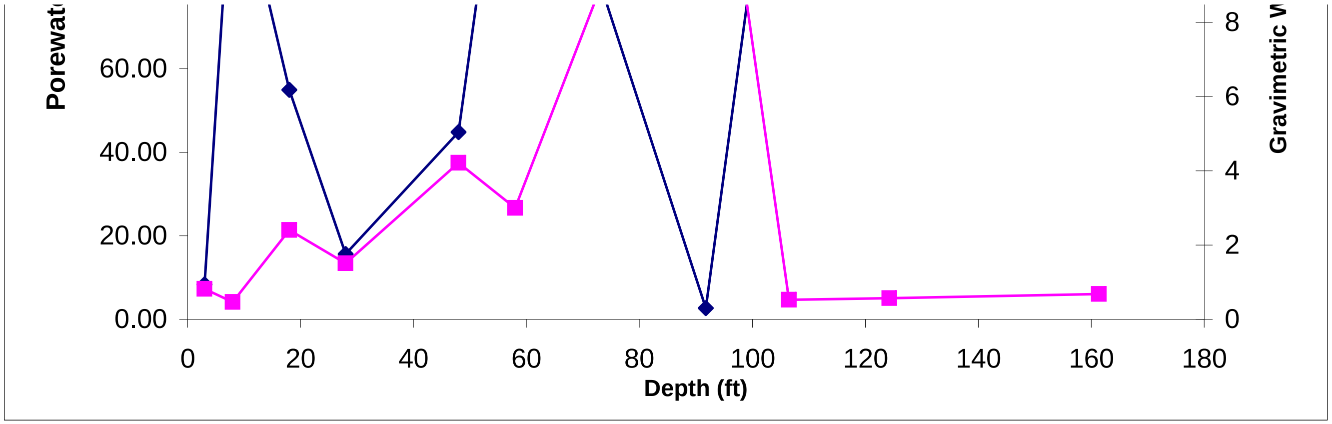
BD-below detection

MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Al Leachate (mg/L)	H2O (ml)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820	50.020	0.0322	75.26
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462	49.980	0.2432	75.23
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406	50.240	0.6220	75.24
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511	50.170	0.1110	75.20
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221	50.250	0.8907	75.19
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998	50.120	2.0114	75.21
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286	49.990	0.1960	75.02
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524	49.980	0.3489	75.05
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573	49.970	0.2602	74.96
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683	50.000	0.2996	75.00

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994





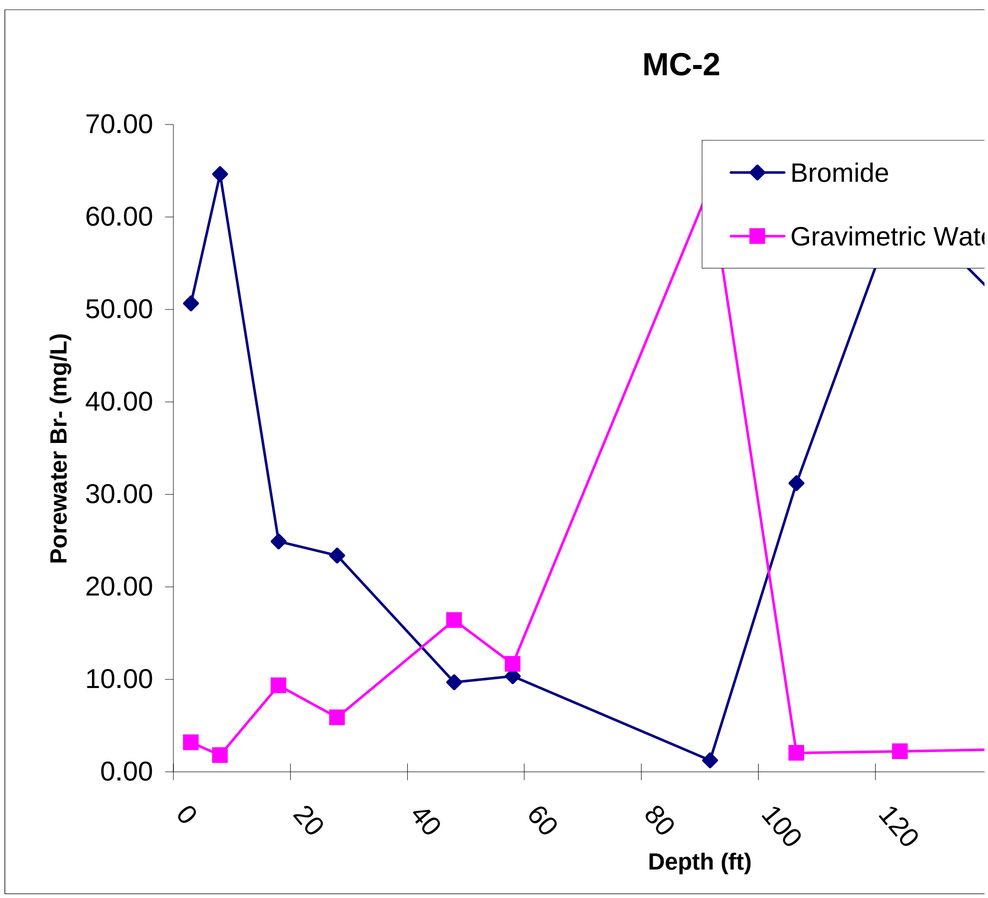
Porewat
60.00
40.00
20.00
0.00
0
20
40
60
80
100
120
140
160
180
Depth (ft)
8
6
4
2
0
Gravimetric W

Al µg/g	Pore H2O (L)	Al (mg)	Al PW (mg/L)	Interval (m)	Interval Alswi (g/m2)	Cum. Alswi (g/m2)	Interval θd (m)	Cum θd (m)
0.05	0.00	0.00	8.39	1.676	0.115	0.115	0.014	0.014
0.37	0.00	0.02	112.43	2.286	1.188	1.304	0.011	0.011
0.93	0.00	0.05	54.97	3.048	4.032	5.335	0.073	0.073
0.17	0.00	0.01	15.63	4.572	1.080	6.415	0.069	0.069
1.33	0.00	0.07	44.83	4.572	8.653	15.068	0.193	0.193
3.02	0.00	0.15	142.95	6.706	28.740	43.808	0.201	0.201
0.29	0.01	0.01	2.71	7.315	3.228	47.037	1.191	1.191
0.52	0.00	0.03	149.98	5.029	3.952	50.988	0.026	0.026
0.39	0.00	0.02	80.37	8.336	3.840	54.828	0.048	0.048
0.45	0.00	0.02	77.69	5.685	3.015	57.843	0.039	0.039

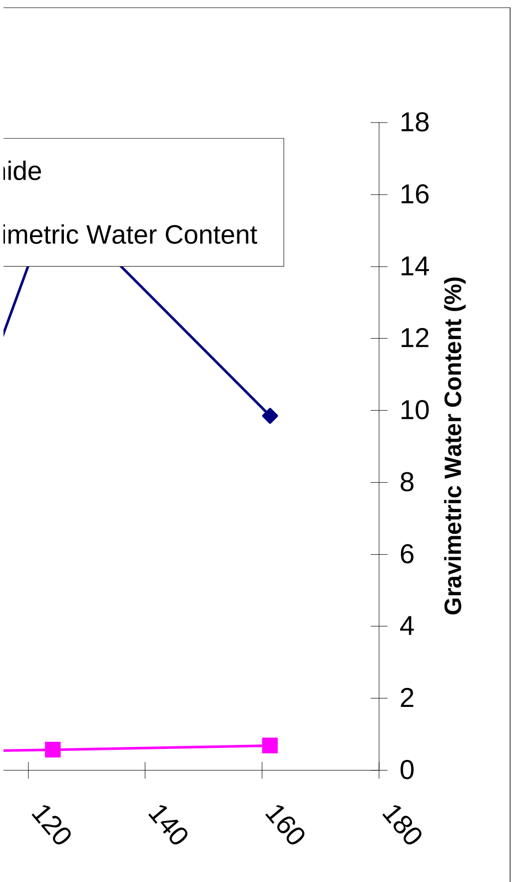
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994
milliters



θv (%)	Tuff Dry wt. (g)	Br Leachate (mg/L)	H2O (ml)	Br- µg/g	Pore H2O (L)	Br- (mg)	Br- PW (mg/L)	Interval (m)
0.820	50.020	0.194	75.26	0.29	0.00	0.01	50.64	1.676
0.462	49.980	0.140	75.23	0.21	0.00	0.01	64.64	2.286
2.406	50.240	0.282	75.24	0.42	0.00	0.02	24.92	3.048
1.511	50.170	0.166	75.20	0.25	0.00	0.01	23.39	4.572
4.221	50.250	0.193	75.19	0.29	0.00	0.01	9.70	4.572
2.998	50.120	0.146	75.21	0.22	0.00	0.01	10.34	6.706
16.286	49.990	0.091	75.02	0.14	0.01	0.01	1.26	7.315
0.524	49.980	0.073	75.05	0.11	0.00	0.01	31.22	5.029
0.573	49.970	0.200	74.96	0.30	0.00	0.02	61.84	8.336
0.683	50.000	0.148	75.00	0.22	0.00	0.01	38.30	5.685

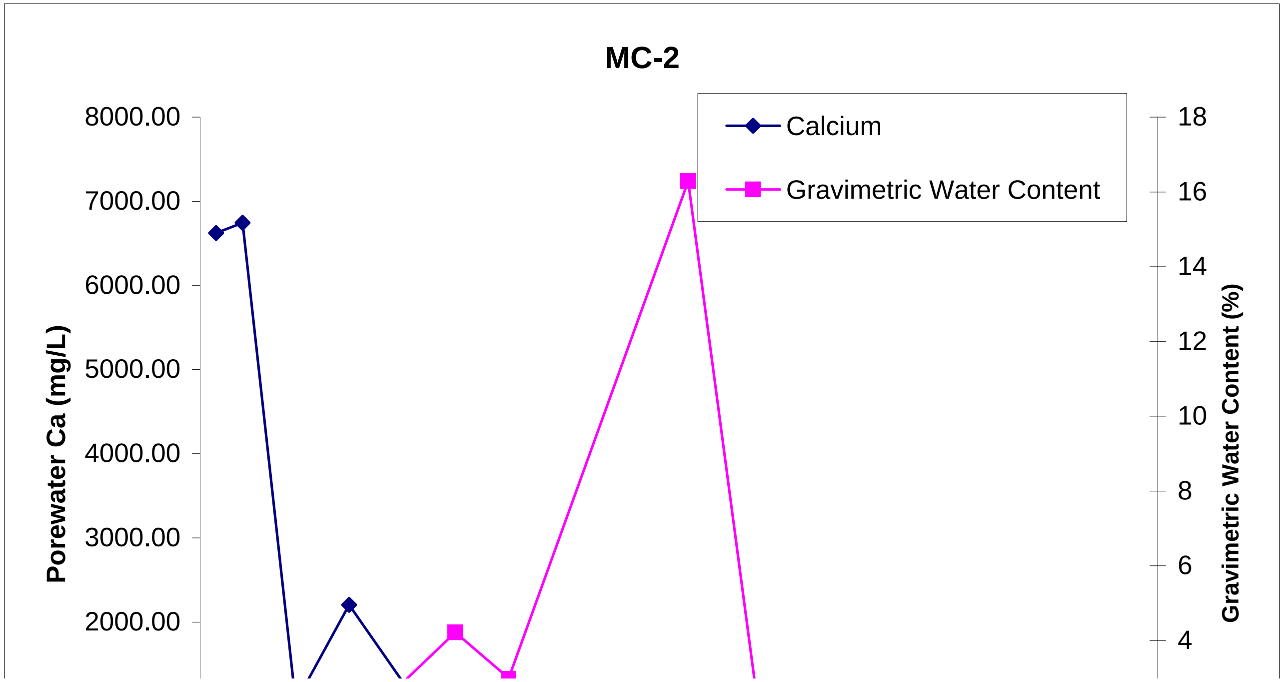


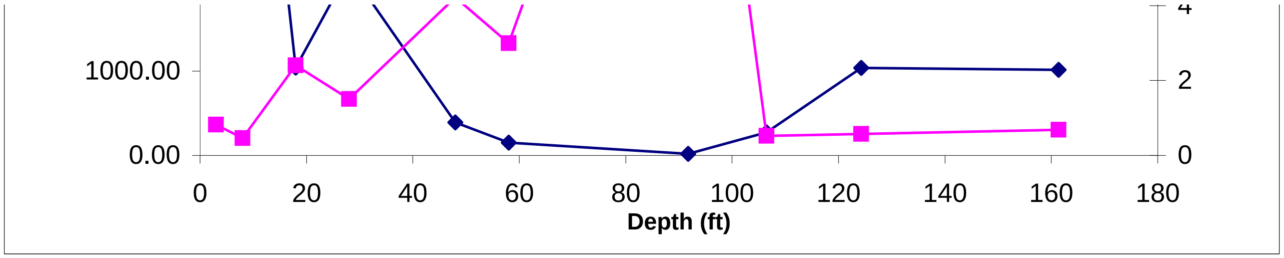
Interval Brswi (g/m2)	Cum. Brswi (g/m2)	Interval qd (m)	Cum qd (m)
0.696	0.696	0.014	0.014
0.683	1.379	0.011	0.024
1.828	3.207	0.073	0.098
1.616	4.824	0.069	0.167
1.872	6.696	0.193	0.360
2.080	8.775	0.201	0.561
1.504	10.280	1.191	1.752
0.823	11.102	0.026	1.779
2.955	14.057	0.048	1.826
1.486	15.543	0.039	1.865

MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Ca Leachate (mg/L)	H2O (ml)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820	50.020	25.4031	75.26
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462	49.980	14.5876	75.23
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406	50.240	11.8022	75.24
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511	50.170	15.6559	75.20
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221	50.250	7.7943	75.19
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998	50.120	2.1660	75.21
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286	49.990	1.3037	75.02
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524	49.980	0.6402	75.05
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573	49.970	3.3600	74.96
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683	50.000	3.9237	75.00

ensity from Rogers and Gallaher 1985
lk density from DB Stephens 1994



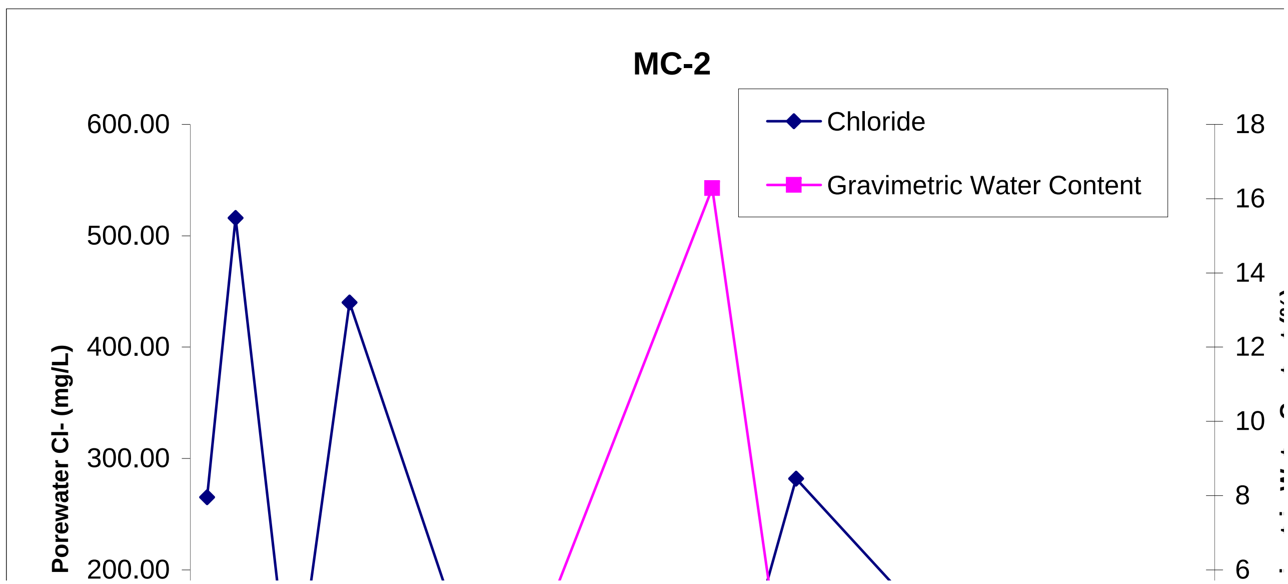

1000.00
0.00
4
2
0
0
20
40
60
80
100
120
140
160
180
Depth (ft)

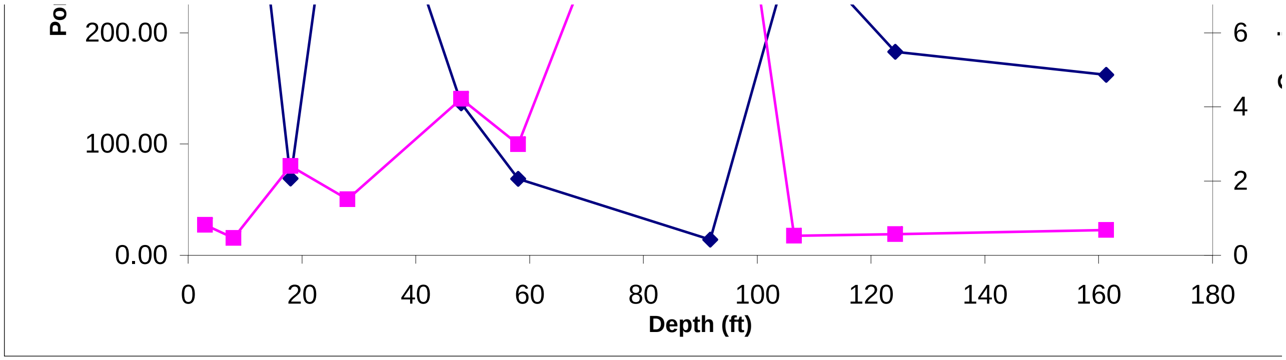
Ca µg/g	Pore H2O (L)	Ca (mg)	Ca PW (mg/L)	Interval (m)	Interval Caswi (g/m2)	Cum. Caswi (g/m2)	Interval θd (m)	Cum θd (m)
38.22	0.00	1.91	6621.77	1.676	90.986	90.986	0.014	0.014
21.96	0.00	1.10	6743.17	2.286	71.276	162.262	0.011	0.024
17.68	0.00	0.89	1043.02	3.048	76.501	238.762	0.073	0.098
23.47	0.00	1.18	2205.11	4.572	152.352	391.114	0.069	0.167
11.66	0.00	0.59	392.31	4.572	75.717	466.831	0.193	0.360
3.25	0.00	0.16	153.93	6.706	30.949	497.780	0.201	0.561
1.96	0.01	0.10	18.02	7.315	21.468	519.248	1.191	1.752
0.96	0.00	0.05	275.20	5.029	7.252	526.499	0.026	1.779
5.04	0.00	0.25	1037.67	8.336	49.581	576.080	0.048	1.826
5.89	0.00	0.29	1017.29	5.685	39.478	615.558	0.039	1.865

MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Cl Leachate (mg/L)	H2O (ml)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820	50.020	1.017	75.26
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462	49.980	1.116	75.23
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406	50.240	0.782	75.24
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511	50.170	3.124	75.20
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221	50.250	2.714	75.19
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998	50.120	0.968	75.21
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286	49.990	1.028	75.02
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524	49.980	0.656	75.05
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573	49.970	0.592	74.96
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683	50.000	0.626	75.00

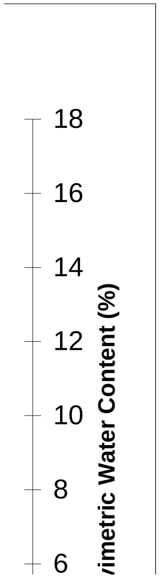
Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

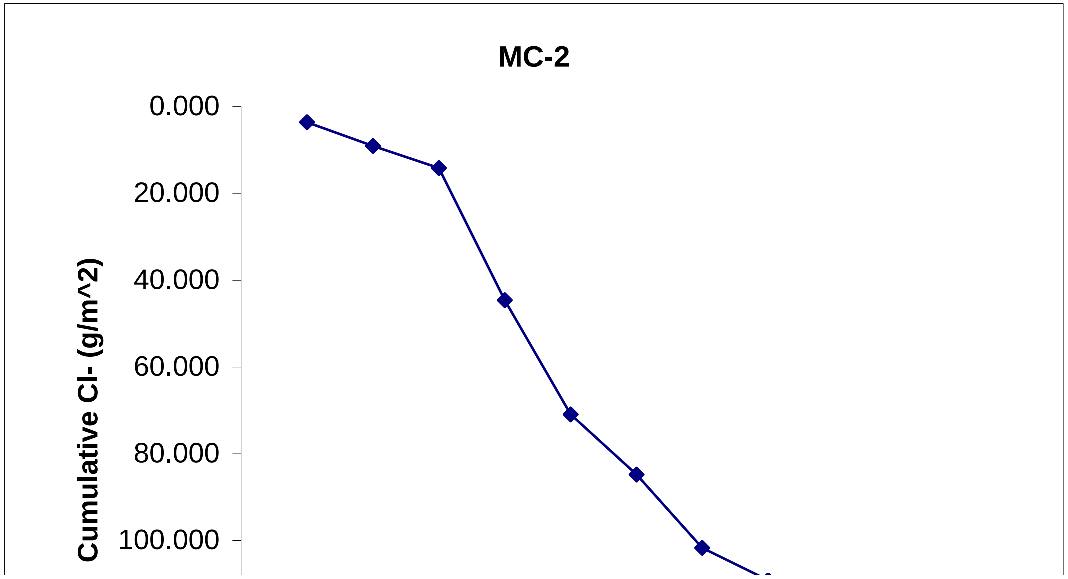


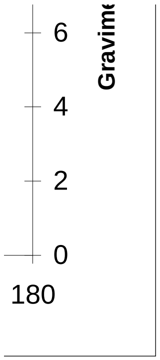


200.00
100.00
0.00
0
20
40
60
80
100
120
140
160
180
Depth (ft)
6
4
2
0

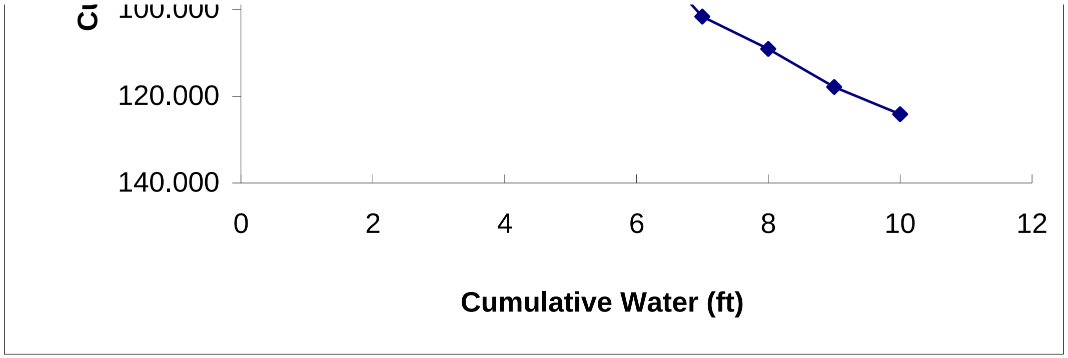
Cl- µg/g	Pore H2O (L)	Cl- (mg)	Cl- PW (mg/L)	Interval (m)	Interval Clswi (g/m2)	Cum. Clswi (g/m2)	Interval θd (m)	Cum θd (m)
1.53	0.00	0.08	265.21	1.676	3.644	3.644	0.014	0.014
1.68	0.00	0.08	515.94	2.286	5.454	9.098	0.011	0.024
1.17	0.00	0.06	69.15	3.048	5.072	14.169	0.073	0.098
4.68	0.00	0.23	440.06	4.572	30.404	44.573	0.069	0.167
4.06	0.00	0.20	136.61	4.572	26.365	70.939	0.193	0.360
1.45	0.00	0.07	68.78	6.706	13.829	84.767	0.201	0.561
1.54	0.01	0.08	14.21	7.315	16.926	101.694	1.191	1.752
0.98	0.00	0.05	281.86	5.029	7.427	109.121	0.026	1.779
0.89	0.00	0.04	182.97	8.336	8.743	117.863	0.048	1.826
0.94	0.00	0.05	162.21	5.685	6.295	124.158	0.039	1.865







Gravim
6
4
2
0
180



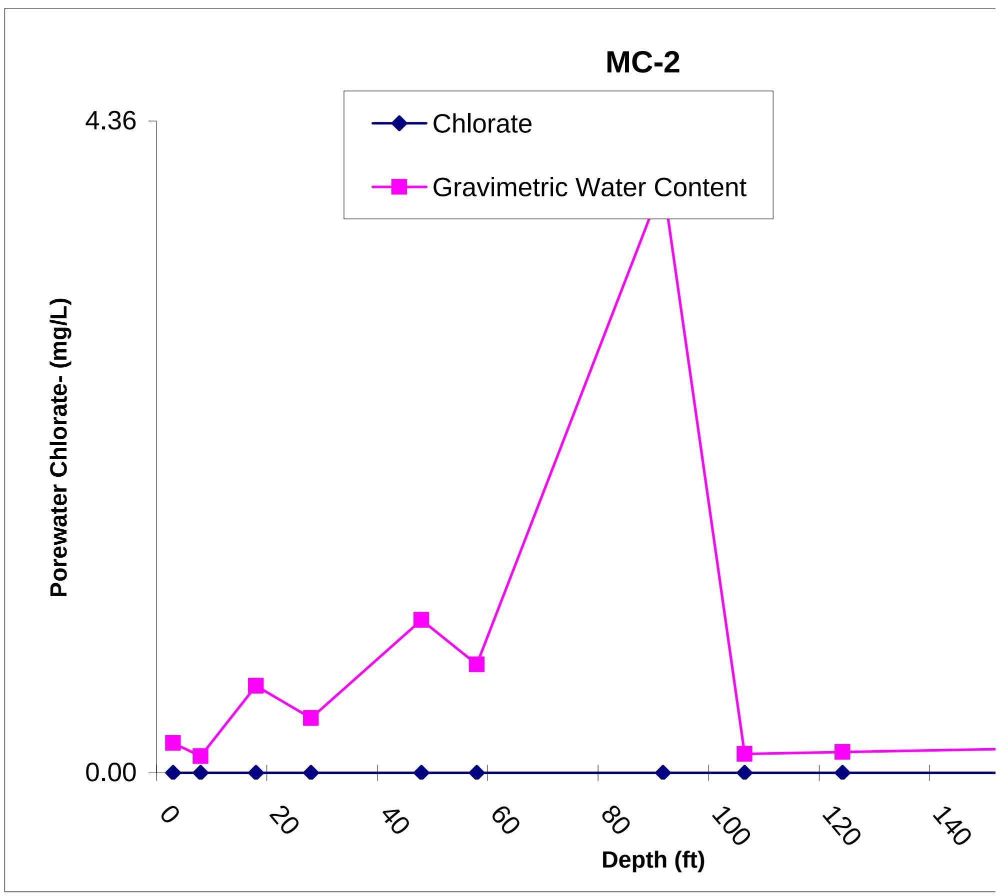
Cu
100.000
120.000
140.000
0
2
4
6
8
10
12
Cumulative Water (ft)

MC-2 Flux and Residence Times							
Depth (m)	Unit	Soil Depth	All Data				
0.91	Qal		265.21	265.21		265.21	
2.44	Qal		515.94	515.94		515.94	
5.49	Qal		69.15	69.15		69.15	
8.53	Qal		440.06		440.06	440.06	
14.63	Qal		136.61		136.61	136.61	
17.68	Qal		68.78		68.78	68.78	
27.97	Qct		14.21		14.21	14.21	
32.46	Qct		281.86		281.86	281.86	
37.87	Qbo		182.97		182.97	182.97	
49.18	Qbo		162.21		162.21	162.21	
Average			213.70	283.43	183.81	213.7	
Flux (m)			0.00050	0.00038	0.00058	0.00050	
Flux (cm)			0.050	0.038	0.058	0.050	
Deepest Residence time			1157	years			
Soil Zone Residence Time (Fix This! cm)			#N/A	years			
These fluxes assume Area G precip and are correct							
Precip Rate							
0.37	m/yr						

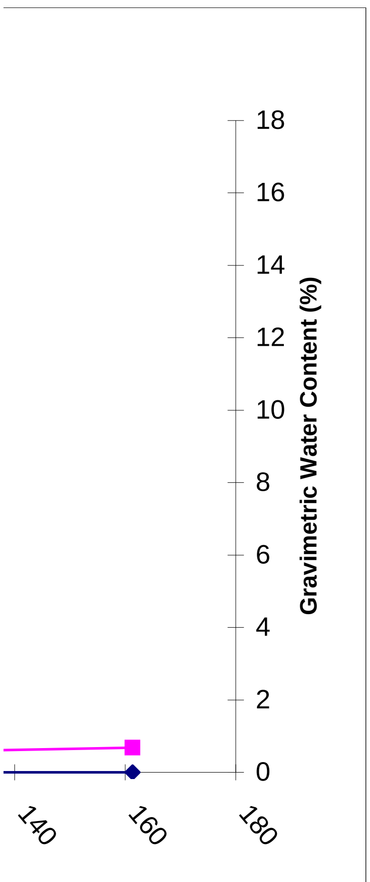
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994



Tuff Dry wt. (g)	ClO3 Leachate (mg/L)	H2O (ml)	ClO3- µg/g	Pore H2O (L)	ClO3- (mg)	ClO3- PW (mg/L)	ClO3- (mg/L)	Interval (m)
50.020	<0.01	75.26	0.00	0.00	0.00	0.00	0.000	1.676
49.980	<0.01	75.23	0.00	0.00	0.00	0.00	0.000	2.286
50.240	<0.01	75.24	0.00	0.00	0.00	0.00	0.000	3.048
50.170	<0.01	75.20	0.00	0.00	0.00	0.00	0.000	4.572
50.250	<0.01	75.19	0.00	0.00	0.00	0.00	0.000	4.572
50.120	<0.01	75.21	0.00	0.00	0.00	0.00	0.000	6.706
49.990	<0.01	75.02	0.00	0.01	0.00	0.00	0.000	7.315
49.980	<0.01	75.05	0.00	0.00	0.00	0.00	0.000	5.029
49.970	<0.01	74.96	0.00	0.00	0.00	0.00	0.000	8.336
50.000	<0.01	75.00	0.00	0.00	0.00	0.00	0.000	5.685



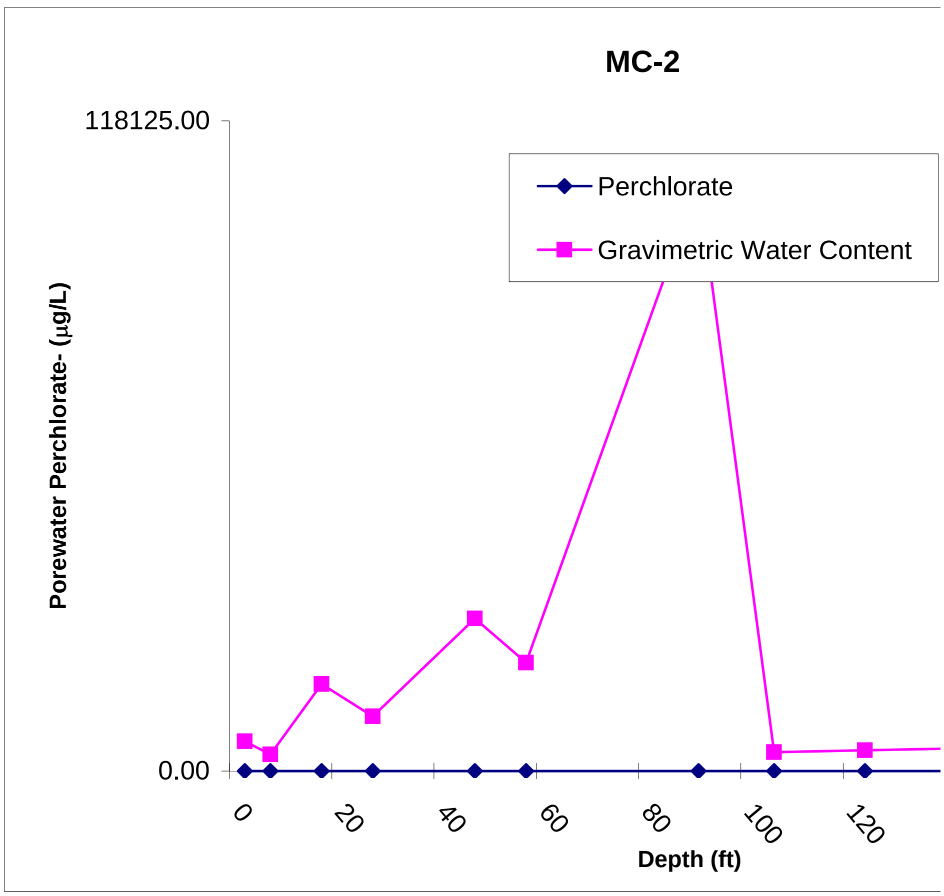
Interval ClO3swi (g/m2)	Cum. ClO3swi (g/m2)	Interval θd (m)	Cum θd (m)
0.000	0.000	0.014	0.01
0.000	0.000	0.024	0.04
0.000	0.000	0.098	0.14
0.000	0.000	0.167	0.30
0.000	0.000	0.360	0.66
0.000	0.000	0.561	1.22
0.000	0.000	1.752	2.98
0.000	0.000	1.779	4.75
0.000	0.000	1.826	6.58
0.000	0.000	1.865	8.45

Based on Prelim
Stratigraphy

MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994



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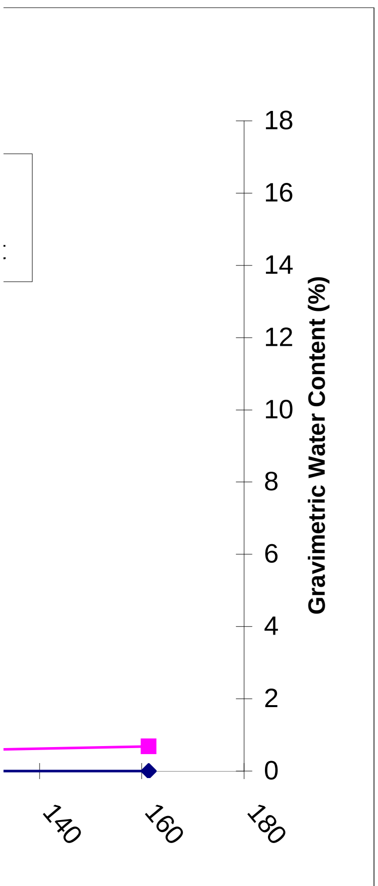
Tuff Dry wt. (g)	ClO4 Leachate (mg/L)	H2O (ml)	ClO4- µg/g	Pore H2O (L)	ClO4- (mg)	ClO4- PW (mg/L)	ClO4- (mg/L)	Interval (m)
50.020	<0.005	75.26	0.00	0.00	0.00	0.00	0.000	1.676
49.980	<0.005	75.23	0.00	0.00	0.00	0.00	0.000	2.286
50.240	<0.005	75.24	0.00	0.00	0.00	0.00	0.000	3.048
50.170	<0.005	75.20	0.00	0.00	0.00	0.00	0.000	4.572
50.250	<0.005	75.19	0.00	0.00	0.00	0.00	0.000	4.572
50.120	<0.001	75.21	0.00	0.00	0.00	0.00	0.000	6.706
49.990	<0.001	75.02	0.00	0.01	0.00	0.00	0.000	7.315
49.980	<0.001	75.05	0.00	0.00	0.00	0.00	0.000	5.029
49.970	<0.001	74.96	0.00	0.00	0.00	0.00	0.000	8.336
50.000	<0.002	75.00	0.00	0.00	0.00	0.00	0.000	5.685

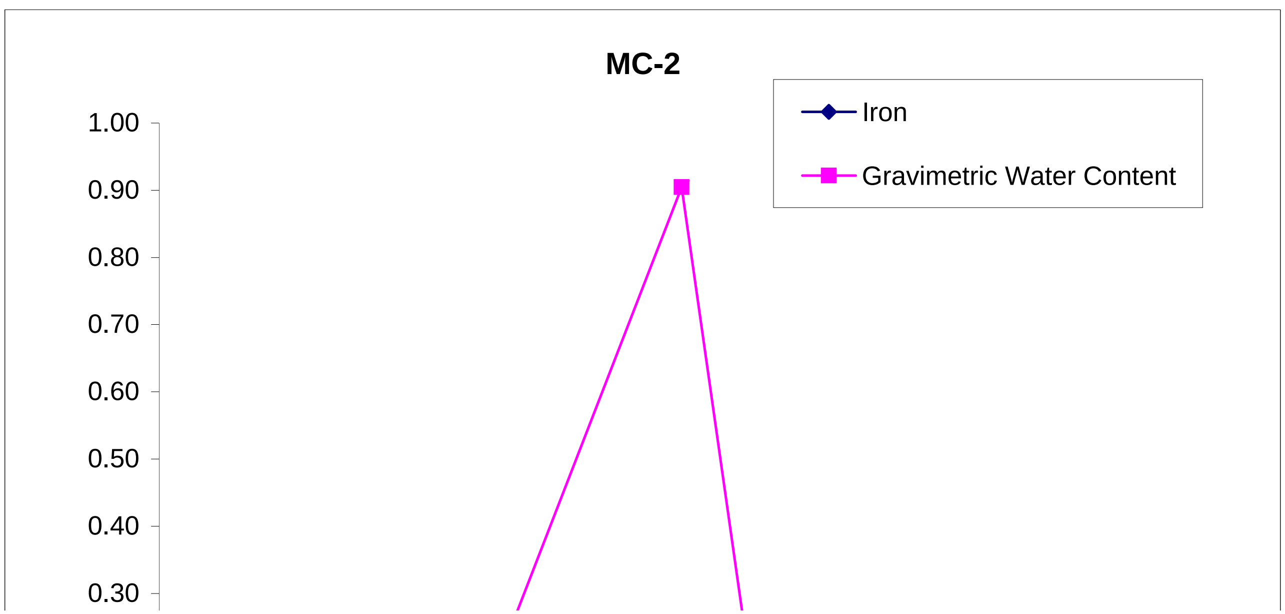


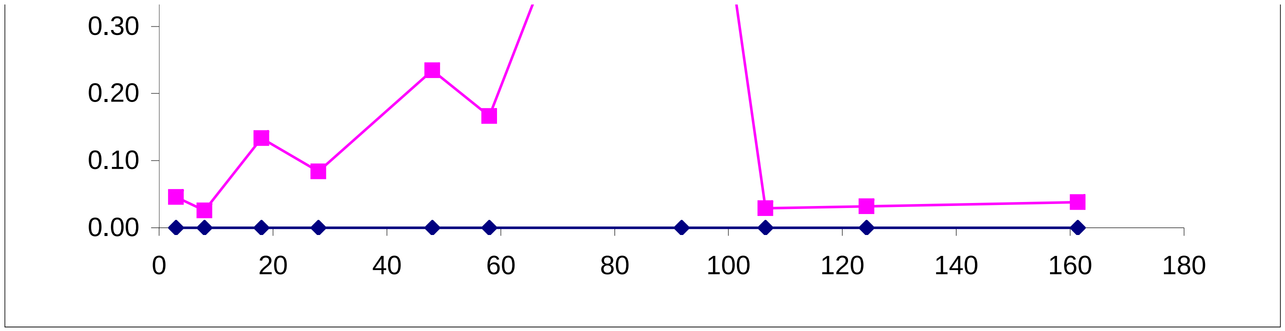
Interval ClO4swi (g/m2)	Cum. ClO4swi (g/m2)	Interval θd (m)	Cum θd (m)
0.000	0.000	0.014	0.01
0.000	0.000	0.024	0.04
0.000	0.000	0.098	0.14
0.000	0.000	0.167	0.30
0.000	0.000	0.360	0.66
0.000	0.000	0.561	1.22
0.000	0.000	1.752	2.98
0.000	0.000	1.779	4.75
0.000	0.000	1.826	6.58
0.000	0.000	1.865	8.45

MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	CO3 Leachate (mg/L)	H2O (ml)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820	50.020	0.000	75.26
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462	49.980	0.000	75.23
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406	50.240	0.000	75.24
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511	50.170	0.000	75.20
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221	50.250	0.000	75.19
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998	50.120	0.000	75.21
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286	49.990	0.000	75.02
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524	49.980	0.000	75.05
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573	49.970	0.000	74.96
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683	50.000	0.000	75.00

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

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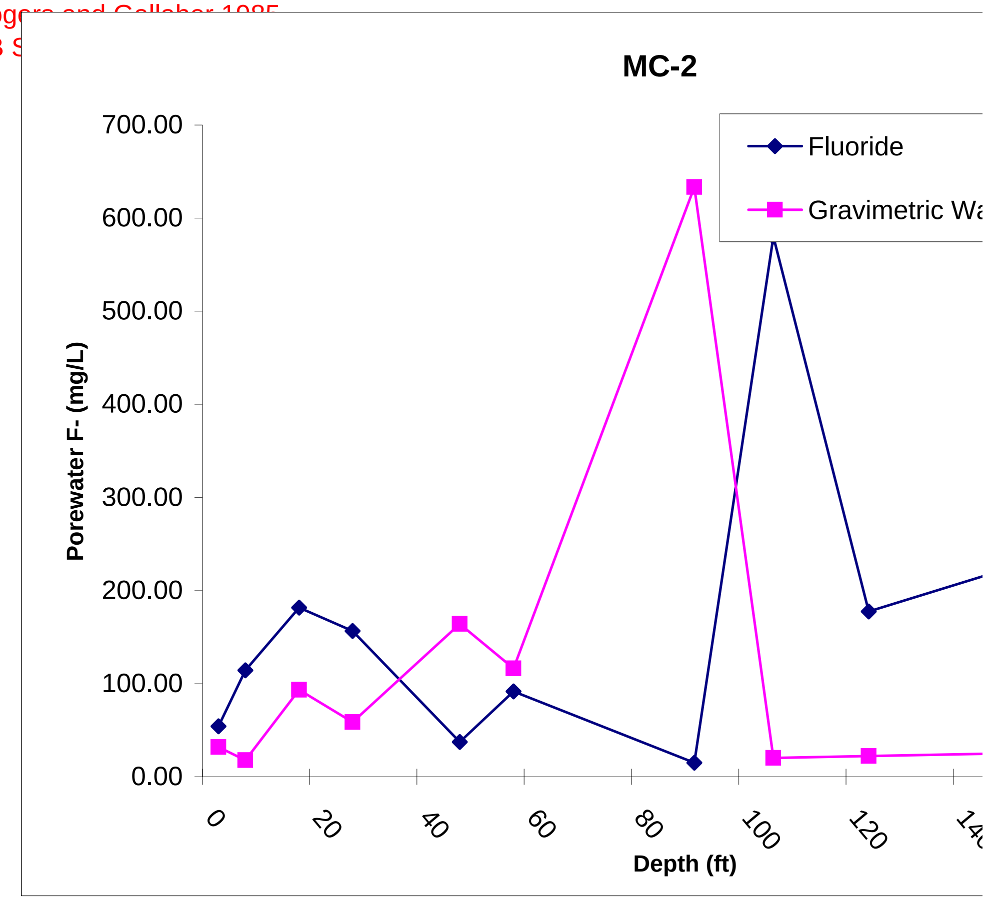
0.20
0.10
0.00
0
20
40
60
80
100
120
140
160
180

CO3 µg/g	Pore H2O (L)	CO3 (mg)	CO3 PW (mg/L)	Interval (m)	Interval CO3swi (g/m2)	Cum. CO3swi (g/m2)	Interval θd (m)	Cum θd (m)
0.00	0.00	0.00	0.00	1.676	0.000	0.000	0.014	0.014
0.00	0.00	0.00	0.00	2.286	0.000	0.000	0.011	0.024
0.00	0.00	0.00	0.00	3.048	0.000	0.000	0.073	0.098
0.00	0.00	0.00	0.00	4.572	0.000	0.000	0.069	0.167
0.00	0.00	0.00	0.00	4.572	0.000	0.000	0.193	0.360
0.00	0.00	0.00	0.00	6.706	0.000	0.000	0.201	0.561
0.00	0.01	0.00	0.00	7.315	0.000	0.000	1.191	1.752
0.00	0.00	0.00	0.00	5.029	0.000	0.000	0.026	1.779
0.00	0.00	0.00	0.00	8.336	0.000	0.000	0.048	1.826
0.00	0.00	0.00	0.00	5.685	0.000	0.000	0.039	1.865

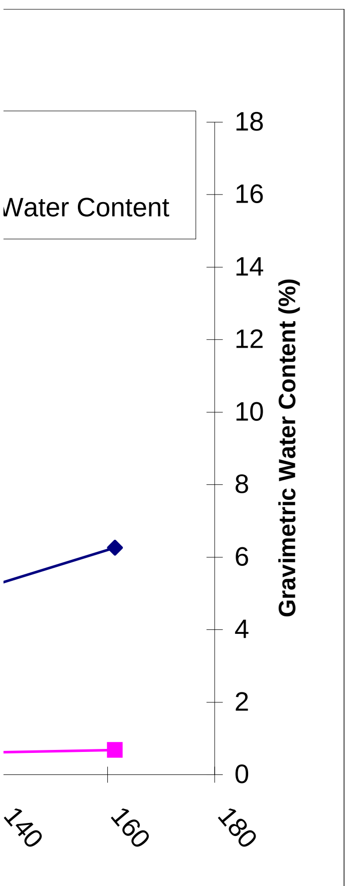
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB S



Tuff Dry wt. (g)	F Leachate (mg/L)	H2O (ml)	F- µg/g	Pore H2O (L)	F- (mg)	F- PW (mg/L)	Interval (m)	Interval Fswi (g/m2)
50.020	0.209	75.26	0.31	0.00	0.02	54.41	1.676	0.748
49.980	0.248	75.23	0.37	0.00	0.02	114.41	2.286	1.209
50.240	2.057	75.24	3.08	0.00	0.15	181.77	3.048	13.332
50.170	1.113	75.20	1.67	0.00	0.08	156.78	4.572	10.832
50.250	0.742	75.19	1.11	0.00	0.06	37.36	4.572	7.210
50.120	1.288	75.21	1.93	0.00	0.10	91.56	6.706	18.408
49.990	1.084	75.02	1.63	0.01	0.08	14.98	7.315	17.849
49.980	1.349	75.05	2.03	0.00	0.10	580.05	5.029	15.284
49.970	0.575	74.96	0.86	0.00	0.04	177.60	8.336	8.486
50.000	0.940	75.00	1.41	0.00	0.07	243.69	5.685	9.457

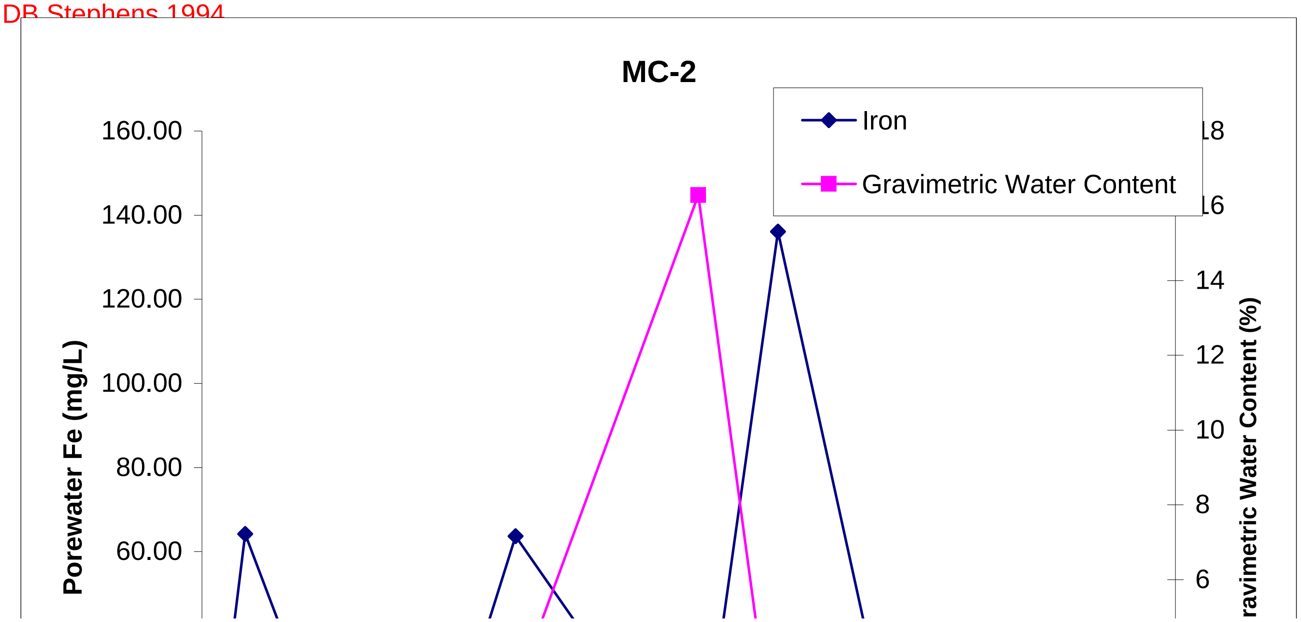


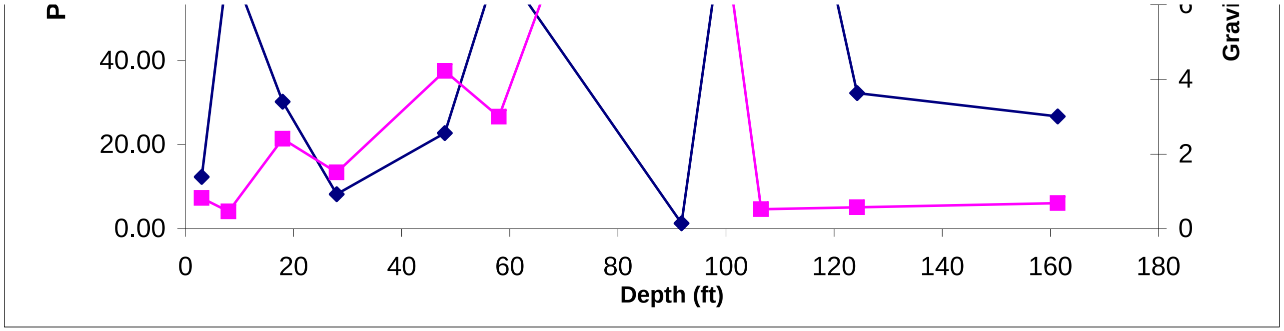
Cum. Fswi (g/m2)	Interval θd (m)	Cum θd (m)
0.748	0.014	0.014
1.957	0.011	0.024
15.289	0.073	0.098
26.121	0.069	0.167
33.331	0.193	0.360
51.739	0.201	0.561
69.588	1.191	1.752
84.872	0.026	1.779
93.358	0.048	1.826
102.815	0.039	1.865

MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	Fe Leachate (mg/L)	H2O (ml)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820	50.020	0.047	75.26
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462	49.980	0.139	75.23
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406	50.240	0.342	75.24
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511	50.170	0.058	75.20
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221	50.250	0.452	75.19
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998	50.120	0.896	75.21
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286	49.990	0.093	75.02
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524	49.980	0.317	75.05
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573	49.970	0.105	74.96
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683	50.000	0.103	75.00

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994

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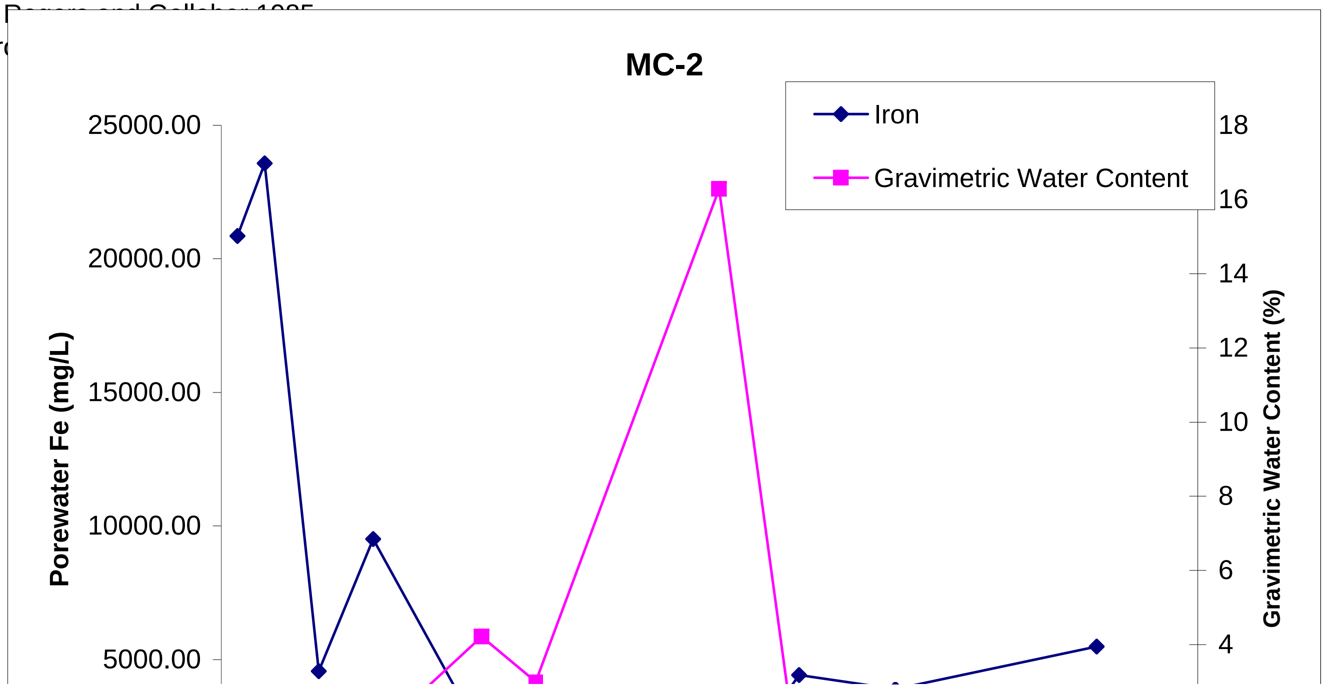
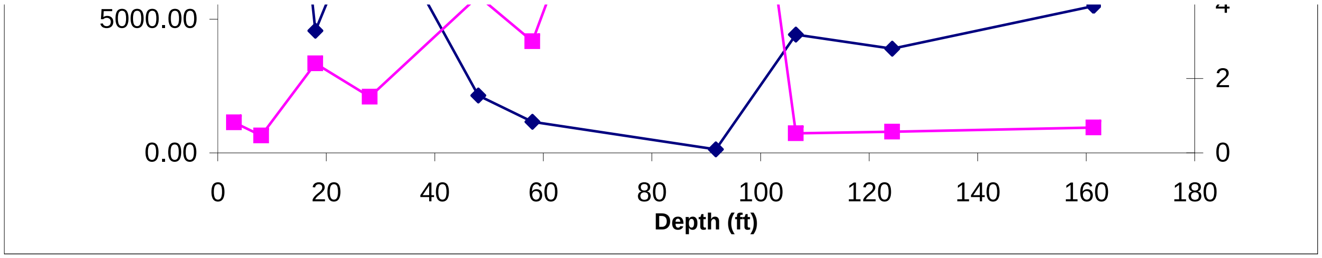
Fe µg/g	Pore H2O (L)	Fe (mg)	Fe PW (mg/L)	Interval (m)	Interval Feswi (g/m2)	Cum. Feswi (g/m2)	Interval θd (m)	Cum θd (m)
0.07	0.00	0.00	12.33	1.676	0.169	0.169	0.014	0.014
0.21	0.00	0.01	64.18	2.286	0.678	0.848	0.011	0.024
0.51	0.00	0.03	30.22	3.048	2.217	3.065	0.073	0.098
0.09	0.00	0.00	8.22	4.572	0.568	3.633	0.069	0.167
0.68	0.00	0.03	22.74	4.572	4.390	8.023	0.193	0.360
1.34	0.00	0.07	63.67	6.706	12.801	20.823	0.201	0.561
0.14	0.01	0.01	1.28	7.315	1.529	22.352	1.191	1.752
0.48	0.00	0.02	136.11	5.029	3.587	25.939	0.026	1.779
0.16	0.00	0.01	32.28	8.336	1.542	27.481	0.048	1.826
0.15	0.00	0.01	26.76	5.685	1.038	28.520	0.039	1.865

MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)	Tuff Dry wt. (g)	HCO3 Leachate (mg/L)	H2O (ml)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820	50.020	80.000	75.26
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462	49.980	51.000	75.23
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406	50.240	51.600	75.24
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511	50.170	67.500	75.20
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221	50.250	42.500	75.19
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998	50.120	16.267	75.21
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286	49.990	9.913	75.02
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524	49.980	10.268	75.05
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573	49.970	12.607	74.96
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683	50.000	21.147	75.00

ensity from Rogers and Gallaher 1985
k density fr





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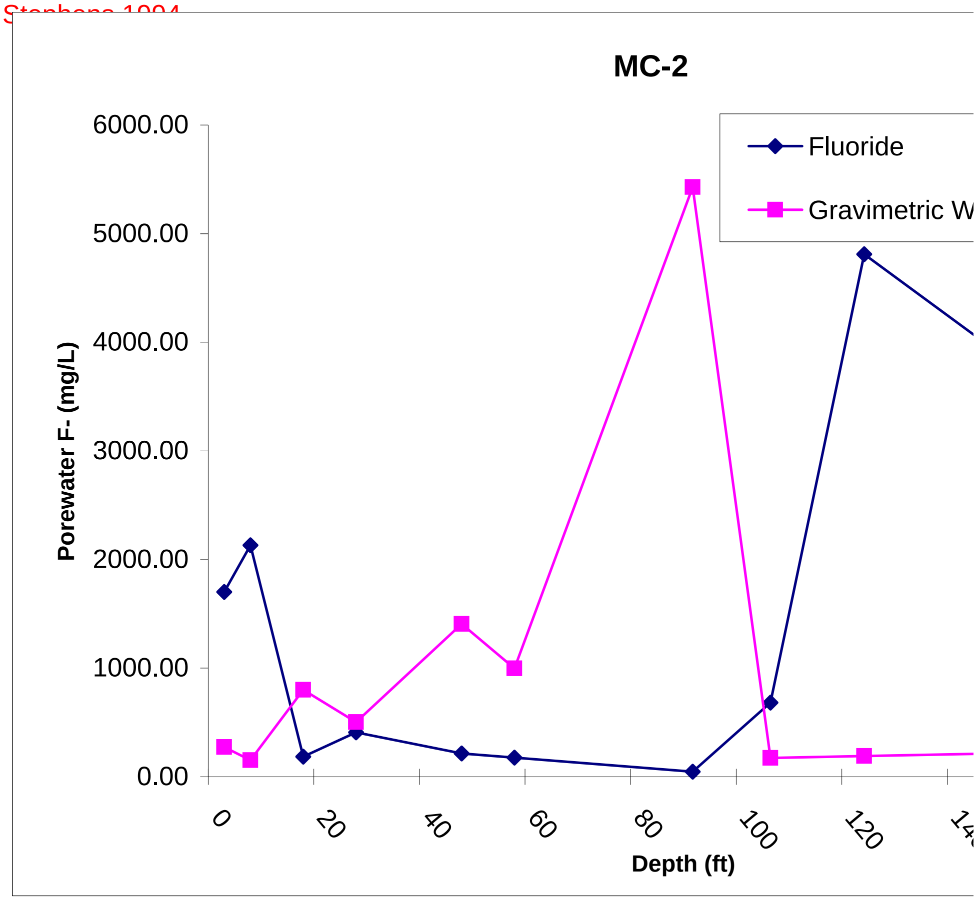
Depth (ft)

HCO3 µg/g	Pore H2O (L)	HCO3 (mg)	HCO3 PW (mg/L)	Interval (m)	Interval HCO3swi (g/m2)	Cum. HCO3swi (g/m2)	Interval θd (m)	Cum θd (m)
120.37	0.00	6.02	20853.41	1.676	286.534	286.534	0.014	0.014
76.77	0.00	3.84	23574.96	2.286	249.189	535.724	0.011	0.024
77.28	0.00	3.88	4560.15	3.048	334.466	870.190	0.073	0.098
101.18	0.00	5.08	9507.28	4.572	656.859	1527.049	0.069	0.167
63.59	0.00	3.20	2139.16	4.572	412.864	1939.913	0.193	0.360
24.41	0.00	1.22	1156.05	6.706	232.428	2172.341	0.201	0.561
14.88	0.01	0.74	137.01	7.315	163.228	2335.569	1.191	1.752
15.42	0.00	0.77	4414.35	5.029	116.317	2451.887	0.026	1.779
18.91	0.00	0.94	3893.34	8.336	186.026	2637.913	0.048	1.826
31.72	0.00	1.59	5482.69	5.685	212.769	2850.683	0.039	1.865

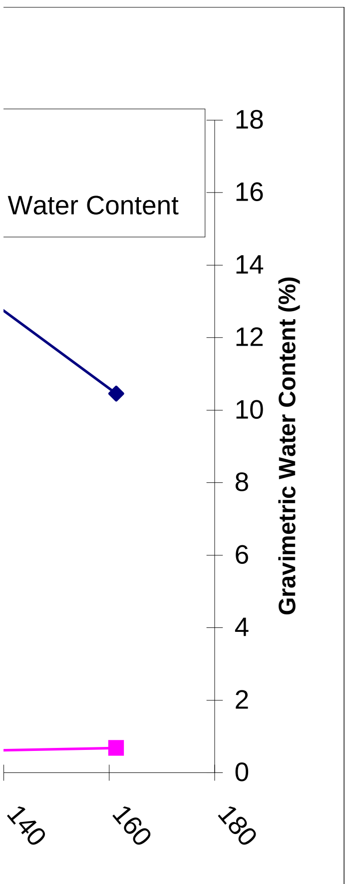
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994



Tuff Dry wt. (g)	K Leachate (mg/L)	H2O (ml)	K µg/g	Pore H2O (L)	K (mg)	K PW (mg/L)	Interval (m)	Interval Kswi (g/m2)
50.020	6.531	75.26	9.83	0.00	0.49	1702.32	1.676	23.391
49.980	4.613	75.23	6.94	0.00	0.35	2132.48	2.286	22.541
50.240	2.087	75.24	3.13	0.00	0.16	184.43	3.048	13.527
50.170	2.915	75.20	4.37	0.00	0.22	410.64	4.572	28.371
50.250	4.283	75.19	6.41	0.00	0.32	215.59	4.572	41.610
50.120	2.488	75.21	3.73	0.00	0.19	176.79	6.706	35.544
49.990	3.388	75.02	5.08	0.01	0.25	46.83	7.315	55.790
49.980	1.588	75.05	2.38	0.00	0.12	682.69	5.029	17.989
49.970	15.577	74.96	23.37	0.00	1.17	4810.81	8.336	229.864
50.000	13.440	75.00	20.16	0.00	1.01	3484.67	5.685	135.231

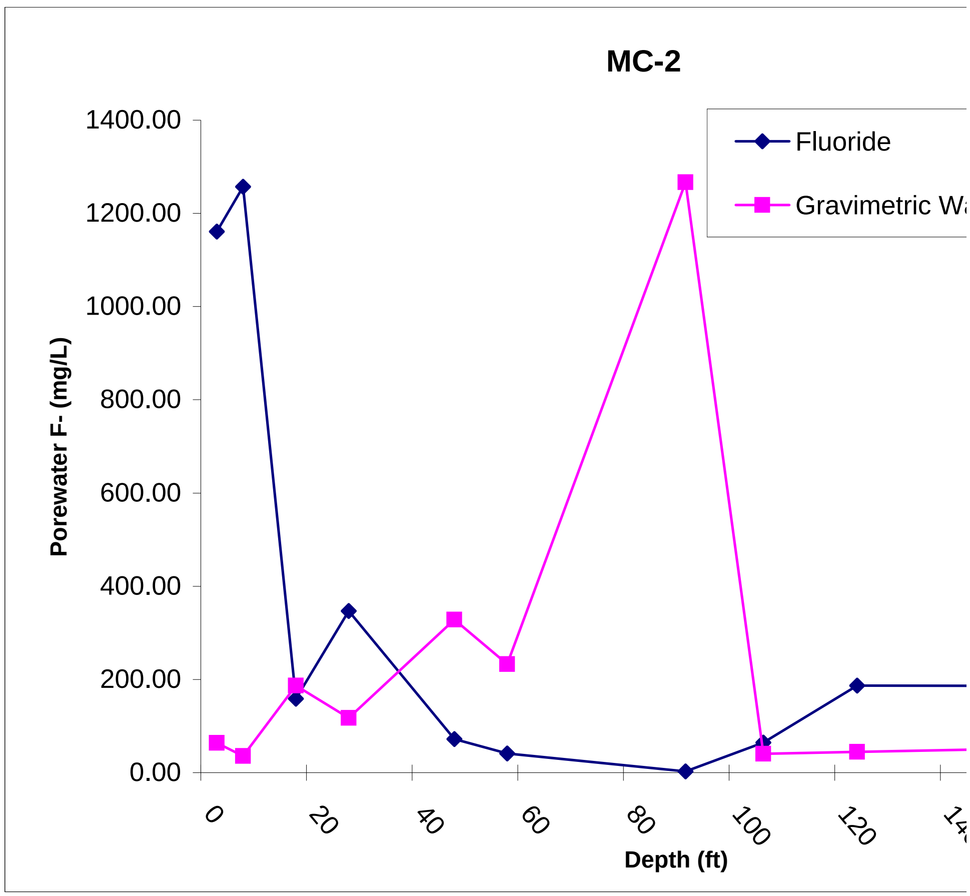


Cum. Kswi (g/m2)	Interval θd (m)	Cum θd (m)
23.391	0.014	0.014
45.931	0.011	0.024
59.458	0.073	0.098
87.829	0.069	0.167
129.439	0.193	0.360
164.983	0.201	0.561
220.773	1.191	1.752
238.762	0.026	1.779
468.626	0.048	1.826
603.857	0.039	1.865

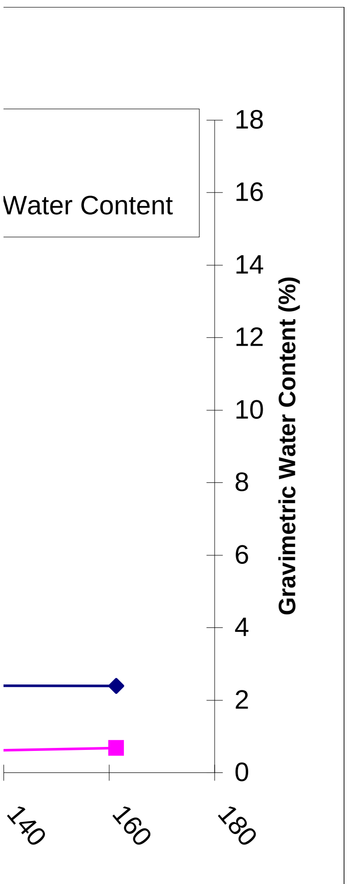
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994



Tuff Dry wt. (g)	Mg Leachate (mg/L)	H2O (ml)	Mg µg/g	Pore H2O (L)	Mg (mg)	Mg PW (mg/L)	Interval (m)	Interval Mgswi (g/m2)
50.020	4.452	75.26	6.70	0.00	0.34	1160.62	1.676	15.947
49.980	2.720	75.23	4.09	0.00	0.20	1257.29	2.286	13.290
50.240	1.799	75.24	2.69	0.00	0.14	159.01	3.048	11.663
50.170	2.464	75.20	3.69	0.00	0.19	347.10	4.572	23.981
50.250	1.427	75.19	2.14	0.00	0.11	71.83	4.572	13.863
50.120	0.577	75.21	0.87	0.00	0.04	40.98	6.706	8.239
49.990	0.220	75.02	0.33	0.01	0.02	3.04	7.315	3.616
49.980	0.150	75.05	0.22	0.00	0.01	64.34	5.029	1.695
49.970	0.604	74.96	0.91	0.00	0.05	186.64	8.336	8.918
50.000	0.718	75.00	1.08	0.00	0.05	186.04	5.685	7.220

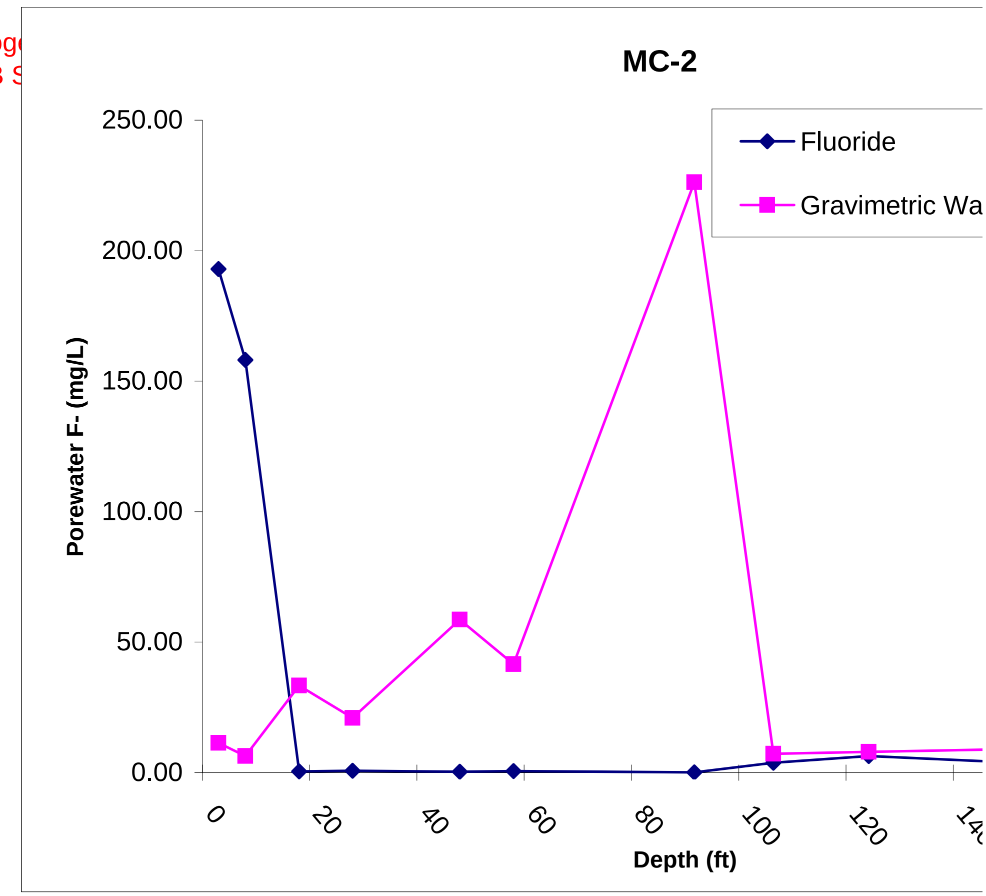


Cum. Mgswi (g/m2)	Interval θd (m)	Cum θd (m)
15.947	0.014	0.014
29.237	0.011	0.024
40.900	0.073	0.098
64.881	0.069	0.167
78.744	0.193	0.360
86.983	0.201	0.561
90.599	1.191	1.752
92.294	0.026	1.779
101.212	0.048	1.826
108.432	0.039	1.865

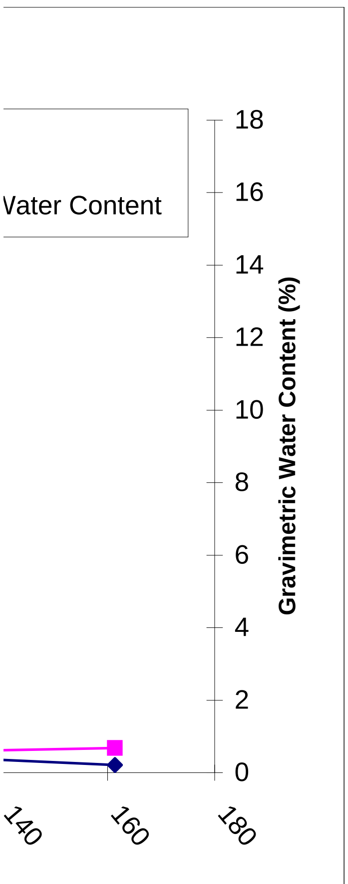
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Roge
Note:Soil Bulk density from DB S



Tuff Dry wt. (g)	Mn Leachate (mg/L)	H2O (ml)	Mn µg/g	Pore H2O (L)	Mn (mg)	Mn PW (mg/L)	Interval (m)	Interval Mnswi (g/m2)
50.020	0.740	75.26	1.11	0.00	0.06	192.90	1.676	2.651
49.980	0.342	75.23	0.51	0.00	0.03	158.12	2.286	1.671
50.240	0.005	75.24	0.01	0.00	0.00	0.43	3.048	0.032
50.170	0.005	75.20	0.01	0.00	0.00	0.71	4.572	0.049
50.250	0.007	75.19	0.01	0.00	0.00	0.33	4.572	0.064
50.120	0.008	75.21	0.01	0.00	0.00	0.56	6.706	0.113
49.990	0.007	75.02	0.01	0.01	0.00	0.09	7.315	0.108
49.980	0.009	75.05	0.01	0.00	0.00	3.85	5.029	0.101
49.970	0.021	74.96	0.03	0.00	0.00	6.38	8.336	0.305
50.000	0.011	75.00	0.02	0.00	0.00	2.92	5.685	0.113

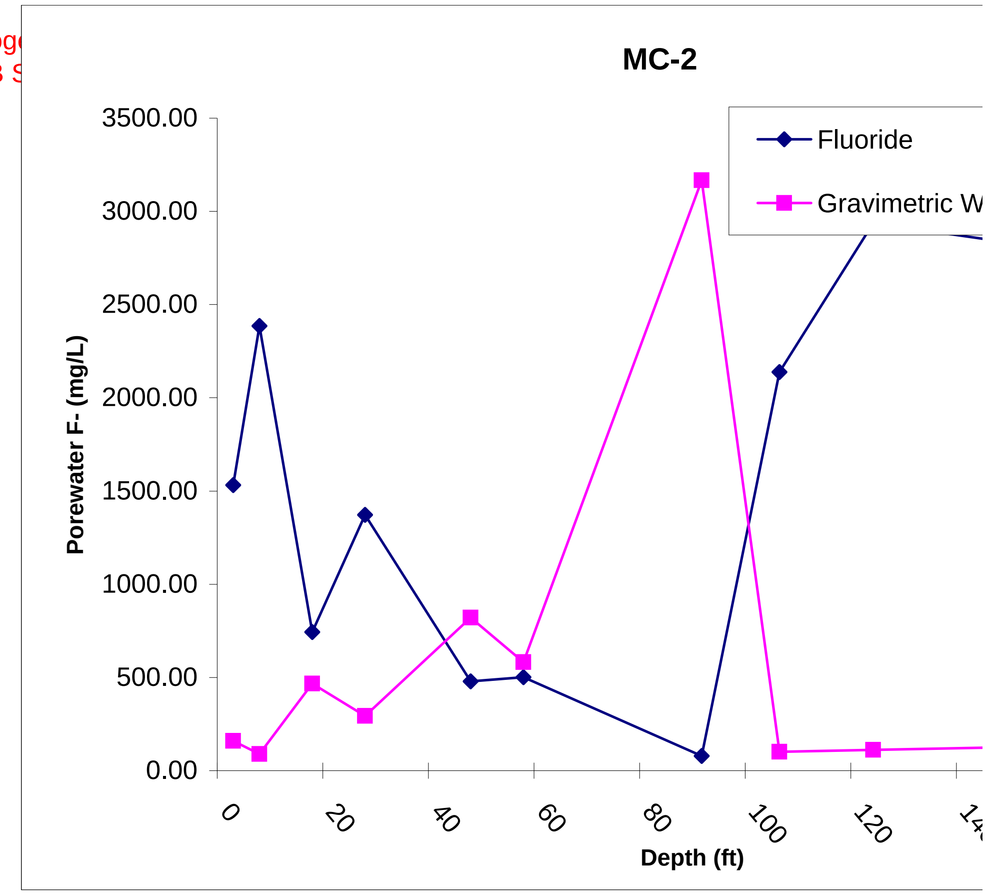


Cum. Mnswi (g/m2)	Interval θd (m)	Cum θd (m)
2.651	0.014	0.014
4.322	0.011	0.024
4.354	0.073	0.098
4.403	0.069	0.167
4.467	0.193	0.360
4.581	0.201	0.561
4.689	1.191	1.752
4.790	0.026	1.779
5.095	0.048	1.826
5.208	0.039	1.865

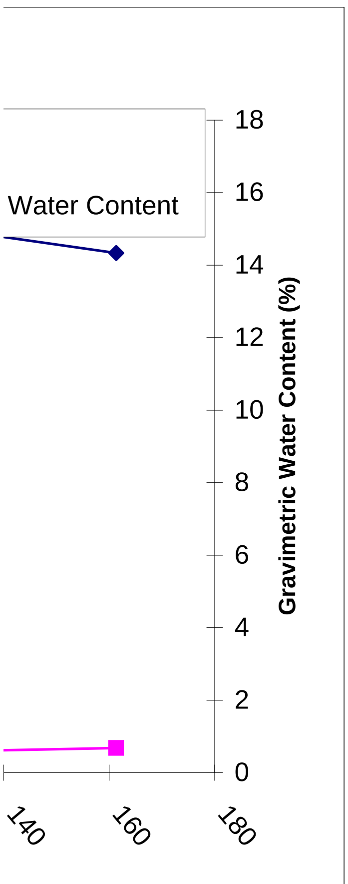
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rog
Note:Soil Bulk density from DB S



Tuff Dry wt. (g)	Na Leachate (mg/L)	H2O (ml)	Na µg/g	Pore H2O (L)	Na (mg)	Na PW (mg/L)	Interval (m)	Interval Naswi (g/m2)
50.020	5.876	75.26	8.84	0.00	0.44	1531.75	1.676	21.047
49.980	5.161	75.23	7.77	0.00	0.39	2385.49	2.286	25.215
50.240	8.409	75.24	12.59	0.00	0.63	743.12	3.048	54.505
50.170	9.743	75.20	14.60	0.00	0.73	1372.23	4.572	94.807
50.250	9.509	75.19	14.23	0.00	0.71	478.62	4.572	92.374
50.120	7.048	75.21	10.58	0.00	0.53	500.87	6.706	100.702
49.990	5.725	75.02	8.59	0.01	0.43	79.13	7.315	94.271
49.980	4.973	75.05	7.47	0.00	0.37	2138.06	5.029	56.338
49.970	9.508	74.96	14.26	0.00	0.71	2936.29	8.336	140.298
50.000	10.749	75.00	16.12	0.00	0.81	2786.98	5.685	108.155

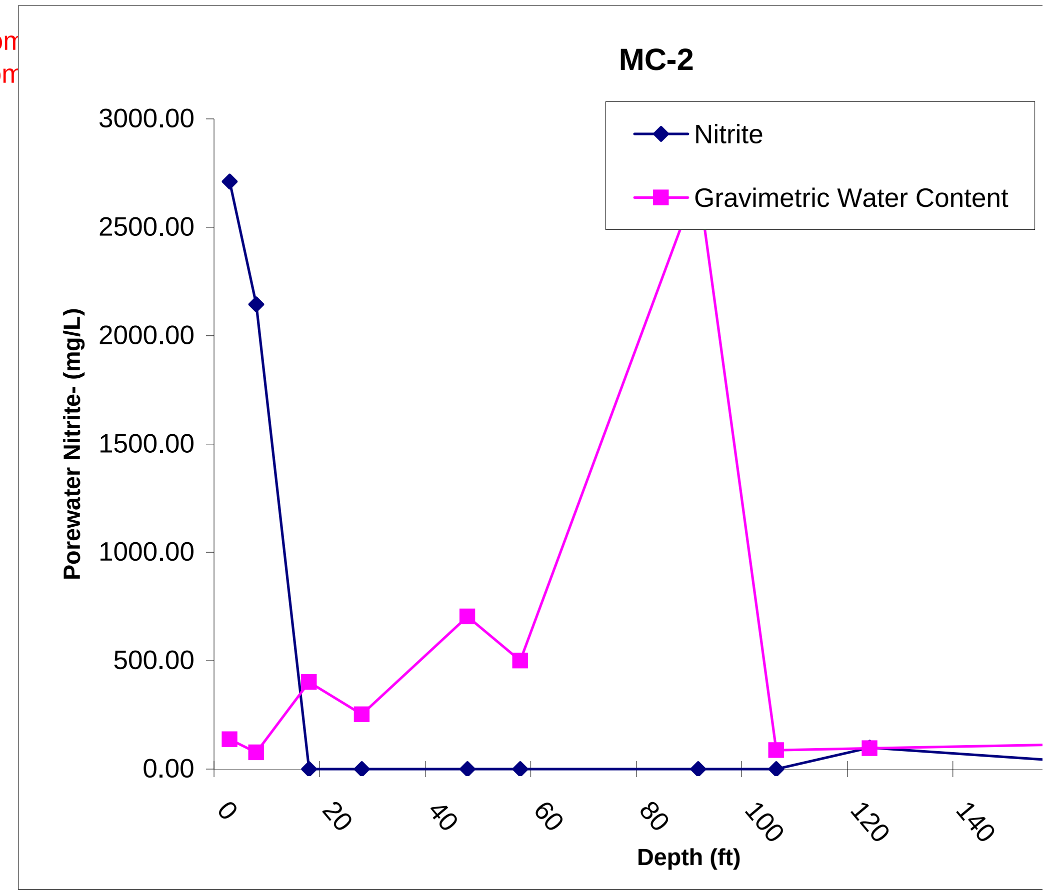


Cum. Naswi (g/m2)	Interval θd (m)	Cum θd (m)
21.047	0.014	0.014
46.262	0.011	0.024
100.766	0.073	0.098
195.574	0.069	0.167
287.948	0.193	0.360
388.650	0.201	0.561
482.921	1.191	1.752
539.259	0.026	1.779
679.557	0.048	1.826
787.712	0.039	1.865

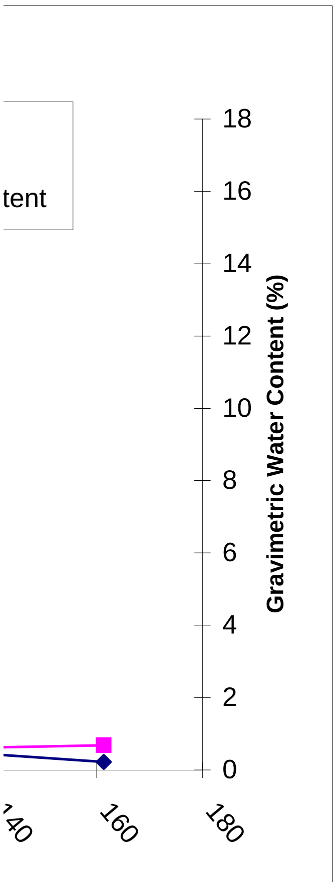
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from
Note:Soil Bulk density from



Tuff Dry wt. (g)	NO2 Leachate (mg/L)	H2O (ml)	NO2- µg/g	Pore H2O (L)	NO2- (mg)	NO2- (mg/L)	Interval (m)	Interval NO2swi (g/m2)
50.020	10.400	75.26	15.65	0.00	0.78	2710.94	1.676	37.249
49.980	4.640	75.23	6.98	0.00	0.35	2144.86	2.286	22.671
50.240	<0.01	75.24	0.00	0.00	0.00	0.00	3.048	0.000
50.170	<0.01	75.20	0.00	0.00	0.00	0.00	4.572	0.000
50.250	<0.01	75.19	0.00	0.00	0.00	0.00	4.572	0.000
50.120	<0.01	75.21	0.00	0.00	0.00	0.00	6.706	0.000
49.990	<0.01	75.02	0.00	0.01	0.00	0.00	7.315	0.000
49.980	<0.01	75.05	0.00	0.00	0.00	0.00	5.029	0.000
49.970	0.320	74.96	0.48	0.00	0.02	98.83	8.336	4.722
50.000	0.140	75.00	0.21	0.00	0.01	36.30	5.685	1.409

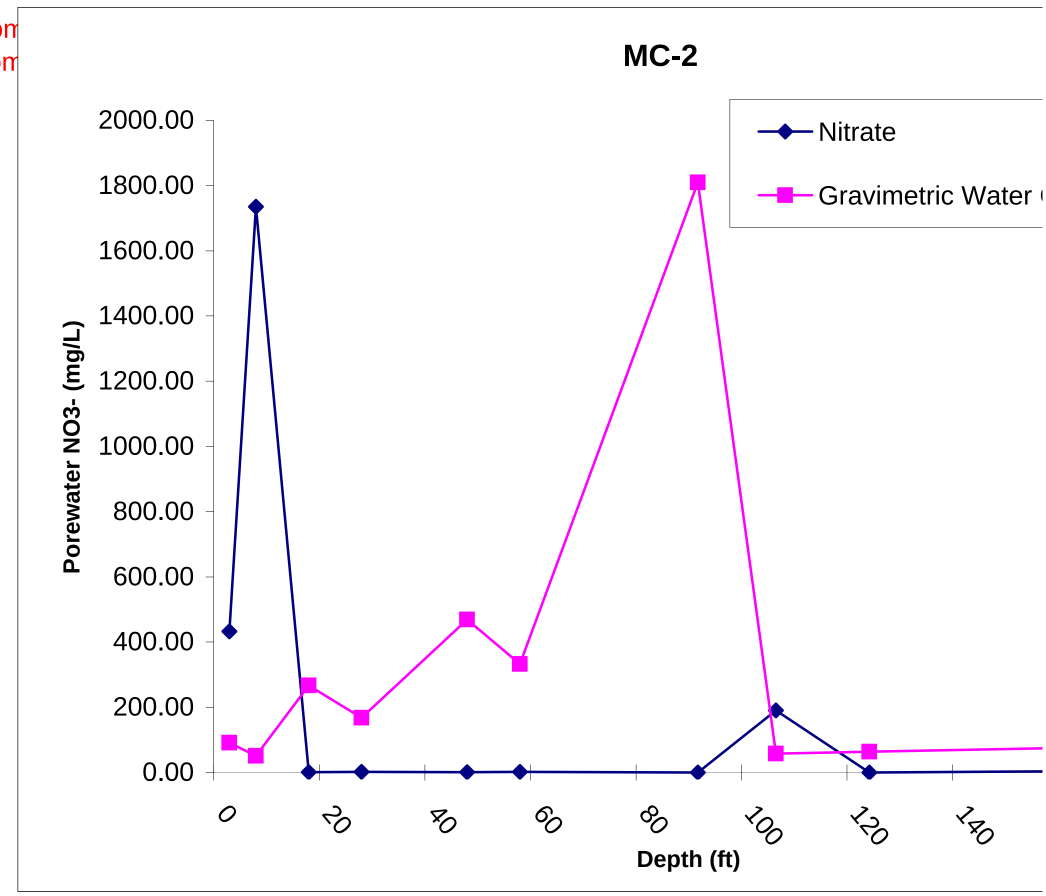


Cum. NO2swi (g/m2)	Interval θd (m)	Cum θd (m)
37.249	0.014	0.014
59.921	0.011	0.024
59.921	0.073	0.098
59.921	0.069	0.167
59.921	0.193	0.360
59.921	0.201	0.561
59.921	1.191	1.752
59.921	0.026	1.779
64.643	0.048	1.826
66.051	0.039	1.865

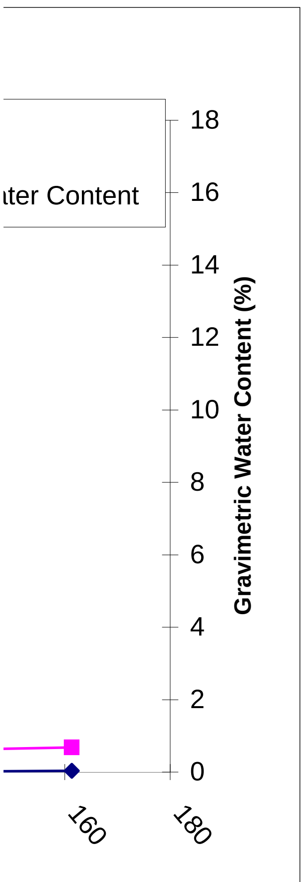
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from
Note:Soil Bulk density from



Tuff Dry wt. (g)	NO3 Leachate (mg/L)	H2O (ml)	NO3- µg/g	Pore H2O (L)	NO3- (mg)	NO3- (mg/L)	Interval (m)	Interval NO3swi (g/m2)
50.020	1.659	75.26	2.50	0.00	0.12	432.38	1.676	5.941
49.980	3.754	75.23	5.65	0.00	0.28	1735.14	2.286	18.341
50.240	0.016	75.24	0.02	0.00	0.00	1.41	3.048	0.103
50.170	0.015	75.20	0.02	0.00	0.00	2.05	4.572	0.142
50.250	0.017	75.19	0.03	0.00	0.00	0.84	4.572	0.162
50.120	0.022	75.21	0.03	0.00	0.00	1.56	6.706	0.315
49.990	0.014	75.02	0.02	0.01	0.00	0.19	7.315	0.224
49.980	0.444	75.05	0.67	0.00	0.03	190.79	5.029	5.027
49.970	<0.01	74.96	0.00	0.00	0.00	0.00	8.336	0.000
50.000	0.014	75.00	0.02	0.00	0.00	3.66	5.685	0.142



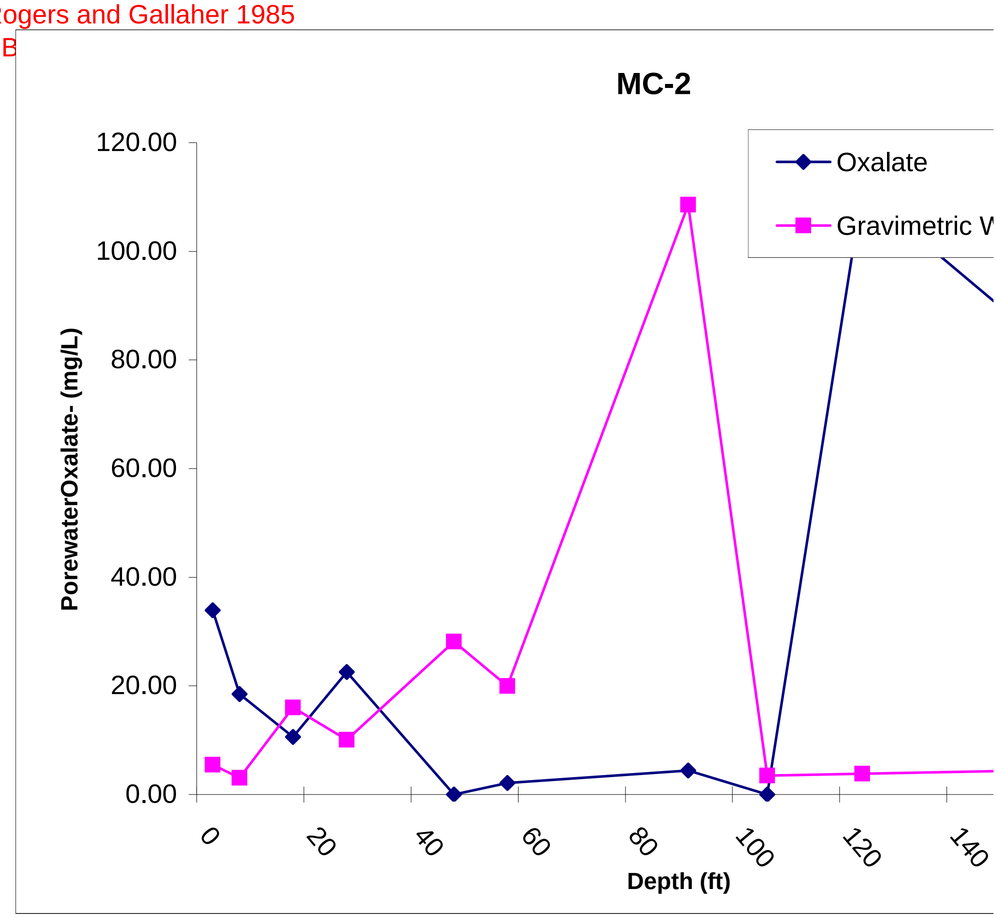
Cum. NO3swi (g/m2)	Interval θd (m)	Cum θd (m)
5.941	0.014	0.014
30.223	0.011	0.024
60.549	0.073	0.098
121.240	0.069	0.167
121.402	0.193	0.360
121.717	0.201	0.561
121.941	1.191	1.752
126.968	0.026	1.779
126.968	0.048	1.826
127.111	0.039	1.865

MC-2

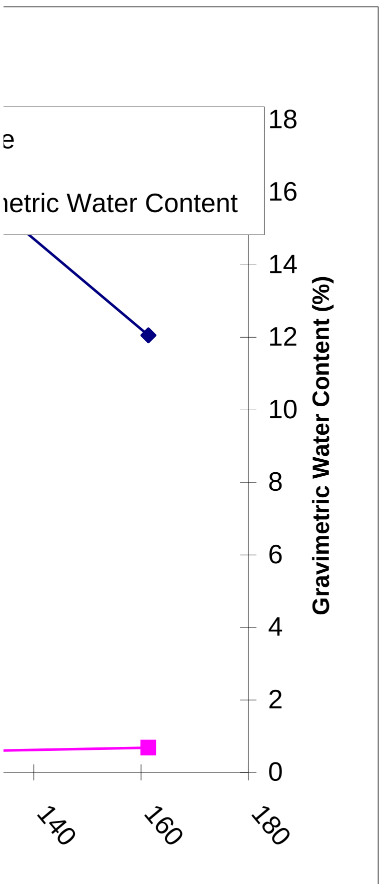
Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985

Note:Soil Bulk density from DB



Tuff Dry wt. (g)	OXA Leachate (mg/L)	H2O (mL)	OXA- µg/g	Pore H2O (L)	OXA- (mg)	OXA- (mg/L)	Interval (m)	Interval OXAswi (g/m2)
50.020	0.130	75.26	0.20	0.00	0.01	33.89	1.676	0.466
49.980	0.040	75.23	0.06	0.00	0.00	18.49	2.286	0.195
50.240	0.120	75.24	0.18	0.00	0.01	10.61	3.048	0.778
50.170	0.160	75.20	0.24	0.00	0.01	22.54	4.572	1.557
50.250	<0.01	75.19	0.00	0.00	0.00	0.00	4.572	0.000
50.120	0.030	75.21	0.05	0.00	0.00	2.13	6.706	0.429
49.990	0.320	75.02	0.48	0.01	0.02	4.42	7.315	5.269
49.980	<0.01	75.05	0.00	0.00	0.00	0.00	5.029	0.000
49.970	0.360	74.96	0.54	0.00	0.03	111.18	8.336	5.312
50.000	0.310	75.00	0.47	0.00	0.02	80.37	5.685	3.119

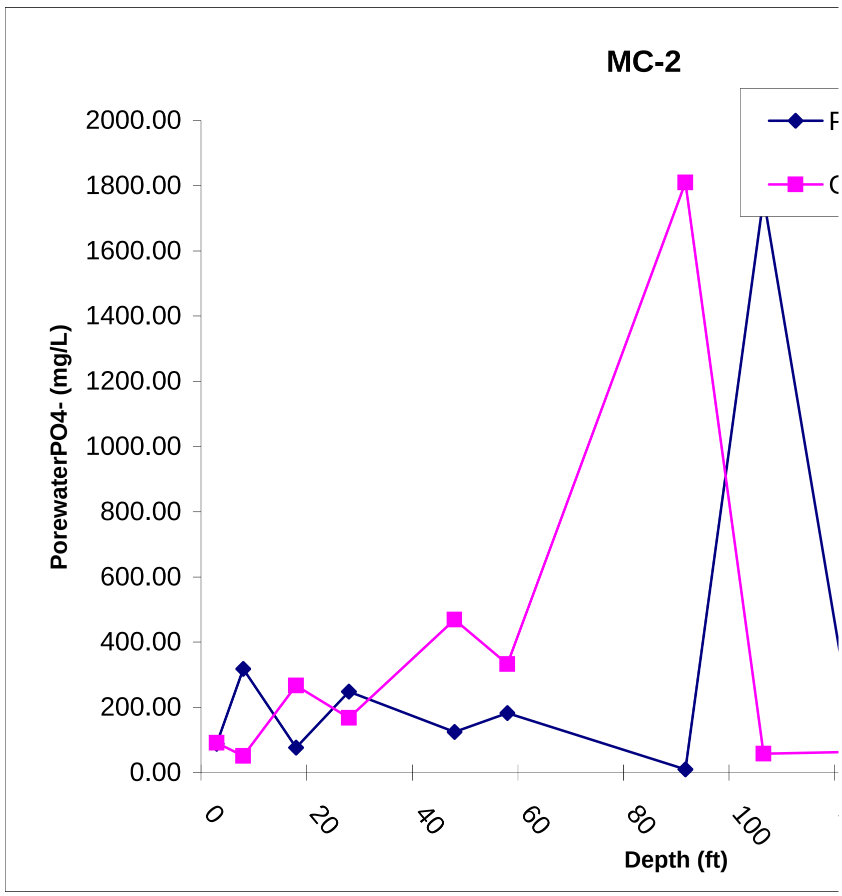


Cum. OXAswi (g/m2)	Interval θd (m)	Cum θd (m)
0.466	0.014	0.014
0.661	0.011	0.024
1.439	0.073	0.098
2.996	0.069	0.167
2.996	0.193	0.360
3.425	0.201	0.561
8.694	1.191	1.752
8.694	0.026	1.779
14.006	0.048	1.826
17.125	0.039	1.865

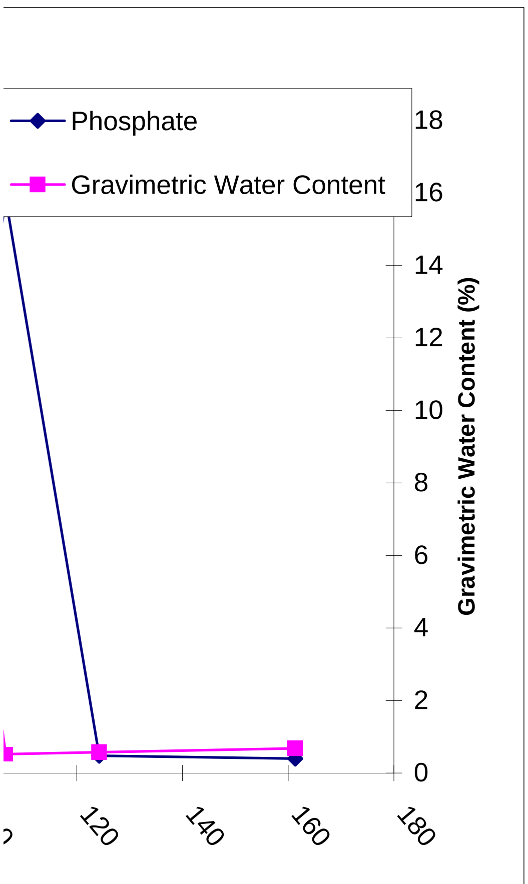
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

sity from Rogers and Gallaher 1985
density from DB Stephens 1994



Tuff Dry wt. (g)	PO4 Leachate (mg/L)	H2O (mL)	PO4- µg/g	Pore H2O (L)	PO4- (mg)	PO4- (mg/L)	Interval (m)	Interval PO4swi (g/m2)
50.020	0.341	75.26	0.51	0.00	0.03	88.80	1.676	1.220
49.980	0.689	75.23	1.04	0.00	0.05	318.27	2.286	3.364
50.240	0.861	75.24	1.29	0.00	0.06	76.07	3.048	5.579
50.170	1.763	75.20	2.64	0.00	0.13	248.26	4.572	17.153
50.250	2.470	75.19	3.70	0.00	0.19	124.35	4.572	23.999
50.120	2.566	75.21	3.85	0.00	0.19	182.36	6.706	36.664
49.990	0.699	75.02	1.05	0.01	0.05	9.66	7.315	11.512
49.980	4.099	75.05	6.16	0.00	0.31	1762.22	5.029	46.434
49.970	0.170	74.96	0.26	0.00	0.01	52.59	8.336	2.513
50.000	0.170	75.00	0.25	0.00	0.01	43.95	5.685	1.706

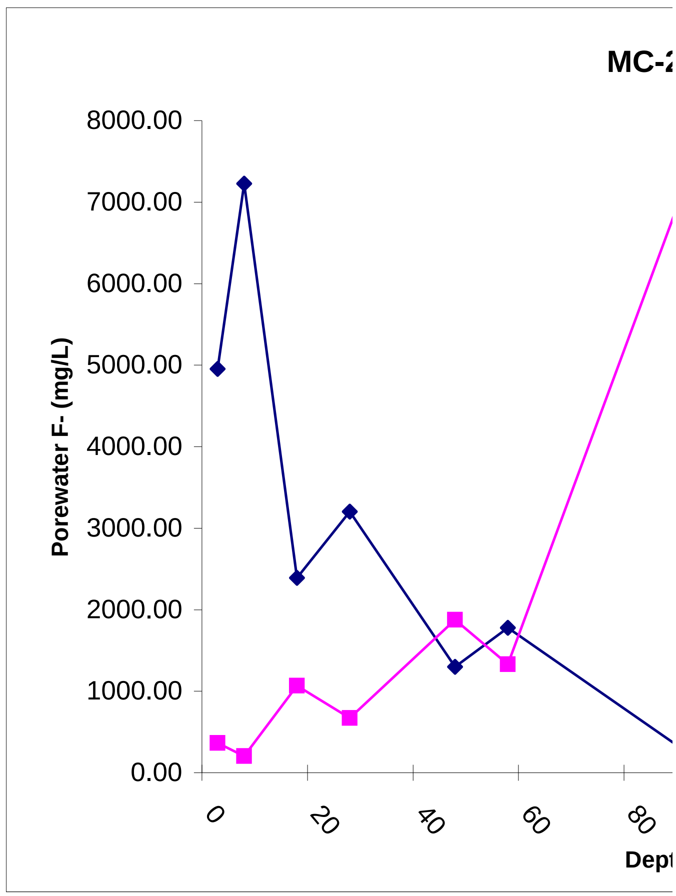


Cum. PO4swi (g/m2)	Interval θd (m)	Cum θd (m)
1.220	0.014	0.014
4.584	0.011	0.024
10.163	0.073	0.098
27.316	0.069	0.167
51.315	0.193	0.360
87.980	0.201	0.561
99.491	1.191	1.752
145.926	0.026	1.779
148.438	0.048	1.826
150.144	0.039	1.865

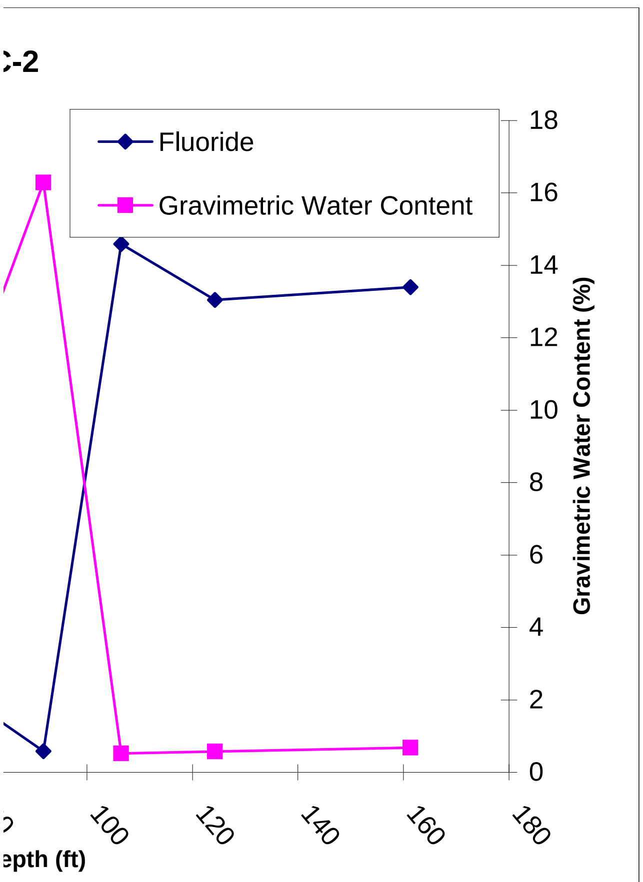
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994



Tuff Dry wt. (g)	Si Leachate (mg/L)	H2O (ml)	Si µg/g	Pore H2O (L)	Si (mg)	Si PW (mg/L)	Interval (m)	Interval Siswi (g/m2)
50.020	19.006	75.26	28.60	0.00	1.43	4954.18	1.676	68.072
49.980	15.635	75.23	23.53	0.00	1.18	7227.33	2.286	76.394
50.240	27.046	75.24	40.50	0.00	2.03	2390.22	3.048	175.311
50.170	22.755	75.20	34.11	0.00	1.71	3204.99	4.572	221.433
50.250	25.799	75.19	38.60	0.00	1.94	1298.56	4.572	250.625
50.120	25.020	75.21	37.54	0.00	1.88	1778.14	6.706	357.500
49.990	18.691	75.02	28.05	0.01	1.40	258.34	7.315	307.780
49.980	15.084	75.05	22.65	0.00	1.13	6484.56	5.029	170.867
49.970	18.776	74.96	28.17	0.00	1.41	5798.50	8.336	277.056
50.000	22.969	75.00	34.45	0.00	1.72	5955.20	5.685	231.106

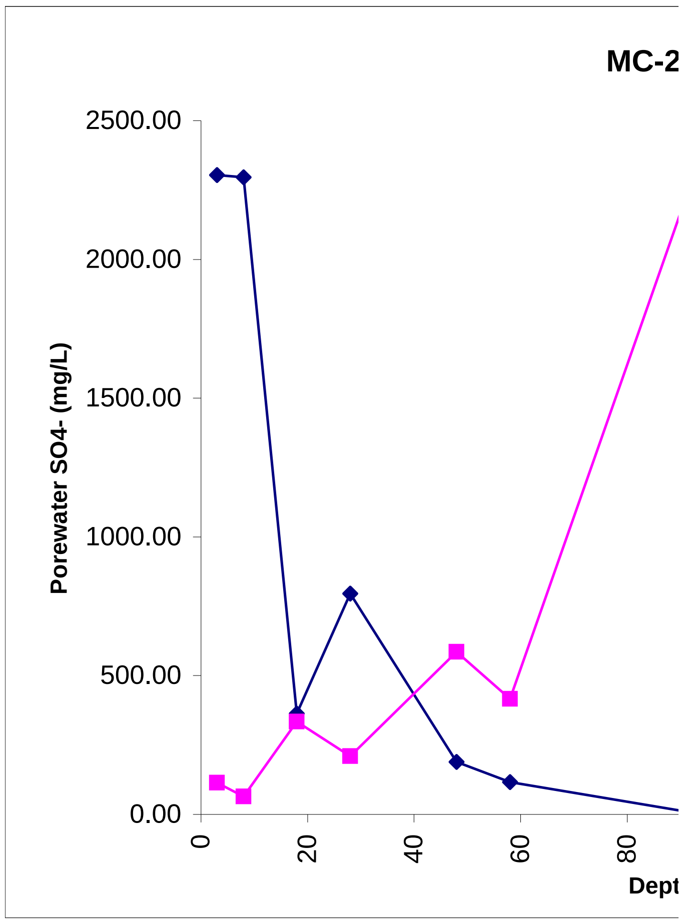


Cum. Siswi (g/m2)	Interval θd (m)	Cum θd (m)
68.072	0.014	0.014
144.466	0.011	0.024
319.777	0.073	0.098
541.210	0.069	0.167
791.835	0.193	0.360
1149.336	0.201	0.561
1457.116	1.191	1.752
1627.983	0.026	1.779
1905.039	0.048	1.826
2136.146	0.039	1.865

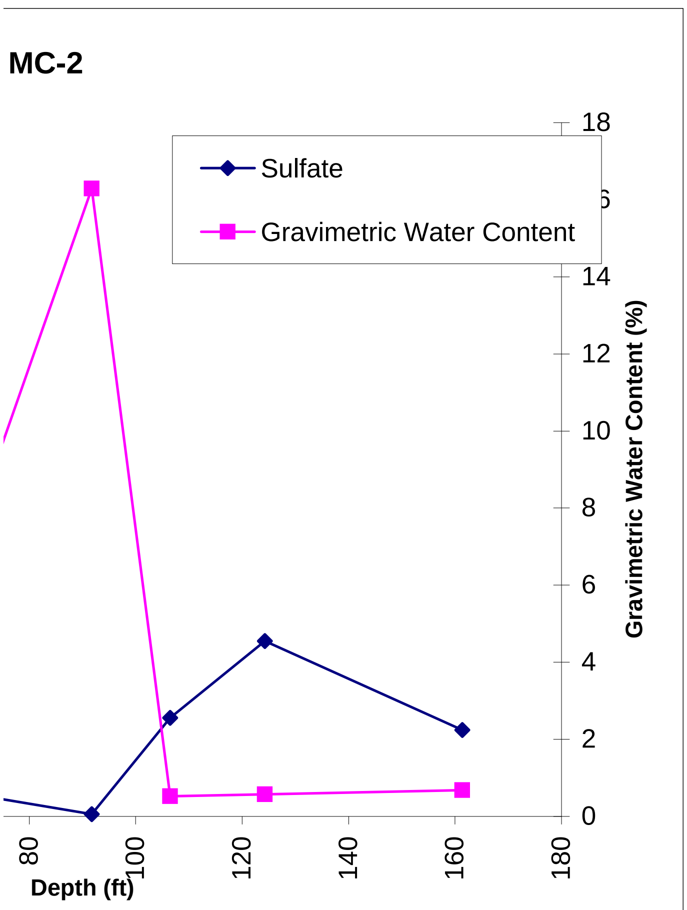
MC-2

Depth (ft)	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)	Unit	θg (%)	ρb* (g/cm3)	θv (%)
2.5-3.5	2.5	3.5	3.00	0.91	Qal	0.577	1.420	0.820
7.5-8.5	7.5	8.5	8.00	2.44	Qal	0.326	1.420	0.462
17.5-18.5	17.5	18.5	18.00	5.49	Qal	1.695	1.420	2.406
27.5-28.5	27.5	28.5	28.00	8.53	Qal	1.064	1.420	1.511
47.5-48.5	47.5	48.5	48.00	14.63	Qal	2.973	1.420	4.221
57.5-58.5	57.5	58.5	58.00	17.68	Qal	2.111	1.420	2.998
91.5-92.0	91.5	92.0	91.75	27.97	Qct	10.857	1.500	16.286
106.0-107.0	106.0	107.0	106.50	32.46	Qct	0.349	1.500	0.524
124.0-124.5	124.0	124.5	124.25	37.87	Qbo	0.486	1.180	0.573
161.2-161.5	161.2	161.5	161.35	49.18	Qbo	0.579	1.180	0.683

Note:Tuff Bulk density from Rogers and Gallaher 1985
Note:Soil Bulk density from DB Stephens 1994



Tuff Dry wt. (g)	SO4 Leachate (mg/L)	H2O (mL)	SO4- µg/g	Pore H2O (L)	SO4- (mg)	SO4- (mg/L)	Interval (m)	Interval SO4swi (g/m2)
50.020	8.839	75.26	13.30	0.00	0.67	2304.06	1.676	31.659
49.980	4.966	75.23	7.48	0.00	0.37	2295.77	2.286	24.266
50.240	4.105	75.24	6.15	0.00	0.31	362.75	3.048	26.606
50.170	5.652	75.20	8.47	0.00	0.43	796.12	4.572	55.004
50.250	3.751	75.19	5.61	0.00	0.28	188.79	4.572	36.437
50.120	1.635	75.21	2.45	0.00	0.12	116.17	6.706	23.357
49.990	0.573	75.02	0.86	0.01	0.04	7.92	7.315	9.435
49.980	0.827	75.05	1.24	0.00	0.06	355.55	5.029	9.369
49.970	2.046	74.96	3.07	0.00	0.15	631.94	8.336	30.195
50.000	1.200	75.00	1.80	0.00	0.09	311.16	5.685	12.075



Cum. SO4swi (g/m2)	Interval θd (m)	Cum θd (m)
31.659	0.014	0.014
55.925	0.011	0.024
82.531	0.073	0.098
137.535	0.069	0.167
173.972	0.193	0.360
197.329	0.201	0.561
206.764	1.191	1.752
216.133	0.026	1.779
246.328	0.048	1.826
258.403	0.039	1.865

MC-1

Iso_Depth (ft)	d18O	dD_Depth (ft)	dD
9.9	-10.980	9.9	-80.950
9.9		9.9	-81.265
20.3	-9.766	20.3	-77.504
30.7	-8.971	30.7	-75.947
30.7	-9.025	30.7	-75.561
30.7		30.7	-74.705
30.7		30.7	-77.218
30.7		30.7	-76.622
30.7		30.7	-76.436
40.0	-10.914	40.0	-82.640
40.0	-10.926	40.0	
50.1	-13.250	50.1	-91.588
50.1	-13.540	50.1	
62.4	-12.583	62.4	-83.844
62.4		62.4	-83.848
75.0	-9.937	75.0	-76.838
90.3	-11.281	90.3	-77.809
100.1	-10.709	100.1	-82.438
125.3	-8.766	125.3	-79.194
150.1	-10.972	150.1	-78.688
175.3	-10.532	175.3	-74.305
200.3	-9.683	200.3	-71.724
200.3		200.3	-71.488
225.3	-10.193	225.3	-78.126
225.3	-10.242	225.3	
250.3	-9.784	250.3	-74.048
275.8	-11.276	275.8	-79.850
300.1	-11.691	300.1	-79.895
349.9	-11.621	349.9	-82.619
394.9	-10.951	394.9	-79.077

Sample Number			Depth Range	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)
GW01-04-52716	GW01-04-	ok	9.0-10.8	9.0	10.8	9.9	3.0
GW01-04-52716	GW01-04-	ok	9.0-10.8	9.0	10.8	9.9	3.0
GW01-04-52717	GW01-04-	ok	19.0-21.5	19.0	21.5	20.3	6.2
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52719	GW01-04-	ok	39.0-40.9	39.0	40.9	40.0	12.2
GW01-04-52719	GW01-04-	ok	39.0-40.9	39.0	40.9	40.0	12.2
GW01-04-52720	GW01-04-	ok	49.0-51.1	49.0	51.1	50.1	15.3
GW01-04-52720	GW01-04-	ok	49.0-51.1	49.0	51.1	50.1	15.3
GW01-04-52731	GW01-04-	ok	61.0-63.7	61.0	63.7	62.4	19.0
GW01-04-52731	GW01-04-	ok	61.0-63.7	61.0	63.7	62.4	19.0
GW01-04-52721	GW01-04-	ok	74.0-76.0	74.0	76.0	75.0	22.9
GW01-04-52732	GW01-04-	ok	89.0-91.5	89.0	91.5	90.3	27.5
GW01-04-52722	GW01-04-	ok	99.0-101.1	99.0	101.1	100.1	30.5
GW01-04-52723	GW01-04-	ok	124.0-126.6	124.0	126.6	125.3	38.2
GW01-04-52724	GW01-04-	ok	149.0-151.2	149.0	151.2	150.1	45.8
GW01-04-52725	GW01-04-	ok	174.0-176.5	174.0	176.5	175.3	53.4
GW01-04-52726	GW01-04-	ok	199.0-201.5	199.0	201.5	200.3	61.0
GW01-04-52726	GW01-04-	ok	199.0-201.5	199.0	201.5	200.3	61.0
GW01-04-52727	GW01-04-	ok	224.0-226.5	224.0	226.5	225.3	68.7
GW01-04-52727	GW01-04-	ok	224.0-226.5	224.0	226.5	225.3	68.7
GW01-04-52728	GW01-04-	ok	249.0-251.5	249.0	251.5	250.3	76.3
GW01-04-52729	GW01-04-	ok	275.0-276.5	275.0	276.5	275.8	84.0
GW01-04-52730	GW01-04-	ok	299.0-301.2	299.0	301.2	300.1	91.5
GW01-04-52733	GW01-04-	ok	349.0-350.8	349.0	350.8	349.9	106.6
GW01-04-52734	GW01-04-	ok	394.0-395.8	394.0	395.8	394.9	120.4

0.487934

0.79658

δ 18O	s.d.	δ D	s.d.
-10.980	0.141	-80.950	0.279
		-81.265	0.187
-9.766	0.176	-77.504	0.117
-8.971	0.056	-75.947	0.312
-9.025	0.097	-75.561	0.410
		-74.705	0.393
		-77.218	0.255
		-76.622	0.251
		-76.436	0.174
-10.914	0.141	-82.640	0.119
-10.926	0.168		
-13.250	0.167	-91.588	0.379
-13.540	0.155		
-12.583	0.130	-83.844	0.192
		-83.848	0.171
-9.937	0.141	-76.838	0.163
-11.281	0.154	-77.809	0.187
-10.709	0.142	-82.438	0.155
-8.766	0.089	-79.194	0.240
-10.972	0.168	-78.688	0.290
-10.532	0.156	-74.305	0.178
-9.683	0.107	-71.724	0.230
		-71.488	0.208
-10.193	0.134	-78.126	0.222
-10.242	0.305		
-9.784	0.108	-74.048	0.313
-11.276	0.143	-79.850	0.187
-11.691	0.084	-79.895	0.196
-11.621	0.144	-82.619	0.197
-10.951	0.135	-79.077	0.309

MC-1 **Paste New Data in Row 59 Column 1**

					date
SAMPLE/ft	DESCRIPTION	H2O content%	Dry wt.	DI Added	MM/DD/YY
2.5-3.5	MC-1	0.987	50.150	75.080	6/5/05
7.5-8.5	MC-1	0.731	50.090	75.020	6/5/05
12.5-13.5	MC-1	0.602	50.060	75.030	6/5/05
22.5-23.5	MC-1	0.391	50.050	75.010	6/5/05
32.5-33.5	MC-1	0.450	50.030	75.040	6/5/05
37.5-38.5	MC-1	1.733	50.360	75.840	6/5/05
42.5-43.5	MC-1	0.358	50.020	75.010	6/5/05
47.5-48.5	MC-1	0.287	49.990	74.980	6/5/05
59.0-60.0	MC-1	1.635	50.130	75.140	6/5/05
62.0-63.0	MC-1	2.615	50.270	75.310	6/5/05
74.0-75.0	MC-1	3.226	50.420	75.390	6/5/05
77.0-78.0	MC-1	1.075	50.230	75.260	6/5/05
83.0-83.5	MC-1	0.452	50.020	75.080	6/5/05
91.0-92.0	MC-1	0.378	50.020	75.010	6/5/05
94.0-95.0	MC-1	0.305	49.930	74.930	6/5/05
116.0-117.0	MC-1	0.410	49.990	75.500	6/5/05
131.0-132.0	MC-1	0.512	50.030	75.010	6/5/05
146.0-147.0	MC-1	0.514	50.000	75.020	6/5/05
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00
0	0	0.000	0.000	0.000	1/0/00

	0	0	0.000	0.000	0.000	1/0/00

After pasting data Ctrl-Shift U runs the Update Macro and prints the desired
H2O conte:

SAMPLE/FT	temp ID	DESCR	depthFt	date MMDDYY	ER Req#
CAMO-05-60648	1	MC-1	2.5-3.5	Jun-05	3369S
CAMO-05-60649	2	MC-1	7.5-8.5	Jun-05	3369S
CAMO-05-60650	3	MC-1	12.5-13.5	Jun-05	3369S
CAMO-05-60651	4	MC-1	22.5-23.5	Jun-05	3369S
CAMO-05-60652	5	MC-1	32.5-33.5	Jun-05	3369S
CAMO-05-60653	6	MC-1	37.5-38.5	Jun-05	3369S
CAMO-05-60654	8	MC-1	42.5-43.5	Jun-05	3369S
CAMO-05-60655	9	MC-1	47.5-48.5	Jun-05	3369S
CAMO-05-60656	10	MC-1	59.0-60.0	Jun-05	3369S
CAMO-05-60657	11	MC-1	62.0-63.0	Jun-05	3369S
CAMO-05-60658	12	MC-1	74.0-75.0	Jun-05	3369S
CAMO-05-60659	13	MC-1	77.0-78.0	Jun-05	3369S
CAMO-05-60660	15	MC-1	83.0-83.5	Jun-05	3369S
CAMO-05-60661	16	MC-1	91.0-92.0	Jun-05	3369S
CAMO-05-60662	17	MC-1	94.0-95.0	Jun-05	3369S
CAMO-05-60663	18	MC-1	116.0-117.0	Jun-05	3369S
CAMO-05-60664	19	MC-1	131.0-132.0	Jun-05	3369S
CAMO-05-60665	20	MC-1	146.0-147.0	Jun-05	3369S

Acetate	Al	Br	Ca	Cl	ClO3	ClO4	CO3	F
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
-	0.1661	0.1920	19.2916	1.3525	<0.01	<0.005	0.0000	0.5781
+	0.1817	0.3185	17.5324	1.0047	<0.01	<0.005	0.0000	0.4515
-	0.0100	0.2211	26.8956	3.6584	<0.01	<0.005	0.0000	1.5656
-	0.2930	0.0853	6.3327	0.8604	<0.01	<0.002	0.0000	2.2745
-	0.2243	0.0872	6.5593	0.9428	<0.01	<0.002	0.0000	2.6274
-	0.3920	0.1182	12.6554	3.5668	<0.01	<0.005	0.0000	0.8605
-	0.2624	0.0852	4.0965	1.2323	<0.01	<0.002	0.0000	2.0185
-	0.1387	0.0620	2.1614	1.0555	<0.01	<0.002	0.0000	1.6397
-	0.4075	0.1004	0.9446	0.8963	<0.01	<0.002	0.0000	8.6071
-	0.8152	0.1077	1.1529	0.7139	<0.01	<0.005	0.0000	10.7758
-	0.3794	0.1132	2.3537	0.6708	<0.01	<0.002	0.0000	7.9070
-	0.1660	0.0781	1.2602	0.5970	<0.01	<0.001	0.0000	5.1944
-	0.3871	0.0556	0.7084	0.6918	<0.01	<0.001	0.0000	2.8573
-	0.3514	0.0859	0.7880	0.6125	<0.01	<0.0005	0.0000	2.0304
-	0.2157	0.0525	0.7788	0.6355	<0.01	<0.0005	0.0000	1.3337
-	0.6528	0.0823	0.6954	0.7501	<0.01	<0.0005	0.0000	1.8397
-	0.4267	0.0621	0.8910	0.8584	<0.01	<0.0005	0.0000	2.4479
-	0.3320	0.0580	0.9261	1.1780	<0.01	<0.0005	0.0000	2.4856
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

d worksheets

nt Measured in accordance with ASTM D2216-90 Weight loss divided by dried sample w

H2O content %	Bulk density gm/cm3	H2O gm/gm	Ag µg/g	Acetate µg/g	Al µg/g	As µg/g	B µg/g	Ba µg/g
0.99	---	0.010	---	---	25.2	---	---	---
0.73	---	0.007	---	---	37.2	---	---	---
0.60	---	0.006	---	---	2.48	---	---	---
0.39	---	0.004	---	---	112	---	---	---
0.45	---	0.004	---	---	74.8	---	---	---
1.73	---	0.017	---	---	34.1	---	---	---
0.36	---	0.004	---	---	110	---	---	---
0.29	---	0.003	---	---	72.5	---	---	---
1.63	---	0.016	---	---	37.4	---	---	---
2.62	---	0.025	---	---	46.7	---	---	---
3.23	---	0.031	---	---	17.6	---	---	---
1.08	---	0.011	---	---	23.1	---	---	---
0.45	---	0.004	---	---	129	---	---	---
0.38	---	0.004	---	---	139	---	---	---
0.31	---	0.003	---	---	106	---	---	---
0.41	---	0.004	---	---	240	---	---	---
0.51	---	0.005	---	---	125	---	---	---
0.51	---	0.005	---	---	97.0	---	---	---

Fe	Formate	HCO3	K	Mg	Mn	Na	NO2	NO3
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.0833	-	94.9000	8.3354	2.6065	0.1280	10.4102	1.2500	0.9097
0.0994	+	73.7000	6.2936	2.5773	0.1125	6.0613	0.1900	0.1405
<0.01	-	114.0000	9.5847	5.4236	0.0506	6.6429	<0.01	<0.01
0.1481	-	39.3000	4.7038	0.9724	0.0032	7.1713	<0.01	<0.01
0.1051	-	6.7400	5.4323	1.0513	0.0124	6.6094	<0.01	<0.01
0.1827	-	53.4000	3.8656	2.0634	0.0123	10.5432	<0.01	<0.01
0.1305	-	21.5000	4.7595	0.7525	0.0082	6.0791	<0.01	<0.01
0.0840	-	17.4000	2.9939	0.4384	0.0076	4.7639	<0.01	<0.01
0.2031	-	16.1000	2.2740	0.1923	<0.002	16.7066	0.0300	<0.01
0.2854	-	14.3000	1.2641	0.2357	0.0048	17.8908	<0.01	<0.01
0.1696	-	15.5000	0.9004	0.4038	0.0030	13.2823	<0.01	0.1123
0.1025	-	12.5000	0.7879	0.2266	<0.002	9.2875	<0.01	<0.01
0.1295	-	14.0000	2.8736	0.1929	0.0037	7.1265	<0.01	<0.01
0.1958	-	7.5000	1.9471	0.1800	0.0051	5.3651	0.0400	0.3796
0.3038	-	12.5000	1.5495	0.1613	0.0116	4.8216	<0.01	0.0664
0.3851	-	13.7000	2.2755	0.2486	0.0067	5.8186	<0.01	0.6244
0.1560	-	15.5000	2.0397	0.2473	0.0034	7.4713	<0.01	0.3805
0.1088	-	17.7000	1.8517	0.2371	0.0023	8.7500	<0.01	0.4633
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

weight

Be	Br	Ca	Cd	Cl	ClO3	ClO4	Co	CO3
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
---	29.1	2927	---	205	<0.1	<0.8	---	---
---	65.3	3592	---	206	<0.1	<1.1	---	---
---	55.0	6692	---	910	<0.1	<1.2	---	---
---	32.7	2427	---	330	<0.1	<0.8	---	---
---	29.1	2187	---	314	<0.1	<0.7	---	---
---	10.3	1100	---	310	<0.1	<0.5	---	---
---	35.6	1714	---	516	<0.1	<0.9	---	---
---	32.4	1130	---	552	<0.1	<1.1	---	---
---	9.20	86.6	---	82.2	<0.1	<0.2	---	---
---	6.17	66.0	---	40.9	<0.1	<0.3	---	---
---	5.25	109	---	31.1	<0.1	<0.1	---	---
---	10.9	176	---	83.2	<0.1	<0.2	---	---
---	18.5	235	---	230	<0.1	<0.4	---	---
---	34.1	313	---	243	<0.1	<0.2	---	---
---	25.8	383	---	313	<0.1	<0.3	---	---
---	30.3	256	---	276	<0.1	<0.2	---	---
---	18.2	261	---	252	<0.1	<0.2	---	---
---	16.9	270	---	344	<0.1	<0.2	---	---

Oxalate	PO4	Si	SO4
ppm	ppm	ppm	ppm
<0.01	0.9307	28.3740	2.5555
<0.01	0.4006	26.7774	2.7296
0.8900	0.5930	24.4077	5.4219
<0.01	0.4121	22.9205	1.6519
0.3000	0.2768	23.2527	2.3441
<0.01	2.4235	25.6132	7.3563
<0.01	0.2577	18.5724	4.3006
0.2200	0.1730	14.7282	1.7692
<0.01	0.7992	29.4334	1.4849
<0.01	1.1249	31.5136	1.0557
<0.01	0.8149	34.6580	0.7154
0.0300	0.5813	30.2445	0.5019
<0.01	0.3024	21.5922	0.8330
<0.01	0.0213	17.9625	0.9208
<0.01	<0.01	13.4466	0.8276
<0.01	0.0478	21.3798	0.9345
<0.01	0.0788	25.1967	0.9507
0.0400	0.0858	25.4611	1.3696
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000

0.0000	0.0000	0.0000	0.0000

Cr	Cs	Cu	F	Fe	Formate	HCO3	Hg	K
µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
---	---	---	87.7	12.6	---	---	---	1265
---	---	---	92.5	20.4	---	---	---	1289
---	---	---	390	<2.5	---	---	---	2385
---	---	---	872	56.7	---	---	---	1803
---	---	---	876	35.0	---	---	---	1811
---	---	---	74.8	15.9	---	---	---	336
---	---	---	845	54.6	---	---	---	1992
---	---	---	857	43.9	---	---	---	1565
---	---	---	789	18.6	---	---	---	209
---	---	---	617	16.3	---	---	---	72.4
---	---	---	366	7.86	---	---	---	41.7
---	---	---	724	14.3	---	---	---	110
---	---	---	949	43.0	---	---	---	954
---	---	---	806	77.7	---	---	---	773
---	---	---	656	149	---	---	---	762
---	---	---	677	142	---	---	---	838
---	---	---	717	45.7	---	---	---	598
---	---	---	726	31.8	---	---	---	541

Li µg/g	Mg µg/g	Mn µg/g	Mo µg/g	Na µg/g	Ni µg/g	NO2 µg/g	NO3 µg/g	d15N from NO3
---	396	19.4	---	1580	---	190	138	---
---	528	23.1	---	1242	---	38.9	28.8	---
---	1349	12.6	---	1653	---	<3	<3	---
---	373	1.21	---	2748	---	<4	<4	---
---	351	4.14	---	2204	---	<4	<4	---
---	179	1.07	---	916	---	<1	<1	---
---	315	3.44	---	2544	---	<5	<5	---
---	229	3.96	---	2490	---	<6	<6	---
---	17.6	<0.2	---	1532	---	2.75	<1	---
---	13.5	0.28	---	1025	---	<1	<1	---
---	18.7	0.14	---	616	---	<1	5.21	---
---	31.6	<0.3	---	1294	---	<2	<2	---
---	64.1	1.23	---	2367	---	<4	<4	---
---	71.4	2.03	---	2129	---	15.9	151	---
---	79.3	5.71	---	2371	---	<5	32.7	---
---	91.5	2.48	---	2142	---	<4	230	---
---	72.5	0.98	---	2189	---	<3	111	---
---	69.3	0.67	---	2555	---	<3	135	---

OH µg/g	Oxalate µg/g	Pb µg/g	pH units	PO4 µg/g	Rb µg/g	Sb µg/g	Se µg/g	Si µg/g
---	<2	---	---	141	---	---	---	4306
---	<2	---	---	82.1	---	---	---	5486
---	221	---	---	148	---	---	---	6073
---	<4	---	---	158	---	---	---	8783
---	100	---	---	92.3	---	---	---	7752
---	<1	---	---	211	---	---	---	2226
---	<5	---	---	108	---	---	---	7771
---	115	---	---	90.4	---	---	---	7698
---	<1	---	---	73.3	---	---	---	2699
---	<1	---	---	64.4	---	---	---	1805
---	<1	---	---	37.8	---	---	---	1606
---	4.18	---	---	81.0	---	---	---	4214
---	<4	---	---	100	---	---	---	7171
---	<4	---	---	8.43	---	---	---	7127
---	<5	---	---	<5	---	---	---	6613
---	<4	---	---	17.6	---	---	---	7870
---	<3	---	---	23.1	---	---	---	7383
---	11.7	---	---	25.0	---	---	---	7436

SO3 µg/g	SO4 µg/g	Sn µg/g	Sr µg/g	Th µg/g	Ti µg/g	Tl µg/g	U µg/g	V µg/g
---	388	---	---	---	---	---	---	---
---	559	---	---	---	---	---	---	---
---	1349	---	---	---	---	---	---	---
---	633	---	---	---	---	---	---	---
---	782	---	---	---	---	---	---	---
---	639	---	---	---	---	---	---	---
---	1800	---	---	---	---	---	---	---
---	925	---	---	---	---	---	---	---
---	136	---	---	---	---	---	---	---
---	60.5	---	---	---	---	---	---	---
---	33.2	---	---	---	---	---	---	---
---	69.9	---	---	---	---	---	---	---
---	277	---	---	---	---	---	---	---
---	365	---	---	---	---	---	---	---
---	407	---	---	---	---	---	---	---
---	344	---	---	---	---	---	---	---
---	279	---	---	---	---	---	---	---
---	400	---	---	---	---	---	---	---

Zn µg/g	Wet wt. gms	Dry wt. gms	flask gms	flask+samp gms	After drying gms	DI added gms	Ag ppm
---	---	50.15	---	---	---	75.08	---
---	---	50.09	---	---	---	75.02	---
---	---	50.06	---	---	---	75.03	---
---	---	50.05	---	---	---	75.01	---
---	---	50.03	---	---	---	75.04	---
---	---	50.36	---	---	---	75.84	---
---	---	50.02	---	---	---	75.01	---
---	---	49.99	---	---	---	74.98	---
---	---	50.13	---	---	---	75.14	---
---	---	50.27	---	---	---	75.31	---
---	---	50.42	---	---	---	75.39	---
---	---	50.23	---	---	---	75.26	---
---	---	50.02	---	---	---	75.08	---
---	---	50.02	---	---	---	75.01	---
---	---	49.93	---	---	---	74.93	---
---	---	49.99	---	---	---	75.50	---
---	---	50.03	---	---	---	75.01	---
---	---	50.00	---	---	---	75.02	---

Acetate ppm	Al ppm	As ppm	B ppm	Ba ppm	Be ppm	Br ppm	Ca ppm	Cd ppm
-	0.17	---	---	---	---	0.19	19.3	---
+	0.18	---	---	---	---	0.32	17.5	---
-	0.010	---	---	---	---	0.22	26.9	---
-	0.29	---	---	---	---	0.09	6.33	---
-	0.22	---	---	---	---	0.09	6.56	---
-	0.39	---	---	---	---	0.12	12.7	---
-	0.26	---	---	---	---	0.09	4.10	---
-	0.14	---	---	---	---	0.06	2.16	---
-	0.41	---	---	---	---	0.10	0.94	---
-	0.82	---	---	---	---	0.11	1.15	---
-	0.38	---	---	---	---	0.11	2.35	---
-	0.17	---	---	---	---	0.08	1.26	---
-	0.39	---	---	---	---	0.06	0.71	---
-	0.35	---	---	---	---	0.09	0.79	---
-	0.22	---	---	---	---	0.05	0.78	---
-	0.65	---	---	---	---	0.08	0.70	---
-	0.43	---	---	---	---	0.06	0.89	---
-	0.33	---	---	---	---	0.06	0.93	---

Cl	ClO3	ClO4	Co	CO3	Cr	Cs	Cu	F
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1.35	<0.01	<0.005	---	0	---	---	---	0.58
1.00	<0.01	<0.005	---	0	---	---	---	0.45
3.66	<0.01	<0.005	---	0	---	---	---	1.57
0.86	<0.01	<0.002	---	0	---	---	---	2.27
0.94	<0.01	<0.002	---	0	---	---	---	2.63
3.57	<0.01	<0.005	---	0	---	---	---	0.86
1.23	<0.01	<0.002	---	0	---	---	---	2.02
1.06	<0.01	<0.002	---	0	---	---	---	1.64
0.90	<0.01	<0.002	---	0	---	---	---	8.61
0.71	<0.01	<0.005	---	0	---	---	---	10.8
0.67	<0.01	<0.002	---	0	---	---	---	7.91
0.60	<0.01	<0.001	---	0	---	---	---	5.19
0.69	<0.01	<0.001	---	0	---	---	---	2.86
0.61	<0.01	<0.0005	---	0	---	---	---	2.03
0.64	<0.01	<0.0005	---	0	---	---	---	1.33
0.75	<0.01	<0.0005	---	0	---	---	---	1.84
0.86	<0.01	<0.0005	---	0	---	---	---	2.45
1.18	<0.01	<0.0005	---	0	---	---	---	2.49

Fe	Formate	HCO3	Hg	K	Li	Mg	Mn	Mo
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.08	-	94.9	---	8.34	---	2.61	0.13	---
0.10	+	73.7	---	6.29	---	2.58	0.11	---
<0.01	-	114	---	9.58	---	5.42	0.051	---
0.15	-	39.3	---	4.70	---	0.97	0.003	---
0.11	-	6.74	---	5.43	---	1.05	0.012	---
0.18	-	53.4	---	3.87	---	2.06	0.012	---
0.13	-	21.5	---	4.76	---	0.75	0.008	---
0.08	-	17.4	---	2.99	---	0.44	0.008	---
0.20	-	16.1	---	2.27	---	0.19	<0.002	---
0.29	-	14.3	---	1.26	---	0.24	0.005	---
0.17	-	15.5	---	0.90	---	0.40	0.003	---
0.10	-	12.5	---	0.79	---	0.23	<0.002	---
0.13	-	14.0	---	2.87	---	0.19	0.004	---
0.20	-	7.5	---	1.95	---	0.18	0.005	---
0.30	-	12.5	---	1.55	---	0.16	0.012	---
0.39	-	13.7	---	2.28	---	0.25	0.007	---
0.16	-	15.5	---	2.04	---	0.25	0.003	---
0.11	-	17.7	---	1.85	---	0.24	0.002	---

Na ppm	Ni ppm	NO2 ppm	NO3 ppm	d15N from NO3	OH ppm	Oxalate ppm	Pb ppm	pH units
10.4	---	1.25	0.91		---	<0.01	---	6.96
6.06	---	0.19	0.14		---	<0.01	---	6.84
6.64	---	<0.01	<0.01		---	0.89	---	7.63
7.17	---	<0.01	<0.01		---	<0.01	---	7.84
6.61	---	<0.01	<0.01		---	0.30	---	7.73
10.5	---	<0.01	<0.01		---	<0.01	---	7.15
6.08	---	<0.01	<0.01		---	<0.01	---	7.56
4.76	---	<0.01	<0.01		---	0.22	---	7.45
16.7	---	0.03	<0.01		---	<0.01	---	7.84
17.9	---	<0.01	<0.01		---	<0.01	---	7.67
13.3	---	<0.01	0.11		---	<0.01	---	7.55
9.29	---	<0.01	<0.01		---	0.03	---	7.59
7.13	---	<0.01	<0.01		---	<0.01	---	8.03
5.37	---	0.04	0.38		---	<0.01	---	7.68
4.82	---	<0.01	0.07		---	<0.01	---	7.39
5.82	---	<0.01	0.62		---	<0.01	---	7.95
7.47	---	<0.01	0.38		---	<0.01	---	8.35
8.75	---	<0.01	0.46		---	0.04	---	8.43

PO4 ppm	Rb ppm	Sb ppm	Se ppm	Si ppm	SO3 ppm	SO4 ppm	Sn ppm	Sr ppm
0.93	---	---	---	28.4	---	2.56	---	---
0.40	---	---	---	26.8	---	2.73	---	---
0.59	---	---	---	24.4	---	5.42	---	---
0.41	---	---	---	22.9	---	1.65	---	---
0.28	---	---	---	23.3	---	2.34	---	---
2.42	---	---	---	25.6	---	7.36	---	---
0.26	---	---	---	18.6	---	4.30	---	---
0.17	---	---	---	14.7	---	1.77	---	---
0.80	---	---	---	29.4	---	1.48	---	---
1.12	---	---	---	31.5	---	1.06	---	---
0.81	---	---	---	34.7	---	0.72	---	---
0.58	---	---	---	30.2	---	0.50	---	---
0.30	---	---	---	21.6	---	0.83	---	---
0.02	---	---	---	18.0	---	0.92	---	---
<0.01	---	---	---	13.4	---	0.83	---	---
0.05	---	---	---	21.4	---	0.93	---	---
0.08	---	---	---	25.2	---	0.95	---	---
0.09	---	---	---	25.5	---	1.37	---	---

Th	Ti	Tl	U	V	Zn	NH4		
ppm	ppm	ppm	ppm	ppm	ppm	ppm	comments	d
---	---	---	---	---	---	---	Unknown peak @ 9.	
---	---	---	---	---	---	---		
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---	---	---	---	---	---	---	Unknown peak @ 7.	
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electronic date sent	mail date sent	Ba corr for Na ppm
.29		
.05,6.95		
.05		
.05		
.11,6.95		
.05		
.05		
.05		
.05,7.30,9.25		
.05		
.31		
.05,9.25		
.05,7.30		
.31		
.31		
.31		

"official" bulk densities to use for anion calculations
Most values from Rogers and Gallaher, 1985

Qal	1.42	
Qbo	1.18	
Qbog	1.25	
Qbt1g	1.13	
Qbt1v	1.26	
Qbt2	1.46	
Qbt3	1.25	Used 1.25 nonwelded from R&G, 1.65 for TA-49 welded
Qbt4	1.73	
Qbtsank	1.25	
Qct	1.5	
soil	1.4	
Tb 4	2.96	
Tpf	1.55	

Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Interval (ft)	Interval (m)
0			3.8	
7.6	8	7.8	4.2	1.3
8	8.3	8.15	2.25	0.7
12.2	12.5	12.35	5.85	1.8
19.7	20	19.85	5.55	1.7
23.3	23.6	23.45	4.15	1.3
28	28.3	28.15	3.35	1.0
30	30.3	30.15	6.6	2.0
41.2	41.5	41.35	8.6	2.6
47.2	47.5	47.35	5.2	1.6
51.6	51.9	51.75	5	1.5
57.2	57.5	57.35	4.55	1.4
60.7	61	60.85	3	0.9
63.2	63.5	63.35	3.25	1.0
67.2	67.5	67.35	4	1.2
71.2	71.5	71.35	4.4	1.3
76	76.5	76.25	5.1	1.6
81.2	81.5	81.35	4.9	1.5
86	86.3	86.15	4.1	1.2
89.4	89.7	89.55	3.5	1.1
93	93.3	93.15	6.3	1.9
102	102.3	102.15	6.5	2.0
106	106.3	106.15	6	1.8
114	114.3	114.15	6.75	2.1
119.5	119.8	119.65	4.25	1.3
122.5	122.8	122.65	3.25	1.0
126	126.3	126.15	3.75	1.1
130	130.3	130.15	3.75	1.1
133.5	133.8	133.65	3	0.9
136	136.3	136.15	3.25	1.0
140	140.3	140.15	4	1.2
144	144.3	144.15	3.5	1.1
147	147.3	147.15	3.25	1.0
150.5	150.8	150.65	3.25	1.0
153.5	153.8	153.65	4.15	1.3
158.8	159.1	158.95	5	1.5
163.5	163.8	163.65	4.6	1.4
168	168.3	168.15	4.75	1.4
173	173.3	173.15	30.75	9.4
229.5	229.8	229.65	28.4	8.7
			229.8	

September 27, 2002

REPORT OF PRE-CONCEPTUAL GEOTECHNICAL INVESTIGATIONS, ADVANCED HYDROTEST FACILITY PROJECT, TA-53
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO
PROJECT NO. C59010120

Prepared for:
Los Alamos National Laboratory
Los Alamos, New Mexico

Submitted to:
C. Robert Hutchins, Project Manager
Holmes & Narver/Raytheon
800 Trinity Drive, Suite K
Los Alamos, New Mexico 87544

Prepared By:
Kleinfelder, Inc.
4905 Hawkins NE
Albuquerque, New Mexico 87109

Alan Kuhn, Ph.D., P.E., R.P.G.
Responsible Engineer

Reviewed By:
John North, P.E.
New Mexico Region Manager

KLEINFELDER
An employee owned company

September 27, 2002
Project No. C59010120

Mr. C. Robert Hutchins, Project Manager
Holmes & Narver/Raytheon
800 Trinity Drive, Suite K
Los Alamos, New Mexico 87544

SUBJECT: **REPORT OF PRE-CONCEPTUAL GEOTECHNICAL INVESTIGATIONS**
ADVANCED HYDROTEST FACILITY PROJECT, TA-53
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO
PROJECT NO. C59010120

Dear Mr. Hutchins:

Submitted herewith is our report of the pre-conceptual geotechnical investigations on the referenced project for your review and comment. The report includes results of test drilling and laboratory tests and our engineering evaluations and preliminary recommendations regarding site geology, subterranean facility depth and layout, tunnel excavation and support, open excavations, and subsequent geotechnical investigations.

We look forward to your comments. Please contact us with any questions you might have.

Respectfully submitted,

KLEINFELDER, INC.

ALAN K. KUHN
NEW MEXICO
6798
REGISTERED PROFESSIONAL ENGINEER

Alan K. Kuhn, Ph.D., P.E., R.P.G.
Senior Consultant

Reviewed By:

John North, P.E.
Regional Manager

AKK:as

Cc: Addressee (6)

SUMMARY OF CONCLUSIONS

The pre-conceptual geotechnical investigations of the AHF Site at TA-53 indicate that the geologic units in which tunnels and shafts will be constructed in the canyons will behave like soil rather than rock. The low strength parameters of the Otowi will require a soft-ground approach to excavation and structural support. If unshielded tunnel construction methods are used (e.g.; roadheader or NATM) the excavation cycle will be short, probably less than 10 feet. If a TBM is used, support immediately behind the shield will be needed. In shafts, shoring or other bracing will be required in each cycle as the shaft is sunk.

In open excavations relatively low in-place densities and unconfined strengths might limit cut slope gradients and increase potential for settlement and slumping of ground adjacent to cuts. These same properties could make retained excavation more feasible because support systems like soldier piles or soil nails should be comparatively quick to install.

If the beam line in the tunnel is at elevation 6600, a 15-foot diameter tunnel will break out of the Otowi into the Cerro Toledo in at least one location and come very close to breaking into alluvium in at least one other location in Sandia Canyon. In Mortandad Canyon the base of the Cerro Toledo will be less than one tunnel diameter above the crown of the tunnel in at least one location. It is reasonable to expect that these conditions would occur over a substantial portion of the tunnel alignments under the canyons. Although the laboratory results from these investigations do not show a sharp contrast in geomechanical properties between the Otowi and the Cerro Toledo, it is possible that the stand-up time and stress-strain behaviors of the two units would be different enough to require different primary support and permanent lining designs. To avoid a mixed-face tunneling scenario and lessen the risk of instability in the tunnel above the crown, the tunnel level can be lowered to a depth that would provide at least one diameter (preferably two diameters) below the Otowi/Cerro Toledo or Otowi/ alluvium contact. This can be achieved by either actually lowering the elevation of the tunnel level or by shifting the alignment to avoid the deepest horizons of those contacts, resulting in a new layout with respect to the site topography and geology. An alternative approach would be to assume the certainty of a mixed-face tunnel scenario and to design the tunnels and plan construction for those conditions.

The results of this investigation have identified additional questions and have shown how variable the geotechnical elements of the site are likely to be. Geotechnical uncertainties of primary importance are:

- Parameters related to facility layout and depth – the shape and position of the top of the Otowi and the thickness and continuity of the overlying geologic units.
- Primary geomechanical parameters – strength parameters (friction, cohesion, unconfined strength, triaxial maximum deviator stress).
- Major geologic structures – the existence and location of any faults or erosional breaks that could impact the position and continuity of geologic units along the tunnel alignments.

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These data needs can be addressed through a set of geotechnical investigations, starting with the "CD0" phase of the Site Characterization Master Plan (SCMP) described in detail in the TA-53 Integrated Design Studies Report, September, 2001. This phase would identify any site features that could force major realignment or repositioning of AHF facilities. The second SCMP phase is the conceptual design, or CD1, phase. It should be focused on the data requirements of conceptual design and on data needed to determine sizes and shapes of tunnels and shafts, methods of excavation and ground support, and identify potential out-of-limits conditions including unstable slopes and excessive contaminant levels. Specifically, these investigations should include:

- Continuous tube sampling and visual logging
- Video logging
- Downhole seismic logging
- Seismic reflection and refraction surveys
- Laboratory testing

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APPENDICES

KLEINFELDER 4905 Hawkins N.E., Albuquerque, NM 87109 (505) 344-7373 (505)-344-1711 fax

1 INTRODUCTION

Kleinfelder, Inc. has prepared this Report of Pre-Conceptual Geotechnical Investigations in fulfillment of the deliverable-product requirements under Task 039 of Holmes and Narver/Raytheon's (HNR's) contract with Los Alamos National Laboratory. It addresses the scope and results of geotechnical investigations conducted to support pre-conceptual design studies of the Advanced Hydrotest Facility (AHF) at TA-53.

1.1 GENERAL DESCRIPTION OF PROJECT

The Advanced Hydrotest Facility (AHF) of the Los Alamos Neutron Science Center (LANSCE) at TA-53 is intended to be a subterranean system of shafts, tunnels, and experiment halls as well as surface support facilities for research associated with the Department of Energy's Stockpile Stewardship program. AHF will have as many as 28 shafts and more than five miles of tunnels under at least 50 feet of cover that is intended to act as a radiation shield. The facility will include two underground test chambers, one tunneled in rock and the other to be constructed at a depth of 180 feet in an open excavation about 600 feet in diameter. The subterranean facilities will include:

- An injector shaft
- A booster ring
- A main ring synchrontron
- Beam ejectors/ splitters
- Beam transport tunnels
- A non-SNM firing site (Firing Site #1, or FS1)
- An SNM firing site (Firing Site #2, or FS2)
- Services shafts with alcoves
- Emergency egress shafts
- One or more access drifts (inclined tunnels)

AHF research will involve a high-energy proton beam and Special Nuclear Materials (SNM), requiring protection from radiation as well as a high level of security. To provide both radiation protection and security, the subterranean facilities must be at least 50 feet below lowest ground surface, or about elevation 6600 feet, and must be in essentially that same plane throughout the entire beam path. No other underground facilities have been constructed at this depth or elevation in the Los Alamos area, and no test borings have been drilled for geotechnical purposes to this elevation in the footprint of the proposed AHF. Consequently, the geologic conditions around the AHF are based on broad-scale studies including surface geologic mapping as well as shallow test borings around the LANSCE complex (TA-53) and test borings in the same vicinity drilled and sampled for environmental and ground water studies.

1.2 Purpose and Content of Report

This report has been prepared as a record of the geotechnical investigations conducted by Kleinfelder, Inc under subcontract to Holmes and Narver/ Raytheon (HNR) during July-September, 2002. The investigations were performed to:

- Develop an initial understanding of the geotechnical conditions of the site in general and of the canyons in particular, and
- Support a preliminary evaluation of geotechnical design parameters that could impact tunnel layout and depth.

This report presents a description of the investigations, findings, and preliminary conclusions and recommendations concerning ground conditions affecting tunnels, shafts, and open excavations. Implications of the findings on facilities layout and depth are discussed, as well. Data needs identified from these investigations and the types of future geotechnical investigations required to address those needs are described.

In section 2, the physical setting of the AHF site at TA-53 is described. The following section, 3.0, describes the scope of investigations andanalyses. Section 4.0 presents the conclusions and recommendations resulting from the investigations and analyses.

2 SITE DESCRIPTION

These facilities are located across a geographic footprint that is approximately 3700 feet from north to south and nearly 3100 feet east to west, hinging on the linear accelerator of the Los Alamos Neutron Science Center (LANSCE) at TA-53. Within this area the terrain includes two mesas and two canyons, aligned approximately east-west and roughly perpendicular to the axis of the beam transport tunnels system, which constitutes most of the length and footprint of the subterranean facilities. This combination of terrain and facility alignment results in tunnels crossing under both Sandia and Mortandad canyons, with FS2 located in Mortandad Canyon at the south end of the tunnels.

The general geologic setting of the AHF area includes, in descending order:

- Uplands or mesas formed by the Tshirege Member of the Bandelier Tuff, which is several hundred feet thick and will be penetrated by shafts from the TA-53 area. The Tshirege is divisible into several units:

    Unit 4 – absent in the AHF area

    Unit 3 - non-welded to partially weld tuff

    Unit 2 - moderately to strongly welded tuff

    Unit 1v – devitrified, non-welded to slightly welded tuff

    Unit 1g – glassy, non-welded to slightly welded tuff with pumice fragments

- Cerro Toledo interval, a volcano-clastic sedimentary unit between tuffs of the two major eruptions. Bounded by erosional surfaces on bottom and top, it is irregular in thickness and

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lateral extent, and is generally not lithified. Where the Cerro Toledo interval is missing, it may be replaced by Tsankawi Pumice, which otherwise forms a layer up to 1m thick overlying the Cerro Toledo.

- Otowi Member of the Bandelier Tuff, underlying the Cerro Toledo as well as both mesas and canyons. The tunnel horizon will be in the upper portion of the Otowi, which is a non-welded tuff.

Alluvium, soil deposited by streams, forms the bottoms of both canyons. The alluvium is derived primarily from erosion of the Tshirege and consists of mostly silt- and sand-size volcanic ash fragments. In the canyons the alluvium overlies the Unit 1g tuff, the Cerro Toledo, or the Otowi tuff depending on location.

The shallowest cover over the tunnels will be in Sandia Canyon, where the surface elevations are lowest. The bedrock/alluvium contact depth has not been known prior to these investigations, and the physical properties of the alluvium had not been characterized in any previous studies. Consequently, there were insufficient data for determining the depth and physical properties of alluvium in Sandia and Mortandad canyons or the thickness, lateral continuity, and physical properties of the Cerro Toledo interval and the Tsankawi Pumice. It is very important to determine where alluvium, the Cerro Toledo interval, and the tuff units are in relation to the planned AHF subterranean facilities and what properties must be considered in locating and designing the facilities. The scope of these investigations was based on developing this information.

3 SCOPE OF INVESTIGATIONS AND ANALYSES

3.1 DESCRIPTION OF INVESTIGATIONS

The pre-conceptual geotechnical investigations were planned and conducted to:

- Explore the shallow subsurface of Sandia and Mortandad canyons using test borings to establish some bounding limits of the positions, thicknesses and properties of the geologic materials (lower Tshirege Member, alluvium, Tsankawi Pumice, Cerro Toledo interval, and upper Otowi Member) that are likely to surround and overlie the AHF subterranean facilities.
- Determine preliminary ranges of physical properties of geologic materials by performing laboratory tests on selected samples obtained from the test borings.
- Evaluate the geologic conditions that might affect tunnel and shaft layout, depth, design, and construction.
- Prepare recommendations that will be used to support decisions concerning subterranean facility locations, depths, and potential construction methods, and to scope subsequent geotechnical investigations of the Site Characterization Master Plan.

In this pre-conceptual stage of the AHF Project, site characterization efforts have been directed toward determining those geologic conditions that define bounding limits for the physical placement and construction of the subterranean facilities. Accordingly, these investigations were limited to delineating major geologic units and their boundaries and general properties (e.g.; what geologic units are present, how thick are they, will they be soft or hard, weak or strong). The investigations consisted of eight test borings drilled through soil and rock to about elevation 6580 or about 15-20 feet below tunnel invert level. Each boring was visually logged and sampled as appropriate for the materials encountered. Limited laboratory testing was performed on selected samples to support soil and rock classification and estimates of unit weight, strength parameters, permeability, and alkali-silica reactivity. Samples splits were made available to LANL ER and ESH groups for chemical testing for environmental contaminants.

3.1.1 Test Borings

Eight test borings were drilled to depths between 84 and 179 feet, sufficient to reach about 15 feet below expected invert elevation (6660 feet), or about elevation 6580 feet. Five of these borings were drilled in Sandia Canyon directly south of TA-53, as shown on Figure 1. Borings in Sandia Canyon were drilled 84 to 150 feet deep and three borings were drilled in Mortandad Canyon to depths of 143 to 179.2 feet. The locations of the eight borings were selected to cover the footprint of the AHF tunnels and other subterranean structures as much as possible and to supplement information previously developed by the LANL Environmental Restoration program.

The test drilling activities were performed in accordance with the requirements of the ESH ID, Excavation Permit, and Activity Hazards Analysis. Each test-boring site was accessed along existing roads and trails, with some overland travel required for short distances at several locations. No earthwork, bridge-building or other special measures were required to get drilling equipment to and from the designated drill sites, and no sites were within stream channels. Consequently, no restoration of access routes or stream channels was needed. Drill site disturbances involved the area immediately around the drillhole where the drill rig and support truck and trailer were parked as well as the space around the collar of the drillhole where cuttings were retained during drilling. No mud pits were used. The typical area of activity around each borehole was about 3600-4000 square feet, at most. Of this area about 100-150 square feet was temporarily covered with cuttings. When each test boring was completed, all cuttings were placed back in the drillhole and the cuttings site was raked. All trash and equipment was removed when the crew left the site. The total area of disturbance for all eight test borings was about 2/3 acre.

The test borings were drilled with a Strata-Star 10 drill rig using an 8.0 inch O.D./4.0 inch I.D. hollow stem auger in accordance with ASTM Method D6151-97. Drill cuttings were retained within 10-20 feet of the borehole during drilling and placed in the borehole as backfill at the completion of drilling of each hole. Samples were obtained by continuous tube sampler advanced inside the auger, by Standard Penetration Test (SPT) drive sampler (ASTM D1586-99), by California drive sampler (ASTM D3550-01) and by grab sampling of auger cuttings. SPT sampling or California ring barrel sampling at five-foot intervals was the usual testing/sampling method applied in alluvium intervals of all test borings and, at the discretion of the field geologist, in some sections of the Cerro Toledo and tuff units encountered in the borings. Grab samples were taken to provide large volumes of material for testing the compaction characteristics of soil and tuff.

Sampling in the Otowi Member usually employed the continuous tube method. Continuous tube samples provide a more complete record of the materials penetrated, making it possible to develop more detailed descriptions of the subsurface conditions. Continuous tube samples were considered to be undisturbed and were sealed and handled in accordance with ASTM D4220-95. When the tubes are removed from the borehole, they were capped and sealed with tape on both ends, labeled, and transported for safekeeping and later testing. Although this ASTM procedure is intended for use with undisturbed soil samples, it was used for samples of tuff, as well, because of the soft soil-like consistency of the tuffs.

Some rock coring was attempted using a NQ wireline core barrel with a diamond or carbide bit per ASTM D2113-99. Due to the softness of the tuffs, rock coring using the standard rock core barrel with air as the drilling fluid was not successful and was abandoned in favor of continuous tube sampling with the hollow stem auger.

A Kleinfelder geologist visually logged all borings. On a standard log form, the geologist recorded:

- Number and location of boring
- Date of start and completion
- Names of driller and geologist
- Boring collar elevation and total depth
- Sampling methods and depth/interval of each sample
- Sample recovery – percentage recovered
- Classification of material – Unified Soil Classification System for soils, petrologic description for rock
- Visual description including color, moisture content, stiffness/density/hardness, grain sizes, structural features (roots, fractures, bedding, etc.), weathering, and visible minerals
- Penetration resistance (SPT blow counts) or advance rate
- Lithologic boundaries or contacts
- Depth of groundwater
- Graphic log illustrating different materials encountered

Additional notes will be added to logs when needed for explanation or clarification of log entries.

Daily field reports were also prepared on which the geologist recorded work started and completed, problems encountered and actions taken, and hours worked.

Upon completion of each test boring, the samples were removed from the site and transported by truck to the Kleinfelder Albuquerque laboratory. All tube samples were maintained in an upright position throughout handling, transportation and storage to retain the undisturbed characteristics of the samples as much as possible. The location and disposition of samples were recorded on a sample inventory/ custody log. LANL's ESH-10 group obtained splits of 32 samples for their use in testing for geochemical characterization and environmental contaminants.

3.1.2 Laboratory Testing

A limited program of laboratory testing was performed on selected samples obtained from the test-boring program. The specific tests included:

- Grain size analysis
- Atterberg limits
- Moisture-density
- Unit weight
- Direct shear
- Unconfined Compression
- Triaxial Compression
- Hydraulic Conductivity
- Alkali-soil reactivity (ASR)

In the investigation program plan, combined hardness and tensile strength tests were to be performed on tuff if suitable samples were obtained. Due to the softness of the tuff, these tests could not be performed.

All geomechanical and ASR testing was performed in Kleinfelder laboratories in Albuquerque, New Mexico and Pleasanton, California.

3.2 GEOTECHNICAL ANALYSES AND FINDINGS

The investigations described above were intended to provide information about the geologic setting and geomechanical properties of geologic units in the canyons of the AHF site at TA-53. As such, they provide the basis for some geotechnical analyses and findings that are general and preliminary. Additional, more detailed investigations will build on this basis to develop the geotechnical parameters needed for conceptual and higher levels of design. The following describes the analyses performed and the resulting preliminary findings.

3.2.1 Results of Test Boring Program

The results of the test-boring program are summarized in Table 1 and illustrated in Figures 2, 3 and 4. The test boring logs, from which Table 1 and Figures 2, 3 and 4 are derived, are included in Appendix B. Borehole BH-7 was drilled at LANSCE in July, 2002 as part of the LANL Environmental Restoration Program at the south edge of the lagoons at TA-53, about 700 feet north-northeast of test boring SC1 of this program; the graphic log of the lower part of BH-7 is included on Figure 2 as supplemental information.

Sandia Canyon (SC) Borings

Borings SC1 through SC5 were drilled in Sandia Canyon at the locations shown on Figure 1 in Appendix A. All SC borings encountered alluvium and tuff of the Otowi Member. The alluvium is primarily silty sand with varying amounts of silt and clay. Colluvium consisting of rock fall and talus from adjacent slopes is randomly interbedded within the alluvium. Thickness of alluvium increases from about 23 feet at SC2, near the west end of the tunnel footprint, to 50 feet at SC4 and SC5.

In the west half of the footprint area, Unit 1g of the Tshirege Member underlies the alluvium, thinning eastward from about 29 feet thickness at SC2 to about 12 feet at SC3. The 1g Unit appears to have been eroded away from the eastern half of the footprint in Sandia Canyon, but it is at least 80 feet thick under the lagoons at TA-53 in BH-7. The 1g Unit is pinkish to reddish brown, non-welded to partially welded ash flow tuff.

The Cerro Toledo interval consists of a variety of non-welded sediments, primarily reddish brown silty sand with fragments of gravel up to one inch in size. Although the Tsankawi Pumice overlies the Cerro Toledo, it is less than three feet thick and not readily distinguishable from the Cerro Toledo; therefore, for the purposes of this report the Tsankawi is treated as part of the Cerro Toledo. Like Unit 1g, the Cerro Toledo interval was found in borings SC2 and SC3 but not in borings in the eastern half of the footprint in Sandia Canyon (SC1, SC4, and SC5), but the Cerro Toledo is approximately 40 feet thick in BH-7. Evidently the Cerro Toledo, like the 1g Unit, has been eroded from Sandia Canyon in the east half of the AHF footprint. The vertical position of the Cerro Toledo is lowest in SC3, where its base elevation is about 6605, putting the Cerro Toledo within the tunnel excavation horizon at that location if the beam line follows elevation 6600. The extreme variability in the elevations of the base of the Cerro Toledo between SC2 and SC3, 51 feet over 1200 feet distance, shows that the Cerro Toledo was deposited on an irregular erosional surface and was, itself, eroded before deposition of the Tshirege tuffs.

The tuff of the Otowi Member was found in all SC borings either below the Cerro Toledo in the western half of the footprint area or below the alluvium in the eastern half. The Otowi is pinkish orange (salmon) colored, non-welded ash flow tuff. It was difficult to sample using air coring, but good sample recovery was achieved using continuous tube sampling with the hollow stem auger. The Otowi is consistently soft and breaks easily. This formation will be the host unit for the AHF underground facilities, but as shown by SC3 and SC5, the depth of the facilities will have to be increased to avoid encountering Cerro Toledo or alluvium in tunnel excavation.

Water was encountered only in boring SC3. The water level was 35 feet depth during drilling, but by the time the boring was completed, the water had drained to some level below the bottom of the borehole. This water was probably transient, arising from rapid infiltration of rainfall and local runoff.

The geologic profile along Sandia Canyon that can be interpreted from the SC borings is shown in Figure 3.

Table 1

AHF Boring Log Summary

Boring	Surface elevation	Depth (ft)	Notes	Water
SC-1	~6691'	0 - 17.5	Alluvium, silty sand w/ gravel to poorly graded sand w/ trace gravel	N/E
		17.5 - 20	Colluvium, block of ash-flow tuff from above vapor-phase notch	
		20 - 23	Alluvium, silty sand w/ gravel to poorly graded sand w/ trace gravel	
		23 - 114	Otowi Member. ash flow tuff, light red to reddish orange, fine grained, ashy matrix w/ phenocrysts of quartz and sanidine, avg. 1mm, up to 2mm, glassy pumice up to 1 cm, slightly weathered, very to extremely weak. Grades to light reddish pink to light gre	
SC-2	~6723	0 - 25	Alluvium, silty sand to sandy silt w/ some gravel	N/E
		25 - 54	Tshirege Member. Unit 1g, ash flow tuff. light pinkish brown, medium to coarse grained matrix, quartz and sanidine phenocrysts up to 1mm, glassy but partially crystalline grey pumice up to 2 cm, non-welded, very few lithics. Grades to light pinkish grey,	
		54 - 67	Cerro Toledo Interval. volcaniclastic sediments consisting of silty sand matrix with medium to coarse grains of quartz and sanidine, pumice fragments up to 5 mm, glassy. Red-brown to brown, wet, extremely weak, crudely bedded, occasional pumice-rich layer	Oct wet
		67 - 149.5	Otowi Member of the Bandelier Tuff. ash flow tuff, light reddish to pinkish brown, fine to medium grained, ashy matrix w/ phenocrysts of quartz and sanidine, up to 2 mm, light grey (some oxidized, orange), glassy pumice up to 1.5 cm, chocolate brown lithi	
SC-3	~6702	0 - 51.5	Alluvium, poorly graded sand, clayey sand, lean clay. silty sand	Init: 35'
		51.5 - 63	Tshirege Member. Unit 1g, ash flow tuff. reddish orangish brown, medium grained ashy. pyroclastic matrix. quartz and sanidine phenocrysts up to 1mm, glassy, grey and yellowish-orange pumice up to 1 cm, non-welded to partially welded, trace lithics.	Final: none
		63 - 97.1	Cerro Toledo Interval. volcaniclastic sediments consisting of silty sand matrix with medium to coarse grains of quartz and sanidine, glassy pumice fragments. Grey to red-brown, crudely bedded, gravelly layers w/ basalt clasts up to 1.5', medium to coarse	Oct wet
		97.1 - 123.7	Otowi Member of the Bandelier Tuff, ash flow tuff, pinkish brown, fine grained, ashy groundmass w/ phenocrysts of quartz and sanidine, up to 1 mm, up to ~3% dark brown lithics up to 3 mm, light grey (some oxidized, orange), glassy pumice up to 3 cm, non-	
SC-4	6682	0 - 50	Alluvium, silty sand to poorly graded sand, clay, clayey sand	N/E
		50 - 104	Otowi Member of the Bandelier Tuff. ash flow tuff, light reddish to pinkish brown, fine to medium grained, ashy matrix w/ medium to coarse grained phenocrysts of quartz and sanidine, up to 2 mm, oxidized (orange) glassy pumice up to 6 cm, 1-2% dark grey l	
SC-5	~6662	0 - 49.5	Alluvium, silty sand to poorly graded sand	N/E
		49.5 - 84	Otowi Member of the Bandelier Tuff. ash flow tuff, pinkish orange, fine grained, ashy matrix w/ phenocrysts of quartz and sanidine, up to 1 mm, oxidized (orange) glassy pumice up to 3 cm, trace lithics up to 1/2". non- to partially welded, extremely to ve	
MC-1	~6765'	0 - 12	Alluvium, silty sand with lean clay layers	N/E
		12 - 55	Tshirege Member. Unit 1g, ash flow tuff, light brown, ashy matrix. quartz and sanidine phenocrysts up to 1mm, glassy but partially crystalline grey pumice up to 1 cm, non-welded, fresh to slightly weathered, extremely weak, non-indurated, trace lithics up	
		55 - 82.1	Cerro Toledo Interval. volcaniclastic sediments consisting of silty sand interlayered with medium to coarse sand, trace silt; white, glassy pumice fragments up to 1 cm, reddish brown, poorly bedded, extremely weak, pumice-rich to 59' with occasional pumic	
		82.1 - 179.2	Otowi Member of the Bandelier Tuff, ash flow tuff, light grey brown, fine to medium grained, ashy matrix w/ phenocrysts of quartz and sanidine, up to 2 mm, light grey to pinkish, glassy pumice up to 5 cm, lithics up to 1/2", non- to partially welded, slig	
MC-2	~6752	0 - 79.5	Alluvium, silty sand to sandy silt, sandy lean clay to clayey sand, poorly graded sand with silt	N/E
		79.5 - 116	Cerro Toledo Interval. volcaniclastic sediments consisting of sand with silt to silty sand, ash and pumice, medium to coarse sand; light grey to light yellow glassy pumice fragments up to 1.5 cm, trace obsidian up to 3/4". poorly bedded, 5-15% lithics (ba	
		116 - 171.5	Otowi Member of the Bandelier Tuff. ash flow tuff, pinkish orange, fine to medium grained, ashy matrix w/ phenocrysts of quartz and sanidine up to 2mm, oxidized (orange). glassy pumice up to 9+ cm (3.5'). lithics up to 1-1/2". ~5%, non welded, slightly we	
MC-3	~6727'	0 - 56.5	Alluvium, silty sand to sand with silt, silty clay with sand	N/E
		56.5 - 64	Colluvium/boulders; gravel- to cobble-sized clasts of ash-flow tuff from above vapor-phase notch	
		64 - 104.2	Cerro Toledo Interval. volcaniclastic sediments consisting of various proportions of sand, silt. lithics (basalt gravel). ash and pumice, medium to coarse sand; light brownish grey, trace obsidian, poorly bedded, 5-15% lithics (basalt), increases up to ~3	
		104.2 - 143.7	Otowi Member of the Bandelier Tuff. ash flow tuff, light pinkish orange, fine to medium grained, ashy matrix w/ sparse phenocrysts of quartz and sanidine, oxidized (orange), glassy pumice up to 5 cm (2'), up to 10% lithics up to ~.2', non welded, slightly	

N/E Not encountered

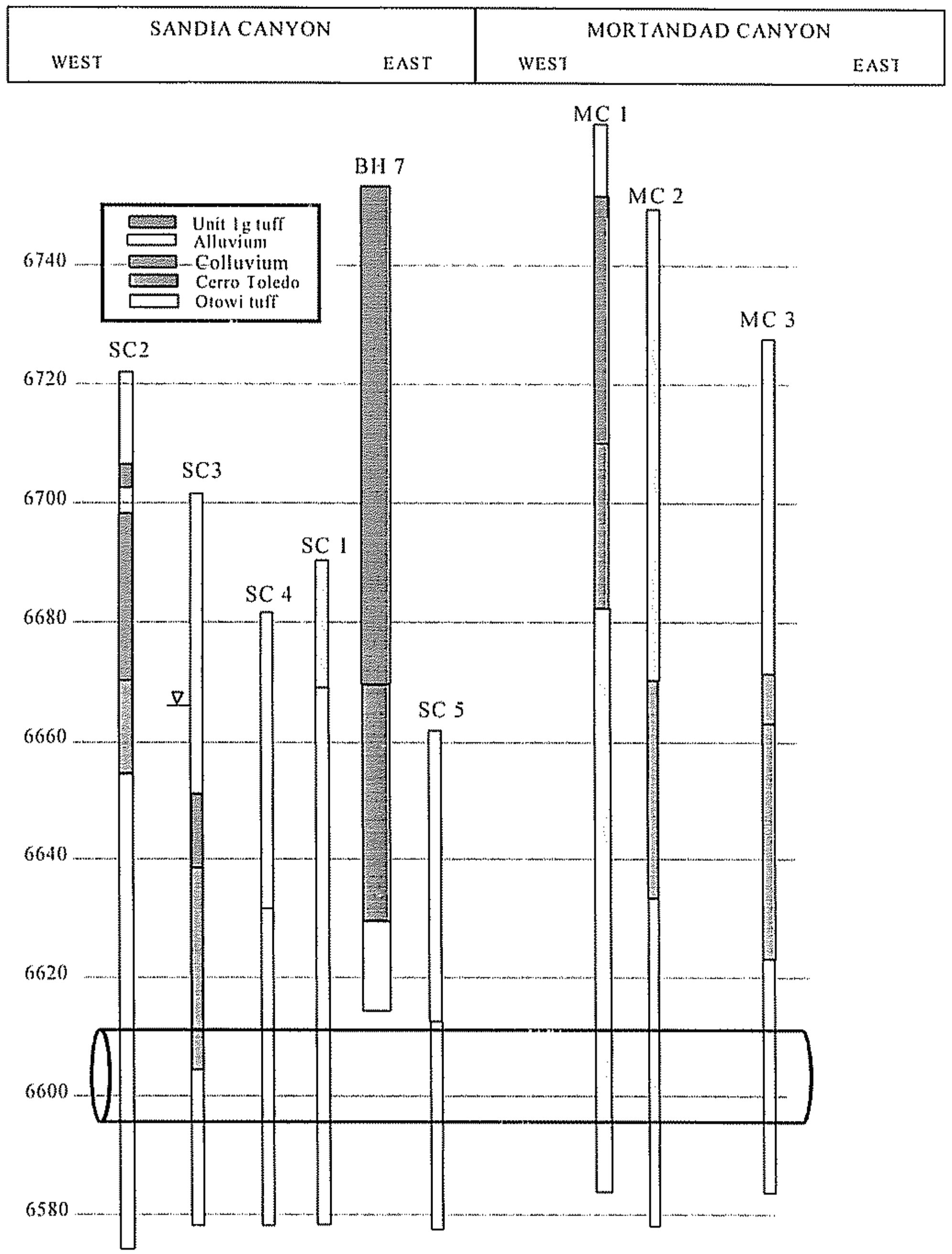
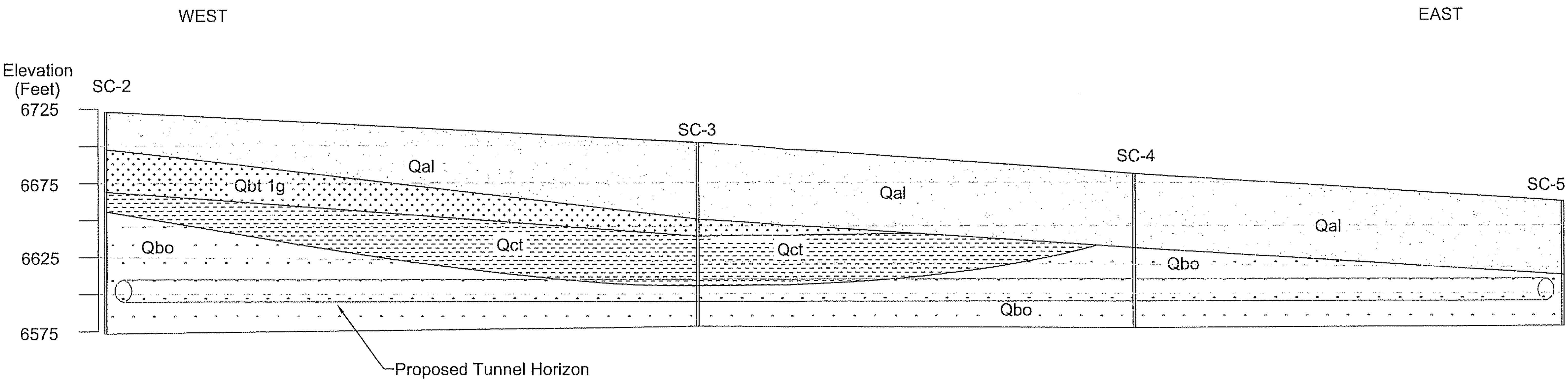


FIGURE 2. Graphic Summary of Test Boring Logs



LEGEND:

- Quaternary Alluvium (Qal)
- Quaternary Tshirege Member, Unit 1g (Qbt 1g)
- Quaternary Cerro Toledo Interval (Qct)
- Quaternary Otowi Member (Qbo)

Horizontal Scale:

200 0 100 200

SCALE: 1 inch =200 ft.

Vertical Scale is 3:1 to Horizontal Scale
All Locations are Approximate
All Contacts are Interpreted

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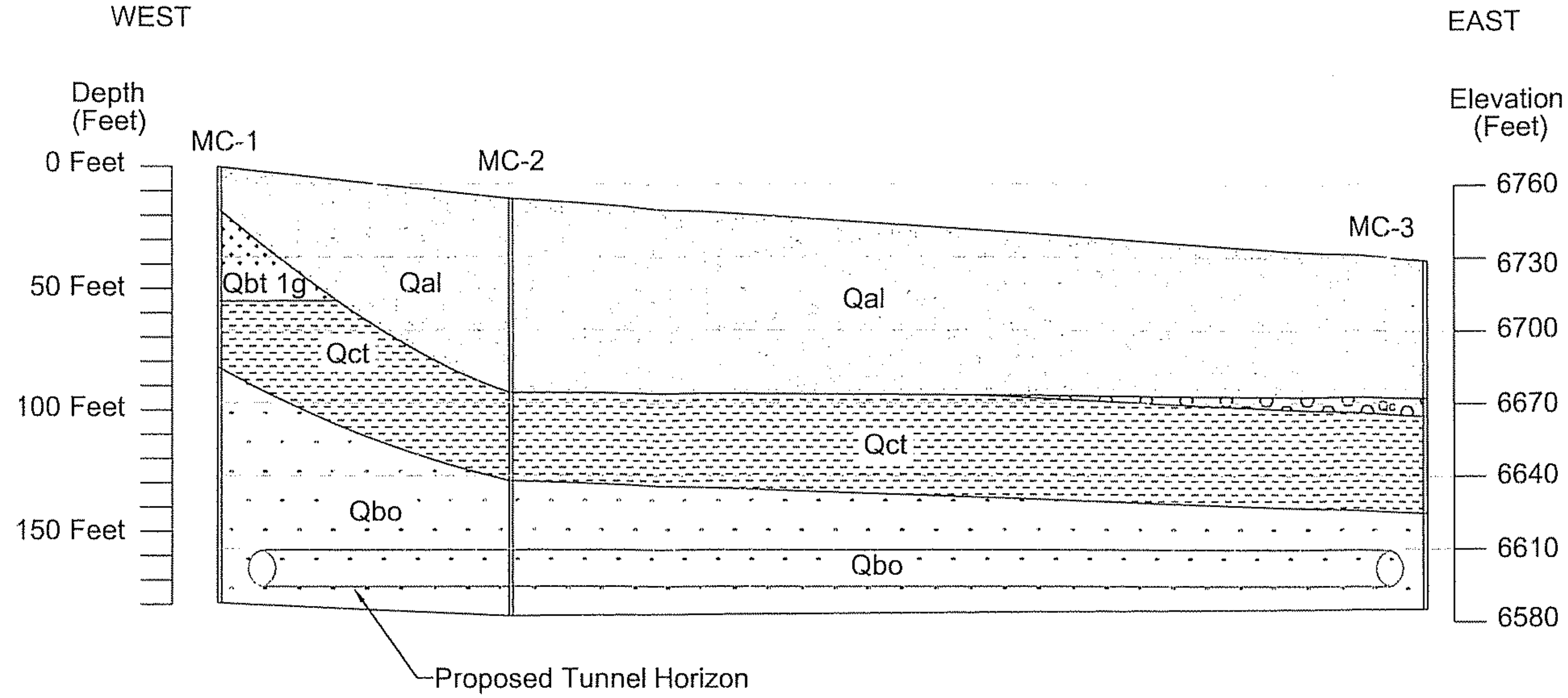
Drawn By: B. Bockisch	Date: September 2002	**Cross Section Parallel to Sandia Canyon** Advanced Hydrotest Facility Los Alamos National Laboratory Los Alamos, New Mexico	Figure 3
Project No: c59010120	Filename: SanCanSec.dwg		



LEGEND:

Quaternary Alluvium (Qal)

Quaternary Colluvium (Qc)

Quaternary Tshirege Member, Unit 1 (Qbt 1g)

Quaternary Cerro Toledo Interval (Qct)

Quaternary Otowi Member (Qbo)

Horizontal Scale:

200 0 100 200

SCALE: 1 inch =200 ft.

Vertical Scale is 3:1 to Horizontal Scale
All Locations are Approximate
All Contacts are Interpreted

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Drawn By: B. Bockisch
Project No.: c59010120
Date: September 2002
Filename: MortCanSec.dwg

Section Through Mortandad Canyon
Advanced Hydrotest Facility
Los Alamos National Laboratory
Los Alamos, New Mexico

Figure
4

Mortandad Canyon (MC) Borings

The three test borings drilled in Mortandad Canyon all encountered the Otowi Member, the Cerro Toledo, and the alluvium, all of which had essentially the same physical properties as in Sandia Canyon. The 1g Unit occurred in MC1 but not in the other two MC borings. Both the absence of the 1g Unit and the much lower position (about 50-60 feet lower) of the Cerro Toledo interval in MC2 and MC3, compared to MC1, implies that there is either a paleocanyon wall or a structural offset (fault) between MC1 and MC2.

No water was encountered in the MC test borings.

The geologic profile along Mortandad Canyon that can be interpreted from the MC borings is shown in Figure 4.

3.2.2 Results of Laboratory Testing Program

Based on the test boring logs and visual examination of samples, a limited number of samples were selected for testing in Kleinfelder's Albuquerque and Pleasanton (CA) material testing laboratories. All sampled materials, including the tuffs, were tested using soil mechanics methods. These tests provide some initial insight into the physical properties of the geologic units in the canyons; although too limited to support design, the test results indicate the range of properties that should be considered when evaluating facility layout and depth, design and excavation approaches, and later site investigation plans.

Laboratory test results are included in Appendix B and summarized in Table 2. The results can be evaluated by geologic unit as follows:

Alluvium – general sandy soil with up to 50% minus #200 sieve (fines) consisting of silt (SM soil) or clay (SC soil), low plasticity to non-plastic. This material should be suitable for excavation of stable cut slopes and for use as engineered fill.

Tshirege Unit 1g – generally silty sand with enough bonding of particles (from cohesion, welding or cementation) to give the tuff relatively good strength (95.8 psi in unconfined compression) considering its low density (71.9 pcf).

Cerro Toledo – variably graded silty sand and silt, moderate to low density (96.2 to 70.9 pcf), low strength in unconfined compression (4.8 to 14.5 psi) but good strength parameters (ϕ =28-31, cohesion = 2-3 ksf) in direct shear. This material should be suitable for excavation of stable cut slopes and for use as engineered fill.

Otowi tuff – generally silty sand with enough bonding of particles (from cohesion, welding or cementation) to give the tuff some unconfined strength (6.0 to 53.0 psi) and good strength parameters (ϕ =38, cohesion = 1.1 ksf) in direct shear. Five triaxial unconsolidated-undrained (U-U) tests, run of samples from five different borings, produced a wide range of results, from a deviator stress of 16.91 ksf at 1.0 ksf confining pressure to 7.19 ksf deviator

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Table 2
Tabulation of Laboratory Test Results

Bore Hole	Depth (ft)	Geologic Unit	USCS	Direct Shear	Sieve Analysis % Passing # 200	Atterberg Limits	Dry Density (pcf)	Moisture Content (%)	Unconfined Compression (psi)	Max Dry Density	Hydraulic Conductivity (k) cm/sec	Triaxial U-U (ksf)
SC-3	30	Alluvium	CL		65.0	LL=33, PI=13		23.0				
SC-3	35	Alluvium	SM		47.0	LL=35, PI=6		29.1				
SC-4	15	Alluvium	SP-SM		5.8	NP		4.3				
SC-4	25	Alluvium	SC-SM		15.0	LL=29, PI=5		6.9				
SC-5	46.5	Alluvium	SC		18.0	LL=31, PI=12		9.5		122pcf @ 10%		
MC-1	8	Alluvium	SM		36.0	NP		5.7				
MC-2	18	Alluvium	ML		55.0	NP		6.6				
MC-2	48	Alluvium	SC-SM		36.0	LL=32, PI=6		11.9				
MC-2	58	Alluvium	SM		24.0	NP		10.7				
MC-3	10	Alluvium	SW-SM		7.4			4.3				
MC-3	30	Alluvium	CL-ML		70.0	LL=27 PI=4		7.7				
MC-3	40	Alluvium	SW-SM		6.2			1.3				
MC-3	60	Colluvium	SM		25.0			6.0				
SC-2	50-51	Tshirege					71.9	31.5	95.8			
MC-1	23	Tshirege	SM		40.0	NP		4.5				
MC-1	43	Tshirege	SM		28.0	NP		5.5				
SC-2	65.5-66	Cerro Toledo				NP	76.7	29.1	7.6			
SC-3	72.2-73.7	Cerro Toledo		ϕ=31°, c=3.0ksf			96.2	14.7	6.0	114 pcf @ 14%		
MC-1	56-58	Cerro Toledo		ϕ=28°, c=2.0ksf			74.1	10.3	14.5			
MC-1	66	Cerro Toledo	SW-SM		8.6			7.9				
MC-1	74	Cerro Toledo	ML		50.0			10.6				
MC-2	80-81.5	Cerro Toledo					70.9	14.0	4.8			
SC-1	92.8-94	Otowi					75.0	15.0	9.7			
SC-2	135.7-136.5	Otowi					83.2	20.8	53.0			
SC-3	109	Otowi					70.2	22.8			2.70 X 10^{-7}	σ_D=16.91, σ_3=1.00
SC-3	110	Otowi					72.8	19.8				
SC-4	75	Otowi					57.1	16.3				σ_D=5.07, σ_3=1.00
SC-4	75.5	Otowi					61.7	14.7				
SC-4	91.5-92.6	Otowi					72.3	12.0	7.3			
SC-5	76.5-77.5	Otowi					78.4	10.0	6.7		4.1 X 10^{-7}	
MC-1	91	Otowi	SM		28.0	NP		8.1				
MC-1	127.5-129	Otowi						NA				
MC-1	152-153.2	Otowi						34.5			2.48 X 10^{-7}	
MC-1	162.8	Otowi					66.5	9.4				σ_D=7.98, σ_3=1.50
MC-2	138.4-140.3	Otowi					69.9	7.0	6.0			
MC-2	145.2	Otowi					65.9	12.9				σ_D=7.19, σ_3=2.00
MC-3	116.2-118.7	Otowi		ϕ=38°, c=1.1ksf			74.9	9.2	6.0			
MC-3	135	Otowi					68.7	8.3				σ_D=11.72, σ_3=1.50

stress at 2.0 ksf confining pressure. Although confinement appears to increase stress at failure, the results are not conclusive. Densities are consistently low, 69.9 to 83.2 pcf, over the six samples tested. Hydraulic conductivity (permeability to water) also appears to be consistent, in the range of 10-7 cm/sec.

Alkali-silica reactivity (ASR) testing was performed on a selected set of samples from the several geologic units. These tests are time-dependent and could not be completed by the submittal date of this report. Laboratory testing started several weeks later than originally scheduled, the result of delays in the drilling and sample collection caused by fire hazard conditions and drill rig mechanical problems. The results of ASR tests will be submitted later as an addendum to this report.

The tests show that all of the geologic units consist of soils or soil-like material – none of these units have typical rock density, hardness or strength properties.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 GROUND CONDITIONS AFFECTING TUNNELS AND SHAFTS

Both the test borings and the laboratory tests indicate that the geologic units in which tunnels and shafts will be constructed in the canyons will behave like soil rather than rock. The low strength parameters of the Otowi will require a soft-ground approach to excavation and structural support. The Otowi should excavate easily but is likely to have short stand-up times, requiring substantial ground support installed close to the heading within a short time, perhaps minutes, of excavation. Consequently, if unshielded tunnel construction methods are used (e.g.; roadheader or NATM) the excavation cycle will be short, probably less than 10 feet. If a TBM is used, support immediately behind the shield will be needed. In shafts, shoring or other bracing will be required in each cycle as the shaft is sunk.

4.2 GROUND CONDITIONS AFFECTING OPEN EXCAVATIONS

The geotechnical parameters that make tunnel and shaft excavation relatively easy should also make open excavation straightforward. The apparent absence of ground water and high-plasticity soils and the good frictional characteristics of all geologic units are favorable factors for open excavation. However, relatively low in-place densities and unconfined strengths might limit cut slope gradients and increase potential for settlement and slumping of ground adjacent to cuts. Alternatively, these same properties could make retained excavation more feasible because support systems like soldier piles or soil nails should be comparatively quick to install.

4.3 IMPLICATIONS FOR FACILITIES LAYOUT AND DEPTH

The graphic logs in Figure 2 and the profiles in Figure 3 and 4 show that, if the beam line in the tunnel is at elevation 6600, a 15-foot diameter tunnel will break out of the Otowi into the Cerro Toledo in at least one location and come very close to breaking into alluvium in at least one other location in Sandia Canyon. In Mortandad Canyon the base of the Cerro Toledo will be less than one tunnel diameter above the crown of the tunnel in at least one location. Considering the number of trouble spots encountered in a limited number of test borings (three out of eight), it is reasonable to expect that these conditions would occur over a substantial portion of the tunnel alignments under the canyons. The variability of the vertical position and thickness of the Cerro Toledo shown by these test borings will almost certainly persist under the mesas, as well. Consequently, with the tunnel elevation and layout that is currently baselined for the AHF project, zones of Cerro Toledo soils and possibly alluvium will be exposed in tunnels. Although the laboratory results from these investigations do not show a sharp contrast in geomechanical properties between the Otowi and the Cerro Toledo, it is possible that the stand-up time and stress-strain behaviors of the two units would be different enough to require different primary support and permanent lining designs. Such a mixed-face condition would add to construction costs and lead to a more complex design.

To avoid a mixed-face tunneling scenario and lessen the risk of instability in the tunnel above the crown, the tunnel level can be lowered to a depth that would provide at least one diameter (preferably two diameters) below the Otowi/Cerro Toledo or Otowi/ alluvium contact. This can be achieved by either actually lowering the elevation of the tunnel level or by shifting the alignment to avoid the deepest horizons of those contacts, resulting in a new layout with respect to the site topography and geology. However, for either approach to be taken with confidence, additional site investigations would be needed to establish the form of the upper surface of the Otowi across the footprint of the tunnel system.

An alternative approach would be to assume the certainty of a mixed-face tunnel scenario and to design the tunnels and plan construction for those conditions.

4.4 DATA NEEDS

This investigation program has produced some initial insight into the geologic conditions and geomechanical properties that will impact the AHF subterranean facilities, but the results of this investigation have also identified additional questions and have shown how variable the geotechnical elements of the site are likely to be. Geotechnical uncertainties of primary importance are:

- Parameters related to facility layout and depth – the shape and position of the top of the Otowi and the thickness and continuity of the overlying geologic units. Data from this investigation shows that these parameters can vary substantially across the site and will have major effect on the layout, construction methods, and cost of the subterranean facilities.
- Primary geomechanical parameters – strength parameters (friction, cohesion, unconfined strength, triaxial maximum deviator stress). The values of these parameters determined in this investigation vary over a wide range. The number of tests performed is not sufficient to support a judgment about whether this variability is due to sample disturbance, test operator influence, or actual variation in the tested materials. Because the strength parameters are critical to design and construction of the tunnels and shafts, more strength testing is needed.

- Major geologic structures – the existence and location of any faults or erosional breaks that could impact the position and continuity of geologic units along the tunnel alignments.

4.5 SUBSEQUENT GEOTECHNICAL INVESTIGATIONS

The site investigations conducted for this pre-conceptual design phase of the project produced the data needed for determining the general geologic setting of the canyons within the AHF footprint and for initial assessments of geotechnical properties. These data needs can be addressed through a set of geotechnical investigations, starting with the "CD0" phase of the Site Characterization Master Plan (SCMP) described in detail in the TA-53 Integrated Design Studies Report, September, 2001.

The CD0 phase is not linked to any specific information needs of CD0; it would occur before the start of conceptual design. This phase would identify any site features that could force major realignment or repositioning of AHF facilities. For example, an active or capable fault underlying the location of FS2 could force that structure to be relocated. Such a feature affects project planning at a pre-conceptual level, so it must be addressed before conceptual design.

The second SCMP phase is the conceptual design, or CD1, phase. It should be focused on the data requirements of conceptual design and on acquiring data needed to determine sizes and shapes of tunnels and shafts, on methods of excavation and ground support, and on identifying potential out-of-limits conditions including unstable slopes and excessive contaminant levels. This phase is intended to produce the additional data needed to support the conceptual design and to provide data required in the Environmental Impact Statement. The geotechnical characterization of SCMP CD1 should be directed toward establishing a geologic model of the entire site, including the mesas, and determining the range of geomechanical properties that affect facility layout, configurations, and constructability. Test borings should be drilled at the locations of the primary subterranean facilities to establish the thickness and vertical limits of rock units, to document in situ rock structure, and to extract additional samples for visual examination and testing. Geophysical surveys should be performed to assist in geologic correlation between test borings, to detect large subsurface discontinuities, and to provide data on rock mass properties. Specifically, these investigations should include:

- Continuous tube sampling and visual logging – to provide better characterization of site geology, to obtain core and other samples for testing, and to provide openings for video and downhole seismic logging.
- Video logging – to observe and record rock discontinuities in situ and in true spatial orientation
- Downhole seismic logging – to determine velocity characteristics of rock with depth, to complement seismic reflection and refraction surveys
- Seismic reflection and refraction surveys – to determine velocity characteristics of rock in three-dimensional space and to locate boundaries between geologic units, to complement downhole seismic logging and rock coring and visual logging

- Laboratory testing
    - Direct shear – to quantify friction angle and cohesion of material
    - Compressive strength – to quantify strength in uniaxial compression
    - Grain size analyses – to classify soil and disaggregated tuff
    - Plasticity Indices– to classify soil and disaggregated tuff
    - Proctor moisture/ density – to quantify compaction characteristics of soil and disaggregated tuff
    - In-situ density and specific gravity – to quantify void ratio and unit weight of tuff
    - Alkali-silica reactivity – to evaluate chemical interaction of tuff with concrete

Data derived from these investigations should be added to the site database and terrain model. The terrain model will provide the primary platform for conceptual modeling of shafts and tunnels. Modeling will include AutoCAD simulation of excavations within the terrain model as well as representations of shaft and tunnel configurations for subsequent structural analysis during design.

5 CLOSURE

5.1 LIMITATIONS

The recommendations contained in this report are based upon the field exploration, laboratory tests, and our understanding of the proposed facilities. It is the responsibility of the design team to determine the suitability of the information contained in this report and, at the discretion of the design team, to seek supplemental geotechnical information and recommendations. This supplemental information could include additional site-specific borings, laboratory testing, geotechnical engineering analysis, or geotechnical consultation.

The subsurface data used in the preparation of this report was obtained from the eight test borings. It is anticipated that variations in the subsurface soil and rock conditions may exist between the boring locations. The nature and extent of variations may not be evident until construction occurs.

This report was prepared in accordance with generally accepted standards of practice at the time the report was written. No warranty, express or implied, is made. It is the Client's responsibility to see that all parties to the project, including the Designer, Contractor, Subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for design purposes; subsequent use of this information for construction should be done at the Contractor's option and risk.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference" as that latter term is used relative to contracts or other matters of law.

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APPENDIX A

Figure 1 – Location Plan of Pre-Conceptual Geotechnical Test Borings

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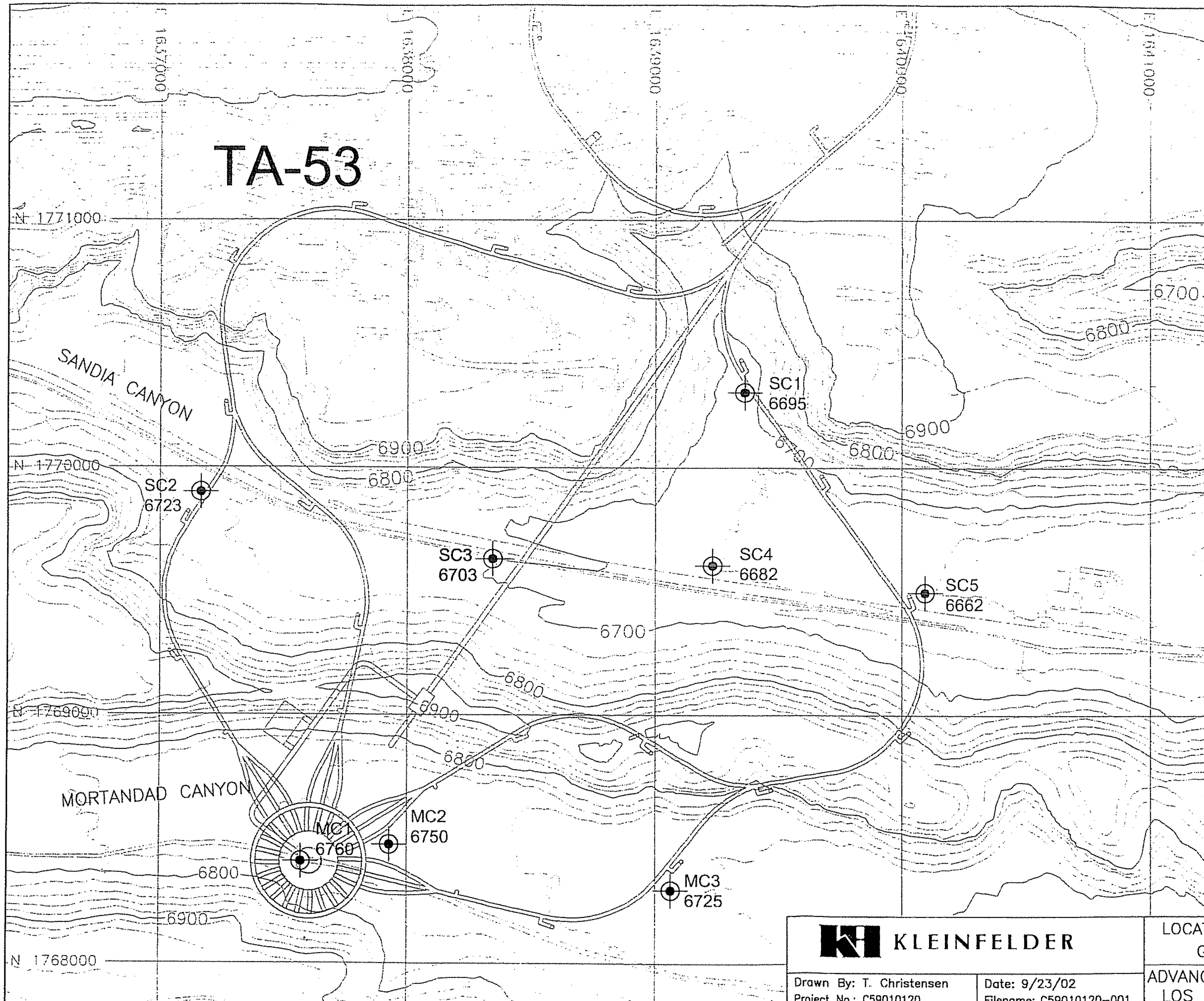

ID	NORTHING	EASTING	ELEV.	DEPTH
SC1	1770304	1639362	6695	115
SC2	1769900(1)	1637167(1)	6723	150
SC3	1769632	1638347	6703	123
SC4	1769606	1639232	6682	102
SC5	1769497	1640094	6662	82
MC1	1768409	1637573	6760	180
MC2	1768477	1637929	6750	170
MC3	1768294	1639063	6725	125

NOTES -

1. LOCATION OF SC2 IS APPROXIMATE WITHIN 10 FT. OF LISTED COORDINATES.

400' 0 200' 400'

SCALE: 1 inch =400 ft.

KLEINFELDER

Drawn By: T. Christensen
Project No.: C59010120

Date: 9/23/02
Filename: C59010120-001

LOCATION PLAN OF PRE-CONCEPTUAL GEOTECHNICAL TEST BORINGS

ADVANCED HYDROTEST FACILITY, TA-53
LOS ALAMOS NATIONAL LABORATORY

FIGURE 1

APPENDIX B

Test Boring Logs

Laboratory Test Results

KLEINFELDER 4905 Hawkins N E , Albuquerque, NM 87109 (505) 344-7373 (505)-344-1711 fax

Date Completed: 08/13/2002 Logged By: S. Merkley

Boring Location: Mortendad Canyon, 17' west of staked location

Driller: Chad Szpunar Drilling Method/Size: 8" HSA

Elev. Top of Hole: 6765' Total Depth (ft): 179.2 Groundwater Depth: I ▽ not encountered

F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Silty SAND (SM), fine grained, brown, dry to slightly moist, loose to medium dense. non-plastic	
								Lean CLAY with sand (CL), fine grained sand, yellowish-brown, very moist. moderately firm to soft, low plasticity	
				4. 6					
								Silty SAND (SM), fine grained, brown, dry to slightly moist. loose to medium dense. non-plastic	
6760	5								
				12, 6					
6755	10								
								Light brown, with some GRAVEL to about 2"	
								Bandelier Tuff (Qbt1g), ash flow TUFF, light brown, ashy matrix with phenocrysts to 1 mm, trace lithics to 2 mm (.1"), pumice to 1 cm (.4"). glassy, fresh to slightly weathered, extremely weak. non-indurated	
				10. 8					
6750	15							Light yellowish-brown at 15'	
				4, 12	NR				

KA_RX-SOIL 010120.GPJ 9/27/02

KLEINFELDER

Drafted By: S Merkley Project No: 59-010120

Date: 09/27/2002 File Number: 59-010120

LOG OF BORING MC-1

Advanced Hydrotest Facility - Preconceptual

Los Alamos National Laboratory

Los Alamos, New Mexico

PLATE

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				8, 12					
6740	25							Light brown Glassy pumice up to 3 cm (1 2")	
				7, 12					
6735	30								
				29, 50					
6730	35								
				32, 48					
6725	40							Whitish-gray	

KLEINFELDER

Drafted By: S Merkley
Date: 09/27/2002

Project No : 59-010120
File Number: 59-010120

LOG OF BORING MC-1
Advanced Hydrotest Facility - Preconceptual
Los Alamos National Laboratory
Los Alamos, New Mexico

PLATE
2 of 8

KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				35, 50/3"					
6720	45								
				55. 50/3"					
6715	50								
								Possible Tsankawi pumice	Start continuous sampling at 53' Drilling adjustment set at 60 inches
6710	55							Cerro Toledo Interval (Qct), reddish-brown, sandy unit with white, glassy pumice up to 1 cm, silty sand, fine grained matrix Pumice-rich to about 59', poorly bedded to crudely bedded	Drilling easier
					96				
								Sand increases, medium to coarse through 62', silt increases to trace to some	
6705	60								
								Pumice-rich bed observed at 61' to 62'	
								Silty sand, predominately fine grained at 63'	
								Pumice-rich bed observed at 64' to 66', up to 40% pumice	
6700	65								

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Drafted By: S Merkley Project No : 59-010120
Date: 09/27/2002 File Number: 59-010120

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Grades from red-brown to light gray-brown, fine to medium SAND (about 80%), [about 5%] pumice up to 4 mm (16"). about 15% silt/ash	
								From 69' to 73 5' interlayered red brown, silty SAND with trace to some pumice, ash, lithics, fine to medium grained, layers of fine grained silty sand with 10 to 20% ash and pumice	
6695	70								
					85				
								From 73 5' to 78' silty SAND, red-brown, predominately fine to medium grained, approximately 30% pumice up to 1 cm (4"), weakly cemented	
6690	75								
6685	80							From 78' to 82.1' poorly graded, medium grained SAND with trace silt. some ash, light brown	
								Bandelier Tuff (Qbo), ash-flow TUFF, light gray brown. non-welded to partially welded, [15 to 20%] pumice to about 1.5 cm (6"), ashy matrix, pumice is glassy. pinkish-brown to white	
6680	85								
								Light pinkish/grayish-brown	
					95				

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Drafted By: S Merkley
Date: 09/27/2002
Project No : 59-010120
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Los Alamos National Laboratory
Los Alamos, New Mexico

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Pinkish-brown, lithics increase to about 5 to 7%. brown to red-brown, dacite, up to 1 2 cm (.5") Note: From 82 1' to about 89' may be re-worked Otowi	
6675	90								
6670	95								
								Unit grades to pinkish-orange, pumice is yellowish-orange. up to 5 cm (2"). glassy	
6665	100							Percent pumice increases to about 30% Lithics angular to sub-angular, 5 to 10% light pinkish-brown, sparse phenocrysts up to about 5 to 10%	Sample tube was crushed - salvaged lower sample tube, 101 5' to 103 8'
					50				
6660	105								
6655	110								
					94				

KA_RX-SOIL 010120.GPJ 9/27/02

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Drafted By: S Merkley
Date: 09/27/2002

Project No : 59-010120
File Number: 59-010120

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6650	115								
6645	120							Light pinkish-gray, percent lithics increases to about 10%, up to 5", pumice up to 5 cm (2") Partially welded	
6640	125				94				
6635	130							Light gray	
6630	135							Basalt lithics to 2", sub-angular to sub-rounded	

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6625	140								
								Degree of welding increases slightly	
6620	145								
6615	150								
					96				
6610	155							Light pinkish-gray, pumice less abundant and smaller, up to about 2 cm (8")	
					100				

KA_RX-SOIL 010120.GPJ 9/27/02

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Drafted By: S Merkley Project No : 59-010120
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Light gray	
6605	160							Basalt lithics to about 25". pumice is white, glassy. sparse phenocrysts	
					100				
								Lithics up to 5"	Drilling slower than last run - drill run stopped at 4.2' run so tubes didn't crush Very hard, slow drilling with sample tubes from approximately 165'
6600	165								
					100				
									3.9' run - tubes started to crush
6595	170								
					100				
								Degree of welding increases slightly, light gray, lithics increase slightly - 10%	
6590	175								
					95				
								Total depth to 179 2'	
6585	180								

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KA_RX-SOIL 010120.GPJ 9/27/02

Date Completed: 08/09/2002 Logged By: S. Merkley

Boring Location: Mortendad Canyon, 8' south of staked location

Driller: Chad Szpunar Drilling Method/Size: 8" HSA

Elev. Top of Hole: 6752' Total Depth (ft): 171.5 Groundwater Depth: I ∇ not encountered

F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Silty SAND (SM) with trace to some gravel, predominately fine grained, brown, slightly moist, medium dense, non-plastic, trace clay (low plasticity), roots to about 10' (trace)	
6750									
				4, 7, 8					
	5								
6745									
				4, 3, 7					
	10							Trace fine gravel	
6740									
				4, 6, 5					
	15								
6735								Sandy SILT (ML), trace clay, fine grained sand, slightly moist, brown, moderately firm, non-plastic	
				4, 6, 8					

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Drafted By: S Merkley Project No : 59-010120

Date: 09/27/2002 File Number: 59-010120

LOG OF BORING MC-2

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6730								Sandy silty CLAY (CL-ML) with trace fine gravel to .25", fine sand, brown, slightly moist, moderately firm. low plasticity to non-plastic. trace quartz/sanidine grains	
				6, 7, 8					
	25							Poorly graded SAND with trace to some silt (SP-SM). fine to medium sand, brown, slightly moist, medium dense, non-plastic, interbedded with 6" to 12" thick silty clay to sandy silt layers as above Note: Burnt wood at bottom of sample	
6725									
				5, 8, 10					
	30								
6720									
				16, 30				Sandy lean CLAY to clayey SAND (CL-SC), predominately fine sand, brown, slightly moist. very firm. low plasticity	
	35								
6715									
				12, 16				Sandy CLAY, same as above with traces of pumice, coarse quartz, sanidine grains	
	40							Sandy lean CLAY (CL), predominately fine sand, occasional layers of medium grained sand, brown, moist to slightly moist. very firm, low plasticity, epiclastic soil (fragments of phenocrysts, trace pumice, lithics)	
6710									

KA_RX-SOIL 010120.GPJ 9/27/02

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				26. 18					
	45								
6705									
				25, 46				Hard	Suspect blow counts - sampler may have been hung up
	50								
6700									
				12, 6				Firm	
	55							Clayey SAND (SC), fine to medium grained, yellowish-brown, slightly moist to moist, firm. low plasticity, layers of non-plastic silty sand, medium grained	
6695									
				10, 13					
	60							Interbedded with poorly graded SAND. predominately medium grained	
6690									
				11, 13				Poorly graded SAND with silt (SP-SM), some gravel up to about 4" (tuff, partially welded, purplish-pink), sand is predominately medium grained with some coarse and fine grained, brown, slightly moist. medium dense, non-plastic	Blow counts suspect
	65								

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Drafted By: S Merkley
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6685									
	70							Grades to fine grained silty SAND with tuff gravel and cobbles, same as above	
6680				3, 5				Abrupt change to orange-brown ash flow TUFF, (possibly colluvial), moderately weathered, matrix is fine grained, some ash with sand, lithics less than 1 mm, pumice is sugary white to glassy white - variable, up to about 3 mm (12")	
	75								
6675									Start continuous sampling at 79'
	80				82			Cerro Toledo Interval (Qct) consisting of thin, interbedded SAND with silt, ash, occasional .2' thick pumice layer with sugary, grainy devitrified pumice and white vitrified pumice, sand is predominately medium grained, with trace obsidian fragments up to about 2 mm, pumice lense approximately 4' thick with pumice up to about 1 5 cm (6") from 86 6' to 87. glassy	
6670									
	85							Color varies from light yellow to white (sands) with tiny black flecks/grains	
6665									

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Unit is about 80% SAND, some sandy pumice layers with up to 50% pumice, light yellow	
	90								
					56				
6660									
	95							Obsidian pieces up to .75" in cuttings and sample Overall about 50% SAND, 25% PUMICE, 10% ASH, 5 to 15% LITHICS. basalt up to 1"	
6655									
	100							[Up to 50%] basalt gravels, angular to sub-angular, up to 2", pumice to about 5" (1 3 cm), non-bedded to slightly bedded	
					62				
6650									
								Gravel up to 70% in coarse grained layers. lose obsidian	
	105								
6645									
	110								
6640									

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
					62				
	115								
					93			Bandelier Tuff (Qbo), ash-flow TUFF, pinkish-orange, ashy matrix with pumice, glassy, containing crystals of quartz and sanidine, lapilli to 3.5" (entire diameter of tube), pumice is orange/oxidized, glassy, lithics about 5%, up to 25", non-welded	
6635									
	120							Pumice about 20 to 30% of unit, up to 1 5" (about 4 cm), lithics up to 1 5" (averaging 25"). phenocrysts about 5%. up to 2 mm	
6630									
								Grades to light pinkish-gray Pumice is white and orange - not all is oxidized	
	125								
					90				
6625									
								Percent ash increases, about 20% pumice	
	130								
6620									
	135							Partially welded	

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Drafted By: S Merkley
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6615									
	140							Pumice is white, not oxidized, unit is light gray, partially welded	Harder drilling from 140' Slow drilling
					100				
6610									
	145								
					100				
6605									
								Cuttings white to light gray	
									Start NQ wireline coring
	150								
6600									
					0			Retrieved a few pieces of pumice/lithic fragments up to about 1"	
	155								
6595									
									Switched back to continuous sampling at 157.5'

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Drafted By: S Merkley　Project No : 59-010120
Date: 09/27/2002　File Number: 59-010120

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	160				100			Partially welded, light whitish-gray, about 20 to 30% pumice, glassy, white. up to 3 cm (1 2") Lithics about 5% up to about 25"	Drilled slow to obtain 100% recovery
6590									
	165				98			Pumice up to 4 cm (1 6"), some are yellowish-orange, oxidized	
6585									
	170				95				
6580								Total depth to 171 5'	
	175								
6575									
	180								

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Drafted By: S Merkley
Date: 09/27/2002
Project No : 59-010120
File Number: 59-010120

LOG OF BORING MC-2
Advanced Hydrotest Facility - Preconceptual
Los Alamos National Laboratory
Los Alamos, New Mexico

Date Completed: 08/08/2002 Logged By: S. Merkley

Boring Location: Mortendad Canyon, North of road

Driller: Rob Helton/Chad Szpunar Drilling Method/Size: 8" HSA

Elev. Top of Hole: 6727' Total Depth (ft): 143.7 Groundwater Depth: I ▽ not encountered

F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6725								Silty SAND (SM) with trace gravel, fine to medium sand, layers of coarse grained sand, light brown, slightly moist, loose to medium dense, non-plastic	
	5			5, 5, 6				Interbedded poorly graded SAND (SP) with silty sand, silty sand is fine grained, medium to coarse grained, light brown to brown, slightly moist, loose to medium dense, non-plastic, trace gravel to 1"	
6720									
	10			3, 4, 4					
6715									
	15			3, 5, 4					
6710									

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Drafted By: S. Merkley Project No.: 59-010120

Date: 09/27/2002 File Number: 59-010120

LOG OF BORING MC-3

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				4, 4, 7					
6705									
	25			8, 13, 14				Silty CLAY with sand (CL-ML), fine grained sand. slightly moist, yellow brown, firm, low plasticity	
6700									
	30			9, 9, 10				At 30', grades to silty clay, some fine sand, yellow-brown, firm, slightly moist, low plasticity	
6695									
	35			5, 7, 9				Silty SAND with trace clay (SM), fine to some medium grained sand, yellow-brown. slightly moist. medium dense, non-plastic to low plasticity	
6690									
								Poorly graded SAND (SP), trace silt, predominately medium grained sand. brown. slightly moist, medium dense, non plastic	
	40			4. 6. 6					
6685									

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	45			5, 11. 12				Percentage of SILT increases slightly, with gravel to cobble-sized tuff fragmets, tuff fragments are friable, light grayish-purple, about 30 to 40% phenocrysts in ashy matrix	
6680									
	50			5, 5, 7				Silty SAND (SM), fine to medium grained, brown, slightly moist, medium dense, non-plastic, some tuff fragments, weakly cemented. trace to some gravel	
6675									
	55			3, 6, 9					
6670								Silty GRAVEL [GM], (Colluvium) with gravel and cobble-sized clasts of tuff, pinkish-orange, pumices up to about 1 cm, gray, devitrified, ashy matrix with altered phenocrysts, some are purplish-gray, sand is fine grained, trace clay Volcanic tuff boulders, very friable to friable, light gray to purplish-gray, pumice dark gray, up to 1 cm, devitrified, some phenocrysts of quartz, sanidine	Start continuous sampling at 58 7'
	60			5, 12, 20	64				
6665								Light gray, ashy matrix with [up to 20%] pumice up to 2 cm, dark gray, devitrified, some quartz and sanidine phenocrysts	
	65							Cerro Toledo Interval (Qct), horizontally bedded sand, ash and pumice, finely bedded, various proportions ash, lithics [basalt. dacite, up to .5", sub-rounded], trace obsidian nodules. pumice, sand Upper 1' of run is weathered, yellow-brown tuff with about 30% white, vitrified pumice. pumice is fine grained sugary white - devitrified	

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Drafted By: S Merkley
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Loose, layered sands may have been blown away	
6660									
	70								
					83				
6655									
	75								
6650									
								Obsidian fragments up to 1 mm	
	80								
6645									
								Light gray to beige, pumices are sugary white, about 30%, up to 4 mm (.25"), lithics are dark gray, up to about 1", phenocrysts of quartz, sanidine up to 2 mm	Drilling harder
	85								
					80				
								Predominately reworked material from ash-flow deposit, light brownish-gray to beige, fine grained ashy matrix with some phenocrysts (about 5%) of quartz, sanidine, up to 2 mm, about 10% lithics, dark gray to black specks up to 4 mm, pumice is white, glassy, up to 1 cm (4"), non-welded. friable texture, slightly porous	
6640									
								Poorly bedded to not bedded	

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Project No : 59-010120
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	90							Lithics increase to 15 to 20%	
6635									
								Percentage of lithics increases to about 30% dacite and basalt, percentage of pumice decreases to about 5%	
	95								
					80				
6630								Grades to light gray-brown	
								Moisture content increases slightly (still slightly moist) Unit is composed predominately of lithics, sub-angular Basalt clasts up to about 2", approximately 50% pumice From 100' to 100 5' is an ashy, fine grained layer with fewer lithics (5%)	
	100								
								Partially cemented from 101'	
6625									
								Bandelier Tuff (Qbo), contact at 104.2' Ash-flow TUFF, fine grained, ashy matrix/groundmass, non-welded, light pinkish-orange (pumpkin colored), with pumice up to 1.8 cm (.75") oxidized (orange), with medium grained crystals in pumice, anhedral to sub-anhedral sparse phenocrysts up to about 5%, up to 1 mm, extremely weak to very weak, fresh, lithics up to 10%. to 5 mm (2")	
	105								
6620									
	110							Color lightens to light pinkish-gray, partially welded	
6615									

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Date: 09/27/2002
Project No : 59-010120
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	115								
					100				
6610									
	120				100				
6605								Increase in percentage lithics to about 15%, basalt, sub-angular to angular, up to .75". partially welded	
	125								
					100			Pumice up to 5 cm (2"), yellow-orange. with crystals, about 20%	
6600									
	130							Occasional layers with increased percentage lithics - up to 30%, basalt, sub-angular. up to 2" (average size .75")	
					100				
6595									
	135							Increase in percentage pumice to about 25%	

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File Number: 59-010120

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
					100				
6590									
	140				100				
6585									Refusal encountered with sample tubes in barrel
								Total depth to 143.7'	
	145								
6580									
	150								
6575									
	155								
6570									

KA_RX-SOIL 010120.GPJ 9/27/02

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Project No.: 59-010120
File Number: 59-010120

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Advanced Hydrotest Facility - Preconceptual
Los Alamos National Laboratory
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PLATE
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Date Completed: 07/26/2002 Logged By: S. Merkley

Boring Location: Thumb canyon on north side of Sandia Canyon, TA-72

Driller: Rob Helton Drilling Method/Size: 8" HSA

Elev Top of Hole: 6691' Total Depth (ft): 114 Groundwater Depth: I ▽ not encountered

F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6690								Silty SAND with gravel (SM), fine grained, light red-brown, slightly moist, loose, non-plastic, strong reaction to HCL, sub-rounded to round gravel up to about 2", consisting of miscellaneous foreign lithics, cemented/welded tuff. dacite	
6685	5			2, 2, 2					
								Occasional gravelly layers	
6680	10			12, 15, 16				Poorly graded SAND with trace to some gravel (SP), medium grained sand. light reddish-gray, slightly moist, dense, non-plastic	
								Interbedded clayey SAND with gravel and poorly graded sand from 13' to 17.5', clayey to silty sand is moist. red. medium dense, low plasticity to non-plastic	
6675	15			36, 15, 15				Poorly graded SAND predominately medium grained	
								From 17.5' to 20' is likely a colluvial block of ash-flow tuff, medium to coarse-grained matrix, highly weathered, moist, unwelded, extremely weak, brown to red-brown, moisture content decreases with depth to slightly moist, phenocrysts of quartz and sanidine, devitrified pumice	Drilling harder

KLEINFELDER

Drafted By: S Merkley Project No: 59-010120

Date: 09/27/2002 File Number: 59-010120

LOG OF BORING SC-1

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Poorly graded SAND with silt (SP), fine to coarse, some bedding. gray brown. slightly moist, non plastic	
6670					95				
								Bandelier Tuff (Qbo), ash-flow TUFF, light red to reddish-orange, fine grained, ashy matrix, with phenocrysts of quartz and sanidine averaging 1 mm, up to 2 mm, glassy pumice up to about 1 cm (4"), very weak to extremely weak, very friable	
	25								
6665									
				50/3"				Light reddish-pink	
	30								
6660									
				50/3"					
	35								
6655									
				50/1"					
	40								
6650									

KLEINFELDER

Drafted By: S Merkley   Project No : 59-010120
Date: 09/27/2002   File Number: 59-010120

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	45			20, 50, 45				Lapilli-sized pumice, vitreous but partially crystalized/sugary texture, chocolate brown dacite lithics up to 1 5". pumice is usually oxidized to orange-yellow	Start continuous sampling at 44'
6645					95				
	50								
6640									
	55								
6635									
	60								
6630					90				
	65								
6625									

KA_RX-SOIL 010120.GPJ 9/27/02

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Drafted By: S Merkley
Date: 09/27/2002

Project No : 59-010120
File Number: 59-010120

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Dark gray, dacitic to andecitic lithics 1" to 2" in size	
								Color darkens to reddish-orange, mottled with lighter red-pink. slightly more moist, percent lithics increases, pumices are yellowish-brown but glassy	Drilling slightly harder
	70								
6620					95				
	75								
6615									
	80							Slightly increased abundance of dark gray dacitic lithics	
6610					85				
	85								
6605									

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Light pinkish-brown	Drilling harder
	90								
6600									
					90				
								Pinkish-beige	
	95								
6595									
	100							Dacite lithics to 75" in size. unit grades to light gray	
6590									
					90				
								Sample is loose, broken up. similar color, composition except lithics sparse, up to about 2 mm	
	105								
6585								Pumice is slightly more abundant, larger clasts up to about 2"	
	110								
6580									
					95				

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Total depth to 114'	
	115								
6575									
	120								
6570									
	125								
6565									
	130								
6560									
	135								

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Project No : 59-010120
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LOG OF BORING SC-1
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Los Alamos National Laboratory
Los Alamos, New Mexico

PLATE

Date Completed: 08/01/2002 Logged By: S. Merkley

Boring Location: Sandia Canyon, south of road, 48' southwest of stream gauge

Driller: Rob Helton Drilling Method/Size: 8" HSA

Elev. Top of Hole: 6723' Total Depth (ft): 149.5 Groundwater Depth: I ▽ perched : 53.7' F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Sandy SILT to silty SAND (SM-ML), trace fine gravel, predominately fine grained sand. brown. slightly moist to moist, loose, non-plastic	
6720									
	5			3, 4, 4					
6715									
	10			2, 2, 3				Silty SAND with some gravel (SM). fine to medium sand, brown, slightly moist, loose to very dense. non-plastic, some gravels are devitrified pumice. up to 1 cm (4")	
6710									
	15			3, 2, 3				Percentage fines decreases, predominately fine grained sand	
6705									

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Drafted By: S Merkley Project No : 59-010120

Date: 09/27/2002 File Number: 59-010120

LOG OF BORING SC-2

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				6, 4, 5				1.5" layer of light gray ash-flow, quartz and sanidine phenocrysts, ashy matrix - within brown silty sand, same as above	
6700				22, 25. 28					Start continuous sampling at 24'
	25				50			Bandelier Tuff (Qbt 1g), ash-flow TUFF, fine grained, ashy matrix with quartz and sanidine phenocrysts up to 1 mm, glassy but partially crystaline pumice, up to 2 cm (8"). light pinkish-brown to light pinkish-gray, non-welded Pumices are generally light gray, very few lithics	
6695								Tuff becomes partially welded	
	30								
6690									
	35				85				
6685									
	40								
6680									

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Project No : 59-010120
File Number: 59-010120

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	45								
6675									
	50								
6670								Moisture content increases to very moist to wet Cerro Toledo Interval (Qct), volcaniclastic sediments consisting of silty sand matrix with grains (medium to coarse) of quartz, sanidine; glassy pumice fragments up to about 5 mm, red-brown to brown. wet. extremely weak, crudely bedded	
	55								
6665									
	60							From 59.3' to 60.3' are 2 layers of pumice in a silty sand matrix, clast-supported pumice lapilli up to 2 cm (8"), vitreous, white to light brown to orange in color; unit is wet, soft Perched water encountered at 59 3'	
6660								At 63.5' unit grades to coarse SAND with silt, some fine gravel - pumice, lithics, fine to medium silty sand, wet, red-brown. dense, non-plastic	
	65							More uniform, basalt lithics up to 5 mm, very moist to moist, red-brown, with pumice lapilli up to about 1 cm (4")	

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
					80				
6655								Bandelier Tuff (Qbo), ash-flow TUFF, reddish-brown to pinkish-brown, moist, fine to medium grained matrix in ash, lithics, phenocrysts of quartz, sanidine, coarse sand-sized, pumice up to 1 5 cm (.6"), whitish-tan to light gray, some orange, glassy, non- to partially welded, (predominately non-welded), uniform	
	70								
6650								Whitish-gray pumice lapilli, 3 cm (1 2") Saturated at 73' Unit is moist to slightly moist	
	75								
6645									
	80							Red-brown to orangish-brown	
6640									
	85							Cuttings very moist to moist	
					90				Drilling very hard
6635									

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	90							Pumices predominately orange, up to 1 cm (4"), partially crystaline but some glassy	
								Percentage lithics increases to about 5%, up to 5 mm, basalt	
6630									
	95							Color grades to pinkish-gray, slight increase in pumice, tuff is partially welded	Drilling got harder again
6625									
	100							Chocolate brown lithics, up to 2 mm, pumice mostly beige to light gray	
6620									
								Pumice block fragments up to 4 to 5 cm (1 6 to 2")	Drilling slightly easier
	105								
					90				
6615									
								Amount and size of pumice decreases. lithics consisting predominately of basalt and dacite	
	110								

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Drafted By: S Merkley
Date: 09/27/2002
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6610									
	115								
								Light gray-brown, some pumices are oxidized - orange. up to 1 cm (.2") Unit is still partially welded. non-uniformly	
6605									
	120							Slightly moist	
6600									
	125								
6595									
								Increase in lithics, size up to 2". consisting mostly of basalt and dacite	Drilling difficulty increases
	130								
6590									
	135								

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6585									
	140							Medium gray-brown, about 15% oxidized pumice, fine grained matrix, trace lithics	Added 4 gallons of water in hole to help retrieve cuttings
6580									
	145								
6575									
	150							Total depth to 149 5' Cave to 140'	
6570									
	155								
6565									

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KA_RX-SOIL 010120.GPJ 9/27/02

Date Completed: 08/05/2002 Logged By: S. Merkley

Boring Location: Sandia Canyon, south of road, 22' southwest of staked location

Driller: Rob Helton Drilling Method/Size: 8" HSA

Elev Top of Hole: 6702' Total Depth (ft): 123.7 Groundwater Depth: I ▽ perched: 35'

F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Poorly graded SAND (SP), with trace silt and gravel, medium to coarse sand, dark brown, moist, loose to medium dense. non-plastic	
6700									
	5			5. 5. 6					
6695									
	10			3, 2, 3				Loose. trace fine gravel to about 1", well rounded	
6690									
	15			3. 3, 3					
6685									

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Drafted By: S Merkley Project No : 59-010120

Date: 09/27/2002 File Number: 59-010120

LOG OF BORING SC-3

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				2, 2. 4				Interbedded with silty SAND (fine to medium grained), very moist	
6680									
	25			6, 7, 3					
6675									
	30			3. 2. 4				Sandy lean CLAY (CL), with trace gravel, fine grained sand, brown, very moist, medium stiff, low to medium plasticity	
6670									
	35			3. 4, 3				Clayey SAND (SC) wih trace gravel, fine to medium grained sand, red brown, wet, medium stiff, low plasticity. interbedded poorly graded sand with silt layer	
6665									
	40			2, 4, 2				Percentage gravel increases. up to 1" in size. well rounded	
6660									

KA_RX-SOIL 010120.GPJ 9/27/02

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Date: 09/27/2002 | File Number: 59-010120

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	45			3, 5, 6				Silty to clayey SAND (SM-SC), fine to coarse grained, brown to red-brown, wet, medium dense, non-plastic to low plasticity	
6655									
	50			2, 5, 10					
6650								Bandelier Tuff (Qbt 1g), ash-flow TUFF, reddish-orangish brown, fine to medium grained, ashy, pyroclastic matrix with grains of quartz and sanidine, pumices are light gray to yellowish-orange, grainy to glassy but mostly crystallized, up to about 1 cm (4") in size, unit is non-welded to partially welded	
									Start continuous sampling at 53 7'
	55								
6645									
								From 58.3' to 58.7' is light gray sandy layer, non-welded. slightly indurated, with black flecks, no pumice 58 7' red-brown, pumice to about 1 5 cm (6") up to 5 to 10%	
	60								
6640									
								Cerro Toledo Interval (Qct), poorly graded SAND. predominately medium grained, quartz, sanidine, black grains (possibly dacite and/or basalt), nonindurated, uncemented. very moist	No cuttings return since 53'
	65								

KA_RX-SOIL 010120.GPJ 9/27/02

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6635								Gray to about 66 5' then grades to red-brown	
								At 68.5' grades to light gray, pumice to about 2 cm. concentrated between 68 5' and 68 7'	
	70				67				
6630								Interbedded sands from about 72'. very moist	Last foot of run drilled harder
	75							From about 75' to 75.5' is a gravelly sand layer with clasts up to 1.5", basalt predominately sub-rounded, about 25% gravel. medium to coarse sand	
6625									
								From 78' to 78.3' is a gravelly sand with pumice, dense, red-brown, gravel, pumice up to .25" Below 78.3' unit is bedded with 1" to 12" layers of coarse, poorly graded sand, pumice is glassy, light gray, with crystals up to 1 mm in size	
	80							Medium SAND with pumice up to .25", red-brown, many of the sand layers are loose to medium dense, very moist to wet	
6620									
								Well graded SAND. coarse to fine	
	85				92				
6615									

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	90							Silty SAND with trace gravel, pumice up to 6 cm (2.4"), non-indurated, red-brown, fine grained, moist, interbedded with poorly graded sand, trace to no silt, medium to coarse grained. loose, very moist to wet	
6610									
	95				82				Drilling noticeably harder around 96' to 97', may be due to slough in hole
6605								Bandelier Tuff (Qbo), ash-flow TUFF, pinkish-brown, fine grained ashy groundmass with phenocrysts up to about 1 mm. lithics about 1 to 2%, dark brown, up to 3 mm, glassy pumice lapilli to 3 cm, light gray to orange (oxidized). pumice about 5 to 10% of unit	
	100							Fresh to slightly weathered, non-indurated, non-welded to partially welded, very weak, friable	
					55				
6600								Basalt lithics to 2 cm	
								Partially welded	
	105								
					100				
6595									
								Light gray-brown grades to light pinkish-gray	
	110								
					100				
6590									

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Drafted By: S. Merkley Project No.: 59-010120

Date: 09/27/2002 File Number: 59-010120

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Los Alamos National Laboratory
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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	115								
					100				
6585									
	120								
					100				
6580									
								Total depth to 123.7' No water in hole when finished	
	125								
6575									
	130								
6570									
	135								

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Drafted By: S. Merkley
Date: 09/27/2002

Project No.: 59-010120
File Number: 59-010120

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Advanced Hydrotest Facility - Preconceptual
Los Alamos National Laboratory
Los Alamos, New Mexico

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KA_RX-SOIL 010120.GPJ 9/27/02

Date Completed: 07/29/2002 Logged By: S. Merkley

Boring Location: Sandia Canyon, TA-72, 24' north of staked location

Driller: Rob Helton Drilling Method/Size: 8" HSA

Elev. Top of Hole: 6682' Total Depth (ft): 104 Groundwater Depth: I ∇ perched: 40'

F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
								Silty SAND (SM) with some fine gravel, grades to poorly graded sand, fine to medium grained, brown, slightly moist. medium dense, non-plastic	
6680									
	5			10. 9, 5					
6675									
	10			10, 7. 7				Percentage silt decreases, trace gravel Poorly graded SAND with silt (SP-SM), fine to medium grained sand, brown. slightly moist, medium dense, non-plastic	
6670									
	15			8. 11, 12				Medium to coarse grained	
6665									

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Drafted By: S Merkley Project No: 59-010120

Date: 09/27/2002 File Number: 59-010120

LOG OF BORING SC-4

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KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				20, 5. 7				Sandy CLAY (CL), fine grained sand, brown, slightly moist, medium firm to firm, low plasticity, interbedded with medium to coarse poorly graded sand	Blow counts suspect
6660									
	25			34, 35, 35				Sandy CLAY (CL) lenses (2" to 4" thick), interbedded with poorly graded sand as above, clay is slightly moist to moist. red-brown, hard, low plasticity, contains some 1 to 2 cm devitrified pumice, quartz, some sanidine (blue optical)	
6655									
	30			50/1 5"				Sand decreases, predominately clayey sand to sandy clay with coarse to medium sand	
6650									
	35			8, 5, 6				Poorly graded SAND (SP) with silt and trace gravel to .5", coarse sand, brown, slightly moist, medium dense. with occasional 1" to 2" clay lenses	Blow counts incorrect
6645									
								Wet	
	40			4, 5. 3				Sandy lean CLAY (CL), medium to fine. some coarse sand, red-brown, wet, medium stiff, low to medium plasticity, probably .5' to 1' thick beds interbedded with sand lenses Cuttings predominately sand, coarse grained	
6640									

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LOG OF BORING SC-4
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Drafted By: S Merkley   Project No : 59-010120
Date: 09/27/2002   File Number: 59-010120

KA_RX-SOIL_010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
									Start continuous sampling at 44'
	45			4, 9, 12				Clayey SAND (SC) with trace gravel. color varies from brown to red-orange, includes clasts of Qbt2 up to about 6" in sampler, devitrified glass in pumice up to about 2 cm. moist to very moist. low plasticity	
6635									
	50							Bandelier Tuff (Qbo) ash-flow TUFF, red-orange mottled with pink, predominately very fine grained matrix with medium to coarse grained phenocrysts of quartz and sanidine, up to about 2 mm, highly weathered, very friable, vitreous pumice up to 1.5 cm (.6"), 1% to 2% dark gray lithics up to about 2 mm, pumices oxidized, ashy matrix	
6630									
	55				50				No cuttings return
6625									
								Moist	
	60								
								Color grades to light red-brown. pumices sparse, less oxidized to no oxidation from about 63'	
6620									
								Dacite lithics about 5%. up to 1" in size Unit is light gray-brown	
	65								

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6615									
								Pumices more abundant, oxidized, unit grades to light red-gray	
	70								
6610									
								Vitreous pumice lapilli up to 6 cm (2 4"), partially welded from 75' to approximately 90'	
	75								
6605									
	80							Lithics decrease in size to about 25" (6 mm) Unit grades to light gray-brown Phenocrysts up to 1 mm average, max 2 mm in size	
6600									
	85								
6595									

KA_RX-SOIL 010120.GPJ 9/27/02

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ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	90							Light gray-brown to light gray	
6590									
	95								
6585									
	100								
6580									
								Total depth to 104' Cave to 96'	
	105								
6575									
	110								
6570									

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File Number: 59-010120

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Los Alamos National Laboratory
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KA_RX-SOIL 010120.GPJ 9/27/02

Date Completed: 07/30/2002 Logged By: S. Merkley

Boring Location: Sandia Canyon, TA-72, 31' southeast of staked location

Driller: Rob Helton Drilling Method/Size: 8" HSA

Elev Top of Hole: 6662' Total Depth (ft): 84 Groundwater Depth: I ▽ not encountered F ▼

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6660								Poorly graded SAND with silt (SP), trace fine gravel, fine to medium sand, brown, slightly moist, loose to medium dense, non-plastic, pumice up to 1 cm in size	
	5			3, 6, 7					
6655								Silty SAND (SM), trace fine gravel, predominately fine sand, occasional poorly graded sand layers with medium to coarse sand, brown, slightly moist, non-plastic, medium dense. interlayered with sandy silt layers	
	10			2, 4, 4				Grades to silty SAND to SILT (SM-ML)	
6650									
	15			3, 4, 4				Poorly graded SAND with silt (SP-SM), fine to medium sand, yellow-brown. loose, slightly moist, non-plastic	
6645									

KA_RX-SOIL 010120.GPJ 9/27/02

KLEINFELDER

LOG OF BORING SC-5

Advanced Hydrotest Facility - Preconceptual

Los Alamos National Laboratory

Los Alamos, New Mexico

PLATE 1 of 4

Drafted By: S Merkley Project No : 59-010120

Date: 09/27/2002 File Number: 59-010120

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
				8. 8. 13				Silty SAND with gravel (SM), brown to red-brown. slightly moist, medium dense, non-plastic, gravel/lithics up to about .5", appears to be material from tuff slopes/cliffs that has fallen into wash and interbedded with poorly graded coarse sand and fine grained silty sand, pumices are altered, devitrified	
6640									
	25								
				6, 9. 8					
6635									
									Drilling harder Start continuous sampling at 29'
	30								
6630									
								Silty SAND (SM), fine grained, trace coarse grains quartz, lithics, medium dense to dense. reddish-brown, slightly moist, non-plastic	
	35								
6625									
								Pumice lapilli and fragments up to 7 cm (2 75") long Light yellow-brown	
	40								
6620									

KLEINFELDER

Drafted By: S Merkley Project No : 59-010120
Date: 09/27/2002 File Number: 59-010120

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Advanced Hydrotest Facility - Preconceptual
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Los Alamos, New Mexico

PLATE
2 of 4

KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
	45								
6615								Poorly graded SAND with silt (SP-SM), trace gravel, medium to coarse grained, interbedded silty sand, fine grained, some sandy silt lenses, brown to red-brown, slightly moist to moist, dense, non-plastic, some pumice to 1 cm (4"), crystallized, devitrified	
	50							Bandelier Tuff (Qbo), ash-flow TUFF, partially to non-welded. pinkish-orange, fine grained, ashy matrix with quartz and sanidine phenocrysts up to 1 mm, no bedding, oxidized pumice up to about 3 cm (1 2"), vitreous, extrememly weak to very weak, trace lithics	
6610									
								Grades to light pinkish-gray	
	55								
6605									
	60							Trace dacite and basalt lithics up to about 5"	
6600									
	65								

LOG OF BORING SC-5
Advanced Hydrotest Facility - Preconceptual
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PLATE
3 of 4

KLEINFELDER

Drafted By: S Merkley
Date: 09/27/2002
Project No : 59-010120
File Number: 59-010120

KA_RX-SOIL 010120.GPJ 9/27/02

ELEVATION	DEPTH	SAMPLE TYPE	SAMPLE/BOX NUMBER	BLOWS PER FOOT	% RECOVERY	RQD	Graphic Log	DESCRIPTION	DRILLING NOTES
6595									
	70							Light pinkish-orange	
6590									
								Light pinkish-gray, slight increase in percentage lithics near 75'	
	75								
6585									
	80								
6580									
								Total depth to 84'	
	85								
6575									

KLEINFELDER

Drafted By: S Merkley
Date: 09/27/2002
Project No : 59-010120
File Number: 59-010120

LOG OF BORING SC-5
Advanced Hydrotest Facility - Preconceptual
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PLATE
4 of 4

KA_RX-SOIL 010120.GPJ 9/27/02

APPENDIX C

(Not Applicable)

KLEINFELDER 4905 Hawkins N.E., Albuquerque, NM 87109 (505) 344-7373 (505)-344-1711 fax

APPENDIX D

(Not Applicable)

KLEINFELDER 4905 Hawkins N E , Albuquerque, NM 87109 (505) 344-7373 (505)-344-1711 fax

APPENDIX E

(Not Applicable)

KLEINFELDER 4905 Hawkins N E., Albuquerque, NM 87109 (505) 344-7373 (505)-344-1711 fax

APPENDIX F

(Not Applicable)

KLEINFELDER 4905 Hawkins N E, Albuquerque, NM 87109 (505) 344-7373 (505)-344-1711 fax

APPENDIX G

(Not Applicable)

KLEINFELDER 4905 Hawkins N E , Albuquerque, NM 87109 (505) 344-7373 (505)-344-1711 fax

MC-3

Iso_Depth (ft)	d18O	dD_Depth (ft)	dD
9.9	-10.980	9.9	-80.950
9.9		9.9	-81.265
20.3	-9.766	20.3	-77.504
30.7	-8.971	30.7	-75.947
30.7	-9.025	30.7	-75.561
30.7		30.7	-74.705
30.7		30.7	-77.218
30.7		30.7	-76.622
30.7		30.7	-76.436
40.0	-10.914	40.0	-82.640
40.0	-10.926	40.0	
50.1	-13.250	50.1	-91.588
50.1	-13.540	50.1	
62.4	-12.583	62.4	-83.844
62.4		62.4	-83.848
75.0	-9.937	75.0	-76.838
90.3	-11.281	90.3	-77.809
100.1	-10.709	100.1	-82.438
125.3	-8.766	125.3	-79.194
150.1	-10.972	150.1	-78.688
175.3	-10.532	175.3	-74.305
200.3	-9.683	200.3	-71.724
200.3		200.3	-71.488
225.3	-10.193	225.3	-78.126
225.3	-10.242	225.3	
250.3	-9.784	250.3	-74.048
275.8	-11.276	275.8	-79.850
300.1	-11.691	300.1	-79.895
349.9	-11.621	349.9	-82.619
394.9	-10.951	394.9	-79.077

Sample Number			Depth Range	Upper Depth (ft)	Lower-Depth (ft)	Mid-Depth (ft)	Depth (m)
GW01-04-52716	GW01-04-	ok	9.0-10.8	9.0	10.8	9.9	3.0
GW01-04-52716	GW01-04-	ok	9.0-10.8	9.0	10.8	9.9	3.0
GW01-04-52717	GW01-04-	ok	19.0-21.5	19.0	21.5	20.3	6.2
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52718	GW01-04-	ok	29.0-32.3	29.0	32.3	30.7	9.3
GW01-04-52719	GW01-04-	ok	39.0-40.9	39.0	40.9	40.0	12.2
GW01-04-52719	GW01-04-	ok	39.0-40.9	39.0	40.9	40.0	12.2
GW01-04-52720	GW01-04-	ok	49.0-51.1	49.0	51.1	50.1	15.3
GW01-04-52720	GW01-04-	ok	49.0-51.1	49.0	51.1	50.1	15.3
GW01-04-52731	GW01-04-	ok	61.0-63.7	61.0	63.7	62.4	19.0
GW01-04-52731	GW01-04-	ok	61.0-63.7	61.0	63.7	62.4	19.0
GW01-04-52721	GW01-04-	ok	74.0-76.0	74.0	76.0	75.0	22.9
GW01-04-52732	GW01-04-	ok	89.0-91.5	89.0	91.5	90.3	27.5
GW01-04-52722	GW01-04-	ok	99.0-101.1	99.0	101.1	100.1	30.5
GW01-04-52723	GW01-04-	ok	124.0-126.6	124.0	126.6	125.3	38.2
GW01-04-52724	GW01-04-	ok	149.0-151.2	149.0	151.2	150.1	45.8
GW01-04-52725	GW01-04-	ok	174.0-176.5	174.0	176.5	175.3	53.4
GW01-04-52726	GW01-04-	ok	199.0-201.5	199.0	201.5	200.3	61.0
GW01-04-52726	GW01-04-	ok	199.0-201.5	199.0	201.5	200.3	61.0
GW01-04-52727	GW01-04-	ok	224.0-226.5	224.0	226.5	225.3	68.7
GW01-04-52727	GW01-04-	ok	224.0-226.5	224.0	226.5	225.3	68.7
GW01-04-52728	GW01-04-	ok	249.0-251.5	249.0	251.5	250.3	76.3
GW01-04-52729	GW01-04-	ok	275.0-276.5	275.0	276.5	275.8	84.0
GW01-04-52730	GW01-04-	ok	299.0-301.2	299.0	301.2	300.1	91.5
GW01-04-52733	GW01-04-	ok	349.0-350.8	349.0	350.8	349.9	106.6
GW01-04-52734	GW01-04-	ok	394.0-395.8	394.0	395.8	394.9	120.4

0.487934

0.79658

δ 18O	s.d.	δ D	s.d.
-10.980	0.141	-80.950	0.279
		-81.265	0.187
-9.766	0.176	-77.504	0.117
-8.971	0.056	-75.947	0.312
-9.025	0.097	-75.561	0.410
		-74.705	0.393
		-77.218	0.255
		-76.622	0.251
		-76.436	0.174
-10.914	0.141	-82.640	0.119
-10.926	0.168		
-13.250	0.167	-91.588	0.379
-13.540	0.155		
-12.583	0.130	-83.844	0.192
		-83.848	0.171
-9.937	0.141	-76.838	0.163
-11.281	0.154	-77.809	0.187
-10.709	0.142	-82.438	0.155
-8.766	0.089	-79.194	0.240
-10.972	0.168	-78.688	0.290
-10.532	0.156	-74.305	0.178
-9.683	0.107	-71.724	0.230
		-71.488	0.208
-10.193	0.134	-78.126	0.222
-10.242	0.305		
-9.784	0.108	-74.048	0.313
-11.276	0.143	-79.850	0.187
-11.691	0.084	-79.895	0.196
-11.621	0.144	-82.619	0.197
-10.951	0.135	-79.077	0.309

Appendix 3

Groundwater-Data Screening Tables
(on CD included with this document)

Appendix 3 includes summary screening tables for water data from Los Alamos, Sandia, and Mortandad canyons. Two groups of data are screened and presented in two different sets of tables. The first group (Table A3-1) includes a screen of data from the complete period of record, and the second group (Table A3-2) includes data from 2000 to the present. Water types presented include persistent surface water (baseflow), snowmelt, springs, alluvial groundwater, perched-intermediate groundwater, and regional groundwater. These tables are included in the attached CD.

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Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Sandia Canyon	Sandia left fork at Asphalt Plant	E122	2000	2004	F	WT	Chromium	9	3	33	6.6	1.5	16.5
Sandia Canyon	Sandia left fork at Asphalt Plant	E122	2000	2004	UF	WT	Chromium	10	9	90	10.6	2.6	29.4
Sandia Canyon	Sandia right fork at Power Plant	E121	2002	2005	F	WT	Chromium	9	8	89	2.6	1.4	3.9
Sandia Canyon	Sandia right fork at Power Plant	E121	2002	2005	UF	WT	Chromium	10	10	100	35	12	71
Sandia Canyon	Sandia Tributary below Sigma	E122.3	2005	2005	F	WT	Chromium	4	3	75	1.5	1	1.9
Sandia Canyon	Sandia Tributary below Sigma	E122.3	2005	2005	UF	WT	Chromium	4	4	100	3.0	1.3	4.5
Sandia Canyon	Sandia below Wetlands	E123	2001	2005	F	WT	Chromium	16	15	94	4.2	2.1	6.1
Sandia Canyon	Sandia below Wetlands	E123	2001	2005	UF	WT	Chromium	17	17	100	270	34	506
Sandia Canyon	Sandia above Firing Range	E124	2002	2005	F	WT	Chromium	9	9	100	6.4	2.2	8.5
Sandia Canyon	Sandia above Firing Range	E124	2002	2005	UF	WT	Chromium	9	9	100	300	22	1230
Sandia Canyon	Sandia above SR-4	E125	2005	2005	F	WT	Chromium	1	1	100	272	272	272
Sandia Canyon	Sandia above SR-4	E125	2005	2005	UF	WT	Chromium	1	1	100	270	270	270

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix	Analyte
Sandia Canyon	Sandia right fork at Power Plant	E121	2003	2005	F	WS	Chromium
Sandia Canyon	Sandia right fork at Power Plant	E121	2005	2005	UF	WS	Chromium
Sandia Canyon	SCS-1	W1CS	2001	2001	F	WS	Chromium
Sandia Canyon	Sandia below Wetlands	E123	2002	2005	F	WS	Chromium
Sandia Canyon	Sandia below Wetlands	E123	2005	2005	UF	WS	Chromium
Sandia Canyon	SCS-2	W2CS	2000	2005	F	WS	Chromium
Sandia Canyon	SCS-2	W2CS	2005	2005	UF	WS	Chromium
Sandia Canyon	SCS-3	W3CS	2001	2001	F	WS	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
4	4	100	4.48	3.14	7.18
2	2	100	5.5	5.3	5.7
1	1	100	3.31	3.31	3.31
4	4	100	5.2	3.8	8.1
1	1	100	12.2	12.2	12.2
6	6	100	11.1	8.6	18.0
1	1	100	12.5	12.5	12.5
1	1	100	9.69	9.69	9.69

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	F/UF	Field Matrix	Analyte	Number of Analyses
Sandia Canyon	Sandia Spring	GSSW	2001	2005	Spring	F	WG	Chromium	5
Sandia Canyon	Sandia Spring	GSSW	2005	2005	Spring	UF	WG	Chromium	1

Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
2	40	2.05	1.1	3
1	100	2.9	2.9	2.9

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte	Number of Analyses
Sandia Canyon	R-11	G11R	2005	2005	Regional	855	F	WG	Chromium	5
Sandia Canyon	R-11	G11R	2006	2006	Regional	855	F	WG	Chromium VI	1
Sandia Canyon	R-11	G11R	2005	2005	Regional	855	UF	WG	Chromium	11
Sandia Canyon	R-11	G11R	2006	2006	Regional	855	UF	WG	Chromium VI	1
Sandia Canyon	PM-3	G3MP	2006	2006	Regional	956	F	WG	Chromium VI	2
Sandia Canyon	PM-3	G3MP	2006	2006	Regional	956	F	WG	Chromium	2
Sandia Canyon	PM-3	G3MP	2006	2006	Regional	956	UF	WG	Chromium VI	2
Sandia Canyon	PM-3	G3MP	2000	2006	Regional	956	UF	WG	Chromium	6
Sandia Canyon	R-12	SA-00006	2000	2005	Regional	810.8	F	WG	Chromium	5
Sandia Canyon	R-12	SA-00006	2006	2006	Regional	810.8	F	WG	Chromium VI	1
Sandia Canyon	R-12	SA-00006	2000	2005	Regional	810.8	UF	WG	Chromium	8
Sandia Canyon	R-12	SA-00006	2006	2006	Regional	810.8	UF	WG	Chromium VI	1
Sandia Canyon	PM-1	G1MP	2006	2006	Regional	945	F	WG	Chromium VI	1
Sandia Canyon	PM-1	G1MP	2006	2006	Regional	945	F	WG	Chromium	1
Sandia Canyon	PM-1	G1MP	2006	2006	Regional	945	UF	WG	Chromium VI	1
Sandia Canyon	PM-1	G1MP	2000	2006	Regional	945	UF	WG	Chromium	5
Sandia Canyon	R-10a	GR10A	2005	2005	Regional		F	WG	Chromium	1
Sandia Canyon	R-10a	GR10A	2006	2006	Regional		F	WG	Chromium VI	1
Sandia Canyon	R-10a	GR10A	2005	2006	Regional		UF	WG	Chromium	7
Sandia Canyon	R-10a	GR10A	2006	2006	Regional		UF	WG	Chromium VI	1
Sandia Canyon	R-10	GR10	2005	2005	Regional		UF	WG	Chromium	2

Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
5	100	19.6	17.2	21.2
0	0	-	-	-
11	100	20	17	22
0	0	-	-	-
2	100	4.6	4.5	4.7
2	100	4.4	4.4	4.4
2	100	4.55	4.5	4.6
6	100	4	3	5
1	20	0.78	0.78	0.78
0	0	-	-	-
7	88	3.4	1.1	9.3
0	0	-	-	-
1	100	4.1	4.1	4.1
1	100	3.9	3.9	3.9
1	100	3.9	3.9	3.9
5	100	3.5	3	3.9
1	100	4.5	4.5	4.5
0	0	-	-	-
7	100	4.2	1.2	8.9
0	0	-	-	-
2	100	4.1	3	5.2

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	468.1	F	WG	Chromium VI
Sandia Canyon	R-12	SA-00006	2000	2005	Intermediate	468.1	F	WG	Chromium
Sandia Canyon	R-12	SA-00006	2000	2005	Intermediate	468.1	UF	WG	Chromium
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	468.1	UF	WG	Chromium VI
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	507	F	WG	Chromium VI
Sandia Canyon	R-12	SA-00006	2000	2001	Intermediate	507	F	WG	Chromium
Sandia Canyon	R-12	SA-00006	2000	2004	Intermediate	507	UF	WG	Chromium
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	507	UF	WG	Chromium VI

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
1	0	0	-	-	-
5	0	0	-	-	-
8	4	50	3.7	0.53	6.3
1	0	0	-	-	-
1	0	0	-	-	-
4	0	0	-	-	-
6	2	33	5.7	3.7	7.6
1	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix	Analyte
Mortandad Canyon	TA-55 NW above Effluent Canyon	E196	2001	2003	F	WT	Chromium
Mortandad Canyon	TA-55 NW above Effluent Canyon	E196	2000	2003	UF	WT	Chromium
Mortandad Canyon	Ten Site below MDA C	E201.3	2004	2005	F	WT	Chromium
Mortandad Canyon	Ten Site below MDA C	E201.3	2004	2005	UF	WT	Chromium
Mortandad Canyon	Ten Site above Mortandad	E201.5	2004	2005	F	WT	Chromium
Mortandad Canyon	Ten Site above Mortandad	E201.5	2004	2005	UF	WT	Chromium
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2002	2005	F	WT	Chromium
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2002	2005	UF	WT	Chromium
Mortandad Canyon	Mortandad above Ten Site	E201	2003	2005	F	WT	Chromium
Mortandad Canyon	Mortandad above Ten Site	E201	2003	2005	UF	WT	Chromium
Mortandad Canyon	Mortandad above Sediment Traps	E202	2005	2005	F	WT	Chromium
Mortandad Canyon	Mortandad above Sediment Traps	E202	2005	2005	UF	WT	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
3	0	0	-	-	-
5	4	80	6.9	1.8	21.3
7	5	71	3.2	1.3	5.1
7	7	100	19.2	5.5	38.8
5	2	40	3.1	2.8	3.4
5	5	100	23.58	6.3	43.8
10	6	60	2.3	1.6	3.5
10	10	100	23.5	7.7	37.6
3	3	100	2.7	1.6	3.8
3	3	100	65	23	148
2	2	100	3.25	3	3.5
2	2	100	18.15	12.8	23.5

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix	Analyte
Mortandad Canyon	M-1W	PW1M	2005	2005	F	WS	Chromium
Mortandad Canyon	M-1W	PW1M	2005	2005	UF	WS	Chromium
Mortandad Canyon	M-1E	PE1M	2005	2005	F	WS	Chromium
Mortandad Canyon	M-1E	PE1M	2005	2005	UF	WS	Chromium
Mortandad Canyon	E-1FW	PWF1E	2005	2005	F	WS	Chromium
Mortandad Canyon	E-1FW	PWF1E	2005	2005	UF	WS	Chromium
Mortandad Canyon	E-1W	PW1E	2005	2005	F	WS	Chromium
Mortandad Canyon	E-1W	PW1E	2005	2005	UF	WS	Chromium
Mortandad Canyon	E-1E	PE1E	2005	2005	F	WS	Chromium
Mortandad Canyon	E-1E	PE1E	2005	2005	UF	WS	Chromium
Mortandad Canyon	TS-1W	PW1ST	2005	2005	F	WS	Chromium
Mortandad Canyon	TS-1W	PW1ST	2005	2005	UF	WS	Chromium
Mortandad Canyon	TS-2E	PE2ST	2005	2005	F	WS	Chromium
Mortandad Canyon	TS-2E	PE2ST	2005	2005	UF	WS	Chromium
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2002	2004	F	WS	Chromium
Mortandad Canyon	Mortandad at GS-1	W1SG	2000	2001	F	WS	Chromium
Mortandad Canyon	Mortandad at GS-1	W1SG	2000	2000	UF	WS	Chromium
Mortandad Canyon	M-2E	PE2M	2005	2005	F	WS	Chromium
Mortandad Canyon	M-2E	PE2M	2005	2005	UF	WS	Chromium
Mortandad Canyon	Rio Grande at Mortandad	STMR	2000	2000	UF	WS	Chromium
Mortandad Canyon	Mortandad at Rio Grande (A-11)	WGRM	2000	2003	F	WS	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
2	1	50	7.8	7.8	7.8
2	2	100	15.5	9.4	21.5
2	1	50	4	4	4
2	2	100	6.0	5.1	6.8
2	2	100	20.3	4.2	36.4
2	2	100	27.4	8.4	46.3
3	2	67	7.4	7.3	7.4
3	2	67	7.4	7	7.7
2	1	50	2.5	2.5	2.5
2	1	50	3.3	3.3	3.3
2	1	50	1.3	1.3	1.3
2	2	100	12.1	3.3	20.8
2	1	50	1.7	1.7	1.7
2	2	100	1.8	1.4	2.1
5	2	40	2.1	1.7	2.4
3	3	100	5.5	2.2	7.2
1	1	100	8.7	8.7	8.7
2	2	100	1.7	1.1	2.3
2	1	50	2.4	2.4	2.4
1	0	0	-	-	-
3	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix	Analyte
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2005	2005	F	WM	Chromium
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2005	2005	UF	WM	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
1	0	0	-	-	-
1	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte
Mortandad Canyon	R-1	G01R	2005	2005	Regional	1031.1	F	WG	Chromium
Mortandad Canyon	R-1	G01R	2006	2006	Regional	1031.1	F	WG	Chromium VI
Mortandad Canyon	R-1	G01R	2005	2006	Regional	1031.1	UF	WG	Chromium
Mortandad Canyon	R-1	G01R	2006	2006	Regional	1031.1	UF	WG	Chromium VI
Mortandad Canyon	Test Well 8	G8WT	2006	2006	Regional	953	F	WG	Chromium VI
Mortandad Canyon	Test Well 8	G8WT	2006	2006	Regional	953	UF	WG	Chromium VI
Mortandad Canyon	Test Well 8	G8WT	2000	2005	Regional	953	UF	WG	Chromium
Mortandad Canyon	PM-5	G5MP	2006	2006	Regional	1440	F	WG	Chromium VI
Mortandad Canyon	PM-5	G5MP	2006	2006	Regional	1440	F	WG	Chromium
Mortandad Canyon	PM-5	G5MP	2006	2006	Regional	1440	UF	WG	Chromium VI
Mortandad Canyon	PM-5	G5MP	2000	2006	Regional	1440	UF	WG	Chromium
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1204.5	F	WG	Chromium
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1204.5	F	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1204.5	UF	WG	Chromium
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1204.5	UF	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1288.5	F	WG	Chromium
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1288.5	F	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1288.5	UF	WG	Chromium
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1288.5	UF	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	995.5	F	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	995.5	F	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	995.5	UF	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	995.5	UF	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	1112.4	F	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	1112.4	F	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	1112.4	UF	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	1112.4	UF	WG	Chromium VI
Mortandad Canyon	R-15	MO-00051	2000	2005	Regional	958.6	F	WG	Chromium
Mortandad Canyon	R-15	MO-00051	2006	2006	Regional	958.6	F	WG	Chromium VI
Mortandad Canyon	R-15	MO-00051	2000	2005	Regional	958.6	UF	WG	Chromium
Mortandad Canyon	R-15	MO-00051	2006	2006	Regional	958.6	UF	WG	Chromium VI
Mortandad Canyon	R-28	G28R	2005	2006	Regional	946.2	F	WG	Chromium
Mortandad Canyon	R-28	G28R	2006	2006	Regional	946.2	F	WG	Chromium VI
Mortandad Canyon	R-28	G28R	2005	2006	Regional	946.2	UF	WG	Chromium
Mortandad Canyon	R-28	G28R	2006	2006	Regional	946.2	UF	WG	Chromium VI
Mortandad Canyon	R-34	G34R	2005	2005	Regional	895.15	F	WG	Chromium
Mortandad Canyon	R-34	G34R	2006	2006	Regional	895.15	F	WG	Chromium VI
Mortandad Canyon	R-34	G34R	2005	2006	Regional	895.15	UF	WG	Chromium
Mortandad Canyon	R-34	G34R	2006	2006	Regional	895.15	UF	WG	Chromium VI
Mortandad Canyon	R-13	MO-10097	2002	2003	Regional	958.3	F	WG	Chromium
Mortandad Canyon	R-13	MO-10097	2006	2006	Regional	958.3	F	WG	Chromium VI
Mortandad Canyon	R-13	MO-10097	2002	2005	Regional	958.3	UF	WG	Chromium
Mortandad Canyon	R-13	MO-10097	2006	2006	Regional	958.3	UF	WG	Chromium VI
Mortandad Canyon	PM-4	G4MP	2002	2005	Regional	1260	UF	WG	Chromium
Mortandad Canyon	R-21	G21R	2004	2005	Regional	888.8	F	WG	Chromium
Mortandad Canyon	R-21	G21R	2004	2005	Regional	888.8	UF	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	866.1	F	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	866.1	UF	WG	Chromium

Mortandad Canyon	R-16	G16R	2004	2005	Regional	1018.4	F	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	1018.4	UF	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	1238	F	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	1238	UF	WG	Chromium
Mortandad Canyon	R-16a	GR16A	2005	2005	Regional		F	WG	Chromium
Mortandad Canyon	R-16a	GR16A	2005	2005	Regional		UF	WG	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
4	3	75	5.0	4.6	5.6
1	0	0	-	-	-
10	9	90	5.2	4.2	6.9
1	0	0	-	-	-
1	1	100	2.3	2.3	2.3
1	1	100	2.3	2.3	2.3
9	8	89	4.1	1.8	7.9
1	1	100	5.3	5.3	5.3
1	1	100	5.5	5.5	5.5
1	1	100	5.5	5.5	5.5
6	6	100	5	4	6
4	4	100	1.88	0.97	3.02
1	0	0	-	-	-
8	7	88	4.3	1.6	7.7
1	0	0	-	-	-
4	1	25	1.03	1.03	1.03
1	0	0	-	-	-
8	2	25	2.155	2.1	2.21
1	0	0	-	-	-
2	2	100	7.1	6	8.2
1	0	0	-	-	-
2	2	100	12.3	12.2	12.3
1	0	0	-	-	-
2	2	100	5.5	5.5	5.5
1	0	0	-	-	-
3	3	100	6.8	6.1	7.6
1	0	0	-	-	-
7	6	86	5.1	2.6	7.7
1	0	0	-	-	-
15	14	93	7.4	3.6	14.7
1	0	0	-	-	-
9	9	100	383	330	404
1	0	0	-	-	-
12	12	100	391	350	416
1	0	0	-	-	-
7	6	86	3.7	3.4	4
2	0	0	-	-	-
14	14	100	6	4	11
2	0	0	-	-	-
5	3	60	3.4	2.7	3.8
1	0	0	-	-	-
10	8	80	4.1	3.0	5.9
1	0	0	-	-	-
2	2	100	5.1	4.7	5.4
6	5	83	2.2	1.6	3
10	7	70	2.2	1.1	2.8
4	0	0	-	-	-
8	2	25	4.1	4.1	4.1

5	1	20	0.93	0.93	0.93
9	5	56	5.0	1.1	8.9
5	2	40	1	0.97	1
9	3	33	1.9	1.2	3.2
1	1	100	4.7	4.7	4.7
3	3	100	3.4	1.2	5.3

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte
Mortandad Canyon	MCOI-8	I-8	2005	2005	Intermediate	686	UF	WG	Chromium
Mortandad Canyon	MCOI-4	I-4	2005	2005	Intermediate	499	F	WG	Chromium
Mortandad Canyon	MCOI-4	I-4	2005	2005	Intermediate	499	UF	WG	Chromium
Mortandad Canyon	MCOBT-4.4	G44M	2002	2003	Intermediate	485.4	F	WG	Chromium
Mortandad Canyon	MCOBT-4.4	G44M	2002	2005	Intermediate	485.4	UF	WG	Chromium
Mortandad Canyon	MCOI-5	I-5	2005	2005	Intermediate	689	F	WG	Chromium
Mortandad Canyon	MCOI-5	I-5	2005	2005	Intermediate	689	UF	WG	Chromium
Mortandad Canyon	MCOI-6	I-6	2005	2005	Intermediate	686	F	WG	Chromium
Mortandad Canyon	MCOI-6	I-6	2006	2006	Intermediate	686	F	WG	Chromium VI
Mortandad Canyon	MCOI-6	I-6	2005	2005	Intermediate	686	UF	WG	Chromium
Mortandad Canyon	MCOI-6	I-6	2006	2006	Intermediate	686	UF	WG	Chromium VI

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
1	0	0	-	-	-
2	2	100	27.2	25	29.4
3	3	100	75.1	29	135
3	3	100	44.2	37.4	53.5
4	4	100	38	15	54
2	2	100	3.3	3.1	3.5
2	2	100	658	545	770
4	4	100	53.8	48.4	58.2
1	0	0	-	-	-
7	7	100	54	48	59
1	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte
Mortandad Canyon	MCO-0.6	GM06	2005	2005	Alluvial	1.05	F	WG	Chromium
Mortandad Canyon	MCO-0.6	GM06	2005	2005	Alluvial	1.05	UF	WG	Chromium
Mortandad Canyon	MCO-2	G2CM	2000	2000	Alluvial	2	F	WG	Chromium
Mortandad Canyon	MCO-2	G2CM	2000	2000	Alluvial	2	UF	WG	Chromium
Mortandad Canyon	MCA-4	A-4	2005	2005	Alluvial	1.75	F	WG	Chromium
Mortandad Canyon	MCA-4	A-4	2005	2005	Alluvial	1.75	UF	WG	Chromium
Mortandad Canyon	MCA-1	A-1	2005	2005	Alluvial	2.4	F	WG	Chromium
Mortandad Canyon	MCA-1	A-1	2005	2005	Alluvial	2.4	UF	WG	Chromium
Mortandad Canyon	MCA-5	A-5	2005	2005	Alluvial	3.4	F	WG	Chromium
Mortandad Canyon	MCA-5	A-5	2005	2005	Alluvial	3.4	UF	WG	Chromium
Mortandad Canyon	MCO-3	G3CM	2000	2004	Alluvial	2	F	WG	Chromium
Mortandad Canyon	MCO-3	G3CM	2000	2004	Alluvial	2	UF	WG	Chromium
Mortandad Canyon	MCO-4B	G4BM	2003	2005	Alluvial	8.9	F	WG	Chromium
Mortandad Canyon	MCO-4B	G4BM	2003	2005	Alluvial	8.9	UF	WG	Chromium
Mortandad Canyon	MCO-5	G5CM	2000	2005	Alluvial	21	F	WG	Chromium
Mortandad Canyon	MCO-5	G5CM	2000	2005	Alluvial	21	UF	WG	Chromium
Mortandad Canyon	MCO-6	G6CM	2000	2005	Alluvial	27	F	WG	Chromium
Mortandad Canyon	MCO-6	G6CM	2000	2005	Alluvial	27	UF	WG	Chromium
Mortandad Canyon	MCA-2	A-2	2005	2005	Alluvial	45	F	WG	Chromium
Mortandad Canyon	MCA-2	A-2	2005	2005	Alluvial	45	UF	WG	Chromium
Mortandad Canyon	MCO-7	G7CM	2000	2005	Alluvial	39	F	WG	Chromium
Mortandad Canyon	MCO-7	G7CM	2000	2005	Alluvial	39	UF	WG	Chromium
Mortandad Canyon	MT-1	G1TM	2005	2005	Alluvial	39	F	WG	Chromium
Mortandad Canyon	MT-1	G1TM	2005	2005	Alluvial	39	UF	WG	Chromium
Mortandad Canyon	MCO-7.5	G57M	2000	2005	Alluvial	35	F	WG	Chromium
Mortandad Canyon	MCO-7.5	G57M	2000	2005	Alluvial	35	UF	WG	Chromium
Mortandad Canyon	MT-3	G3TM	2005	2005	Alluvial	44	F	WG	Chromium
Mortandad Canyon	MT-3	G3TM	2005	2005	Alluvial	44	UF	WG	Chromium
Mortandad Canyon	MT-4	G4TM	2005	2005	Alluvial	54	F	WG	Chromium
Mortandad Canyon	MT-4	G4TM	2005	2005	Alluvial	54	UF	WG	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
1	1	100	6	6	6
1	1	100	12.9	12.9	12.9
1	1	100	13	13	13
1	1	100	17	17	17
1	1	100	43	43	43
1	1	100	101	101	101
2	1	50	4.6	4.6	4.6
2	1	50	6.5	6.5	6.5
1	1	100	3.7	3.7	3.7
1	1	100	5.6	5.6	5.6
5	3	60	2.9	1.9	4.0
5	3	60	3.3	1.8	4.8
4	3	75	1.3	0.7	2.1
4	2	50	1.9	1.3	2.5
7	4	57	1.1	0.7	1.8
10	4	40	1.4	1.2	1.6
9	4	44	1.4	0.9	1.8
10	3	30	2.1	1.0	3.9
3	1	33	1.1	1.1	1.1
3	3	100	2.0	1.8	2.2
8	3	38	1.4	1	1.9
10	3	30	1.5	1.3	1.9
2	2	100	2.3	2.1	2.4
2	2	100	2.5	2.1	2.8
5	4	80	2	1	4
4	3	75	2.4	1.6	2.9
2	2	100	3.5	1.7	5.2
2	2	100	1.8	1.4	2.1
1	1	100	1.6	1.6	1.6
1	1	100	1.9	1.9	1.9

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix
Los Alamos Canyon	Los Alamos above Ice Rink	E025	2000	2000	F	WT
Los Alamos Canyon	Los Alamos above Ice Rink	E025	2000	2000	UF	WT
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	F	WT
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	UF	WT
Los Alamos Canyon	DP above TA-21	E038	2001	2005	F	WT
Los Alamos Canyon	DP above TA-21	E038	2001	2005	UF	WT
Los Alamos Canyon	DP below Meadow at TA-21	E039	2000	2005	F	WT
Los Alamos Canyon	DP below Meadow at TA-21	E039	2000	2005	UF	WT
Los Alamos Canyon	DP above Los Alamos Canyon	E040	2000	2005	F	WT
Los Alamos Canyon	DP above Los Alamos Canyon	E040	2000	2005	UF	WT
Los Alamos Canyon	Los Alamos above DP Canyon	E030	2001	2005	F	WT
Los Alamos Canyon	Los Alamos above DP Canyon	E030	2000	2005	UF	WT
Los Alamos Canyon	Los Alamos above SR-4	E042	2000	2005	F	WT
Los Alamos Canyon	Los Alamos above SR-4	E042	2000	2005	UF	WT
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	F	WT
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	UF	WT
Los Alamos Canyon	Los Alamos Canyon near Otowi Bridge	E110	2003	2003	UF	WT

Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Chromium	3	1	33	0.75	0.75	0.75
Chromium	3	3	100	2.8	1.4	4.3
Chromium	6	0	0	-	-	-
Chromium	6	6	100	89	17	238
Chromium	19	11	58	4.9	1.7	27.9
Chromium	18	18	100	32	11	56
Chromium	13	10	77	2.5	1.7	4.4
Chromium	13	13	100	35	5	107
Chromium	12	6	50	2.3	1.8	2.7
Chromium	15	15	100	55	6	130
Chromium	14	5	36	2.2	1.5	4.2
Chromium	19	19	100	98	3	719
Chromium	21	9	43	2.0	1.1	3.1
Chromium	23	23	100	78	5	350
Chromium	7	4	57	2.7	1.2	6.2
Chromium	7	7	100	81	4	300
Chromium	1	1	100	528	528	528

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix
Los Alamos Canyon	Los Alamos above Reservoir	LA-10126	2001	2001	F	WS
Los Alamos Canyon	Los Alamos above Reservoir	LA-10126	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos below Reservoir	LA-10034	2002	2002	F	WS
Los Alamos Canyon	Los Alamos below Reservoir	LA-10034	2002	2002	UF	WS
Los Alamos Canyon	Los Alamos near LAO-B	LA-10006	2000	2000	F	WS
Los Alamos Canyon	Los Alamos near LAO-B	LA-10006	2000	2000	UF	WS
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2003	F	WS
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos near LAO-0.3	LA-10064	2001	2001	F	WS
Los Alamos Canyon	Los Alamos near LAO-0.3	LA-10064	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos near LAO-0.6	LA-10005	2000	2000	F	WS
Los Alamos Canyon	Los Alamos near LAO-0.6	LA-10005	2000	2000	UF	WS
Los Alamos Canyon	DP below Knights of Columbus	21-10929	2001	2002	F	WS
Los Alamos Canyon	DP below Knights of Columbus	21-10929	2001	2002	UF	WS
Los Alamos Canyon	DPS-1	W1PD	2000	2000	F	WS
Los Alamos Canyon	Los Alamos near LAO-1	LA-10065	2001	2001	F	WS
Los Alamos Canyon	Los Alamos near LAO-1	LA-10065	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2001	F	WS
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos Canyon Weir above SR-4	E049	2003	2003	F	WS
Los Alamos Canyon	Los Alamos near LLAO-1	LA-00218	2000	2002	F	WS
Los Alamos Canyon	Los Alamos near LLAO-1	LA-00218	2000	2002	UF	WS
Los Alamos Canyon	Los Alamos 125 ft. above Guaje	GU-10004	2001	2001	F	WS
Los Alamos Canyon	Los Alamos 125 ft. above Guaje	GU-10004	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos 285 ft. above Guaje	LA-10057	2001	2001	F	WS
Los Alamos Canyon	Los Alamos 285 ft. above Guaje	LA-10057	2001	2001	UF	WS

Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Chromium	2	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	3	3	100	18.2	5.6	30.1
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	1	100	4.77	4.77	4.77
Chromium	1	0	0	-	-	-
Chromium	8	0	0	-	-	-
Chromium	8	1	13	4.7	4.7	4.7
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Matrix
Los Alamos Canyon	Los Alamos above Ice Rink	E025	2001	2001	F	WM
Los Alamos Canyon	Los Alamos above Ice Rink	E025	2001	2001	UF	WM
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	F	WM
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	UF	WM
Los Alamos Canyon	DPS-1	W1PD	2001	2001	F	WM
Los Alamos Canyon	DP above Los Alamos Canyon	E040	2005	2005	UF	WM
Los Alamos Canyon	Los Alamos at Upper GS	WGAL	2001	2001	F	WM
Los Alamos Canyon	Los Alamos above DP Canyon	E030	2005	2005	F	WM
Los Alamos Canyon	Los Alamos above DP Canyon	E030	2005	2005	UF	WM
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2005	F	WM
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2005	UF	WM
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	F	WM
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	UF	WM
Los Alamos Canyon	Los Alamos at SR-4	W4SL	2001	2001	F	WM
Los Alamos Canyon	Los Alamos Canyon near Otowi Bridge	E110	2005	2005	F	WM
Los Alamos Canyon	Los Alamos Canyon near Otowi Bridge	E110	2005	2005	UF	WM
Los Alamos Canyon	Los Alamos at Rio Grande	WGRL	2001	2001	F	WM

Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Chromium	6	0	0	-	-	-
Chromium	6	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	5	1	20	2.05	2.05	2.05
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	2	1	50	1.1	1.1	1.1
Chromium	6	0	0	-	-	-
Chromium	7	4	57	4.0	2	6
Chromium	7	1	14	1.68	1.68	1.68
Chromium	8	3	38	4.5	2.6	5.6
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	2	2	100	12.9	9.2	16.6
Chromium	1	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	F/UF	Field Matrix	Analyte	Number of Analyses
Los Alamos Canyon	DP Spring	GSPD	2001	2005	Spring	F	WG	Chromium	4
Los Alamos Canyon	DP Spring	GSPD	2001	2005	Spring	UF	WG	Chromium	3
Los Alamos Canyon	Basalt Spring	GGSB	2000	2005	Spring	F	WG	Chromium	14
Los Alamos Canyon	Basalt Spring	GGSB	2000	2005	Spring	UF	WG	Chromium	9

Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
0	0	-	-	-
0	0	-	-	-
6	43	1.0	0.5	1.4
7	78	1.0	0.4	1.4

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte	Number of Analyses
Los Alamos Canyon	R-7	LA-10041	2001	2002	Regional	915.1	F	WG	Chromium	4
Los Alamos Canyon	R-7	LA-10041	2001	2005	Regional	915.1	UF	WG	Chromium	8
Los Alamos Canyon	R-6	G06R	2005	2005	Regional	1205	F	WG	Chromium	3
Los Alamos Canyon	R-6	G06R	2005	2005	Regional	1205	UF	WG	Chromium	7
Los Alamos Canyon	O-4	G4OW	2000	2005	Regional	1115	UF	WG	Chromium	5
Los Alamos Canyon	R-8	72-10000	2004	2004	Regional	711.1	F	WG	Chromium	4
Los Alamos Canyon	R-8	72-10000	2004	2005	Regional	711.1	UF	WG	Chromium	9
Los Alamos Canyon	R-8	72-10000	2004	2004	Regional	825	F	WG	Chromium	4
Los Alamos Canyon	R-8	72-10000	2004	2005	Regional	825	UF	WG	Chromium	9
Los Alamos Canyon	R-9	LA-00168	2000	2001	Regional	684	F	WG	Chromium	4
Los Alamos Canyon	R-9	LA-00168	2000	2005	Regional	684	UF	WG	Chromium	13
Los Alamos Canyon	LA-5	G5AL	2001	2005	Regional	440	UF	WG	Chromium	6

Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
2	50	3.45	1.1	5.8
7	88	4.2	2.1	8.9
3	100	3.8	3.4	4
7	100	3.6	3.1	4.2
5	100	4.2	3	5.7
2	50	3.5	2.9	4
8	89	5.3	2.2	10.9
4	100	2.7	0.8	3.7
9	100	4.2	1.1	10.9
3	75	1.9	1.7	2.1
12	92	4	2	18
6	100	4.7	4.0	5.6

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte
Los Alamos Canyon	LAOI(A)-1.1	G11L	2000	2000	Intermediate	295.2	F	WG	Chromium
Los Alamos Canyon	LAOI(A)-1.1	G11L	2004	2005	Intermediate	295.2	UF	WG	Chromium
Los Alamos Canyon	R-7	LA-10041	2001	2001	Intermediate	350	F	WG	Chromium
Los Alamos Canyon	R-7	LA-10041	2001	2001	Intermediate	350	UF	WG	Chromium
Los Alamos Canyon	R-7	LA-10041	2001	2002	Intermediate	378	F	WG	Chromium
Los Alamos Canyon	R-7	LA-10041	2001	2002	Intermediate	378	UF	WG	Chromium
Los Alamos Canyon	R-6(i)	G6IR	2005	2005	Intermediate	602	F	WG	Chromium
Los Alamos Canyon	R-6(i)	G6IR	2005	2005	Intermediate	602	UF	WG	Chromium
Los Alamos Canyon	LAOI-3.2a	GI32A	2005	2006	Intermediate		UF	WG	Chromium
Los Alamos Canyon	LAOI-3.2	G32L	2005	2005	Intermediate	153.3	F	WG	Chromium
Los Alamos Canyon	LAOI-3.2	G32L	2005	2005	Intermediate	153.3	UF	WG	Chromium
Los Alamos Canyon	LAOI-7	LAOI7	2005	2005	Intermediate		UF	WG	Chromium
Los Alamos Canyon	R-9i	LA-10029	2000	2001	Intermediate	198.8	F	WG	Chromium
Los Alamos Canyon	R-9i	LA-10029	2000	2005	Intermediate	198.8	UF	WG	Chromium
Los Alamos Canyon	R-9i	LA-10029	2000	2001	Intermediate	278.8	F	WG	Chromium
Los Alamos Canyon	R-9i	LA-10029	2000	2004	Intermediate	278.8	UF	WG	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
2	1	50	0.4	0.4	0.4
3	2	67	1.495	1.1	1.89
2	2	100	1.675	0.95	2.4
2	2	100	166.5	33	300
4	4	100	1.7	1	2.9
5	4	80	16.0	1.3	48.8
2	1	50	2.2	2.2	2.2
5	4	80	4.025	2.2	8.9
2	2	100	1.05	1	1.1
1	0	0	-	-	-
4	0	0	-	-	-
7	6	86	2.05	1.5	2.8
4	3	75	2.6	1.4	3.4
8	6	75	3.82	0.36	9.63
4	1	25	1.1	1.1	1.1
6	5	83	5	1	11

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Matrix	Analyte	Number of Analyses
Los Alamos Canyon	LAO-B	GBAL	2000	2005	Alluvial	11.84	F	WG	Chromium	15
Los Alamos Canyon	LAO-B	GBAL	2000	2005	Alluvial	11.84	UF	WG	Chromium	13
Los Alamos Canyon	LAO-C	GCOL	2001	2005	Alluvial	3	F	WG	Chromium	8
Los Alamos Canyon	LAO-C	GCOL	2000	2005	Alluvial	3	UF	WG	Chromium	16
Los Alamos Canyon	LAO-0.7	G7OL	2001	2003	Alluvial	15	F	WG	Chromium	3
Los Alamos Canyon	LAO-0.7	G7OL	2001	2003	Alluvial	15	UF	WG	Chromium	7
Los Alamos Canyon	LAO-1	G1OL	2001	2005	Alluvial	8	F	WG	Chromium	7
Los Alamos Canyon	LAO-1	G1OL	2001	2005	Alluvial	8	UF	WG	Chromium	10
Los Alamos Canyon	LAUZ-1	G1ZL	2001	2005	Alluvial	5.35	F	WG	Chromium	5
Los Alamos Canyon	LAUZ-1	G1ZL	2001	2005	Alluvial	5.35	UF	WG	Chromium	5
Los Alamos Canyon	LAO-1.6G	G16G	2000	2005	Alluvial	10.47	F	WG	Chromium	11
Los Alamos Canyon	LAO-1.6G	G16G	2000	2005	Alluvial	10.47	UF	WG	Chromium	8
Los Alamos Canyon	LAO-2	G2OL	2000	2005	Alluvial	7	F	WG	Chromium	7
Los Alamos Canyon	LAO-2	G2OL	2000	2000	Alluvial	7	NA	WG	Chromium	1
Los Alamos Canyon	LAO-2	G2OL	2000	2005	Alluvial	7	UF	WG	Chromium	10
Los Alamos Canyon	LAO-3A	GA3L	2000	2004	Alluvial	4.7	F	WG	Chromium	7
Los Alamos Canyon	LAO-3A	GA3L	2000	2004	Alluvial	4.7	UF	WG	Chromium	14
Los Alamos Canyon	LAO-4	G4OL	2001	2001	Alluvial	14	F	WG	Chromium	1
Los Alamos Canyon	LAO-4	G4OL	2000	2001	Alluvial	14	UF	WG	Chromium	2
Los Alamos Canyon	LAO-4.5C	GC54	2001	2005	Alluvial	13.3	F	WG	Chromium	5
Los Alamos Canyon	LAO-4.5C	GC54	2001	2005	Alluvial	13.3	UF	WG	Chromium	5
Los Alamos Canyon	LAO-6A	GA6L	2001	2001	Alluvial	4.2	F	WG	Chromium	1
Los Alamos Canyon	LAO-6A	GA6L	2001	2001	Alluvial	4.2	UF	WG	Chromium	1
Los Alamos Canyon	LLAO-1B	GL1B	2000	2005	Alluvial	11.32	F	WG	Chromium	9
Los Alamos Canyon	LLAO-1B	GL1B	2000	2005	Alluvial	11.32	UF	WG	Chromium	9
Los Alamos Canyon	LLAO-4	LA-00046	2005	2005	Alluvial	5.24	F	WG	Chromium	1
Los Alamos Canyon	LLAO-4	LA-00046	2005	2005	Alluvial	5.24	UF	WG	Chromium	1

Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
1	7	0.64	0.64	0.64
4	31	0.8	0.4	1.3
3	38	0.8	0.5	1.0
3	19	3.0	0.8	7.1
1	33	0.885	0.885	0.885
0	0	-	-	-
7	100	11	5	17
10	100	13.4	6.4	19.4
2	40	0.5	0.4	0.7
4	80	1.0	0.3	2.5
9	82	1.6	0.9	3.3
6	75	2.1	0.9	3.6
4	57	4	1	12
1	100	9	9	9
7	70	2.9	1.1	9.0
2	29	7.4	2.8	12.0
10	71	5.8	3.3	13.9
0	0	-	-	-
0	0	-	-	-
0	0	-	-	-
3	60	1.2	0.8	1.6
0	0	-	-	-
0	0	-	-	-
5	56	0.7	0.4	1.3
6	67	2.3	0.4	7.9
0	0	-	-	-
0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Sandia Canyon	Sandia left fork at Asphalt Plant	E122	2000	2004	F	WT	Chromium	9	3	33	6.6	1.5	16.5
Sandia Canyon	Sandia left fork at Asphalt Plant	E122	1999	2004	UF	WT	Chromium	12	11	92	11.5	2.6	29.4
Sandia Canyon	Sandia right fork at Power Plant	E121	2002	2005	F	WT	Chromium	9	8	89	2.6	1.4	3.9
Sandia Canyon	Sandia right fork at Power Plant	E121	2002	2005	UF	WT	Chromium	10	10	100	34.6	12.3	71
Sandia Canyon	Sandia Tributary below Sigma	E122.3	2005	2005	F	WT	Chromium	4	3	75	1.5	1	1.9
Sandia Canyon	Sandia Tributary below Sigma	E122.3	2005	2005	UF	WT	Chromium	4	4	100	3.0	1.3	4.5
Sandia Canyon	Sandia below Wetlands	E123	2001	2005	F	WT	Chromium	16	15	94	4.2	2.1	6.1
Sandia Canyon	Sandia below Wetlands	E123	2001	2005	UF	WT	Chromium	17	17	100	270	34	506
Sandia Canyon	Sandia above Firing Range	E124	2002	2005	F	WT	Chromium	9	9	100	6.4	2.2	8.5
Sandia Canyon	Sandia above Firing Range	E124	2002	2005	UF	WT	Chromium	9	9	100	300	22	1230
Sandia Canyon	Sandia above SR-4	E125	2005	2005	F	WT	Chromium	1	1	100	272	272	272
Sandia Canyon	Sandia above SR-4	E125	2005	2005	UF	WT	Chromium	1	1	100	270	270	270

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Sandia Canyon	SCC-1		1997	1997	F	WS	Chromium	1	0	0	-	-	-
Sandia Canyon	SCC-2		1997	1997	F	WS	Chromium	1	0	0	-	-	-
Sandia Canyon	SCC-3		1997	1997	F	WS	Chromium	1	0	0	-	-	-
Sandia Canyon	SCC-4		1997	1997	F	WS	Chromium	1	0	0	-	-	-
Sandia Canyon	Sandia right fork at Power Plant	E121	2003	2005	F	WS	Chromium	4	4	100	4.48	3.14	7.18
Sandia Canyon	Sandia right fork at Power Plant	E121	2005	2005	UF	WS	Chromium	2	2	100	5.5	5.3	5.7
Sandia Canyon	SCS-1	W1CS	1997	2001	F	WS	Chromium	3	1	33	3.31	3.31	3.31
Sandia Canyon	SCS-1	W1CS	1993	1994	NA	WS	Chromium	2	1	50	22	22	22
Sandia Canyon	SCS-1	W1CS	1978	1996	UF	WS	Chromium	11	9	82	666	14	5380
Sandia Canyon	Sandia below Wetlands	E123	2002	2005	F	WS	Chromium	4	4	100	5.2	3.8	8.1
Sandia Canyon	Sandia below Wetlands	E123	2005	2005	UF	WS	Chromium	1	1	100	12.2	12.2	12.2
Sandia Canyon	SCS-2	W2CS	1997	2005	F	WS	Chromium	9	8	89	10.3	7.7	18.0
Sandia Canyon	SCS-2	W2CS	1993	1994	NA	WS	Chromium	2	2	100	386	12	760
Sandia Canyon	SCS-2	W2CS	1974	1974	UF	WS	Chromium VI	1	1	100	1000	1000	1000
Sandia Canyon	SCS-2	W2CS	1978	2005	UF	WS	Chromium	9	9	100	25	1	97
Sandia Canyon	SCS-3	W3CS	1997	2001	F	WS	Chromium	5	2	40	9.3	9	9.7
Sandia Canyon	SCS-3	W3CS	1993	1994	NA	WS	Chromium	2	2	100	14	11	17
Sandia Canyon	SCS-3	W3CS	1978	1996	UF	WS	Chromium	11	11	100	24	1	67

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Sandia Canyon	Sandia Spring	GSSW	1998	2005	Spring	F	WG	Chromium	7	2	29	2.1	1.1	3
Sandia Canyon	Sandia Spring	GSSW	1993	1994	Spring	NA	WG	Chromium	2	0	0	-	-	-
Sandia Canyon	Sandia Spring	GSSW	1986	2005	Spring	UF	WG	Chromium	11	6	55	4	1	13

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Sandia Canyon	R-11	G11R	2006	2006	Regional	855	F	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-11	G11R	2005	2005	Regional	855	F	WG	Chromium	5	5	100	19.6	17.2	21.2
Sandia Canyon	R-11	G11R	2006	2006	Regional	855	UF	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-11	G11R	2005	2005	Regional	855	UF	WG	Chromium	11	11	100	20	17	22
Sandia Canyon	PM-3	G3MP	2006	2006	Regional	956	F	WG	Chromium VI	2	2	100	4.6	4.5	4.7
Sandia Canyon	PM-3	G3MP	2006	2006	Regional	956	F	WG	Chromium	2	2	100	4.4	4.4	4.4
Sandia Canyon	PM-3	G3MP	1993	1993	Regional	956	NA	WG	Chromium	1	0	0	-	-	-
Sandia Canyon	PM-3	G3MP	1977	2006	Regional	956	UF	WG	Chromium	25	21	84	4.9	1.9	10
Sandia Canyon	PM-3	G3MP	2006	2006	Regional	956	UF	WG	Chromium VI	2	2	100	4.55	4.5	4.6
Sandia Canyon	R-12	SA-00006	2006	2006	Regional	810.8	F	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-12	SA-00006	1998	2005	Regional	810.8	F	WG	Chromium	7	1	14	0.78	0.78	0.78
Sandia Canyon	R-12	SA-00006	2006	2006	Regional	810.8	UF	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-12	SA-00006	1998	2005	Regional	810.8	UF	WG	Chromium	10	7	70	3.4	1.1	9.3
Sandia Canyon	PM-1	G1MP	2006	2006	Regional	945	F	WG	Chromium VI	1	1	100	4.1	4.1	4.1
Sandia Canyon	PM-1	G1MP	2006	2006	Regional	945	F	WG	Chromium	1	1	100	3.9	3.9	3.9
Sandia Canyon	PM-1	G1MP	1993	1994	Regional	945	NA	WG	Chromium	2	1	50	4	4	4
Sandia Canyon	PM-1	G1MP	1977	2006	Regional	945	UF	WG	Chromium	23	18	78	4.7	1.6	10
Sandia Canyon	PM-1	G1MP	2006	2006	Regional	945	UF	WG	Chromium VI	1	1	100	3.9	3.9	3.9
Sandia Canyon	R-10a	GR10A	2006	2006	Regional		F	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-10a	GR10A	2005	2005	Regional		F	WG	Chromium	1	1	100	4.5	4.5	4.5
Sandia Canyon	R-10a	GR10A	2006	2006	Regional		UF	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-10a	GR10A	2005	2006	Regional		UF	WG	Chromium	7	7	100	4.2	1.2	8.9
Sandia Canyon	R-10	GR10	2005	2005	Regional		UF	WG	Chromium	2	2	100	4.1	3	5.2

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	468.1	F	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-12	SA-00006	1998	2005	Intermediate	468.1	F	WG	Chromium	8	1	13	216	216	216
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	468.1	UF	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-12	SA-00006	1998	2005	Intermediate	468.1	UF	WG	Chromium	10	4	40	3.7	0.5	6.3
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	507	F	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-12	SA-00006	2000	2001	Intermediate	507	F	WG	Chromium	4	0	0	-	-	-
Sandia Canyon	R-12	SA-00006	2006	2006	Intermediate	507	UF	WG	Chromium VI	1	0	0	-	-	-
Sandia Canyon	R-12	SA-00006	2000	2004	Intermediate	507	UF	WG	Chromium	6	2	33	5.7	3.7	7.6

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Mortandad Canyon	TA-55 NW above Effluent Canyon	E196	2001	2003	F	WT	Chromium	3	0	0	-	-	-
Mortandad Canyon	TA-55 NW above Effluent Canyon	E196	1999	2003	UF	WT	Chromium	7	4	57	6.865	1.82	21.3
Mortandad Canyon	Ten Site below MDA C	E201.3	2004	2005	F	WT	Chromium	7	5	71	3.212	1.3	5.1
Mortandad Canyon	Ten Site below MDA C	E201.3	2004	2005	UF	WT	Chromium	7	7	100	19.2	5.5	38.8
Mortandad Canyon	Ten Site above Mortandad	E201.5	2004	2005	F	WT	Chromium	5	2	40	3.1	2.8	3.4
Mortandad Canyon	Ten Site above Mortandad	E201.5	2004	2005	UF	WT	Chromium	5	5	100	23.6	6.3	43.8
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2002	2005	F	WT	Chromium	10	6	60	2.26	1.6	3.5
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2002	2005	UF	WT	Chromium	10	10	100	23.5	7.7	37.6
Mortandad Canyon	Mortandad above Ten Site	E201	2003	2005	F	WT	Chromium	3	3	100	2.7	1.6	3.8
Mortandad Canyon	Mortandad above Ten Site	E201	2003	2005	UF	WT	Chromium	3	3	100	64.9	22.6	148
Mortandad Canyon	Mortandad above Sediment Traps	E202	2005	2005	F	WT	Chromium	2	2	100	3.25	3	3.5
Mortandad Canyon	Mortandad above Sediment Traps	E202	2005	2005	UF	WT	Chromium	2	2	100	18.15	12.8	23.5

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Mortandad Canyon	M-1W	PW1M	2005	2005	F	WS	Chromium	2	1	50	7.8	7.8	7.8
Mortandad Canyon	M-1W	PW1M	2005	2005	UF	WS	Chromium	2	2	100	15.5	9.4	21.5
Mortandad Canyon	M-1E	PE1M	2005	2005	F	WS	Chromium	2	1	50	4	4	4
Mortandad Canyon	M-1E	PE1M	2005	2005	UF	WS	Chromium	2	2	100	6.0	5.1	6.8
Mortandad Canyon	E-1FW	PWF1E	2005	2005	F	WS	Chromium	2	2	100	20.3	4.2	36.4
Mortandad Canyon	E-1FW	PWF1E	2005	2005	UF	WS	Chromium	2	2	100	27.4	8.4	46.3
Mortandad Canyon	E-1W	PW1E	2005	2005	F	WS	Chromium	3	2	67	7.35	7.3	7.4
Mortandad Canyon	E-1W	PW1E	2005	2005	UF	WS	Chromium	3	2	67	7.35	7	7.7
Mortandad Canyon	E-1E	PE1E	2005	2005	F	WS	Chromium	2	1	50	2.5	2.5	2.5
Mortandad Canyon	E-1E	PE1E	2005	2005	UF	WS	Chromium	2	1	50	3.3	3.3	3.3
Mortandad Canyon	TA-50		1998	1998	UF	WS	Chromium	1	0	0	-	-	-
Mortandad Canyon	TS-1W	PW1ST	2005	2005	F	WS	Chromium	2	1	50	1.3	1.3	1.3
Mortandad Canyon	TS-1W	PW1ST	2005	2005	UF	WS	Chromium	2	2	100	12.1	3.3	20.8
Mortandad Canyon	TS-2E	PE2ST	2005	2005	F	WS	Chromium	2	1	50	1.7	1.7	1.7
Mortandad Canyon	TS-2E	PE2ST	2005	2005	UF	WS	Chromium	2	2	100	1.8	1.4	2.1
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2002	2004	F	WS	Chromium	5	2	40	2.055	1.72	2.39
Mortandad Canyon	Mortandad at GS-1	W1SG	1997	2001	F	WS	Chromium	8	3	38	5.5	2.2	7.2
Mortandad Canyon	Mortandad at GS-1	W1SG	1993	1994	NA	WS	Chromium	2	1	50	5	5	5
Mortandad Canyon	Mortandad at GS-1	W1SG	1978	2000	UF	WS	Chromium	11	5	45	8	1	16
Mortandad Canyon	Mortandad at GS-1	W1SG	1974	1974	UF	WS	Chromium VI	1	1	100	5000	5000	5000
Mortandad Canyon	M-2E	PE2M	2005	2005	F	WS	Chromium	2	2	100	1.7	1.1	2.3
Mortandad Canyon	M-2E	PE2M	2005	2005	UF	WS	Chromium	2	1	50	2.4	2.4	2.4
Mortandad Canyon	Rio Grande at Mortandad	STMR	2000	2000	UF	WS	Chromium	1	0	0	-	-	-
Mortandad Canyon	Mortandad at Rio Grande (A-11)	WGRM	1997	2003	F	WS	Chromium	5	0	0	-	-	-
Mortandad Canyon	Mortandad at Rio Grande (A-11)	WGRM	1993	1993	NA	WS	Chromium	1	1	100	4	4	4
Mortandad Canyon	Mortandad at Rio Grande (A-11)	WGRM	1986	1996	UF	WS	Chromium	8	3	38	4	3	5

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2005	2005	F	WM	Chromium	1	0	0	-	-	-
Mortandad Canyon	Mortandad below Effluent Canyon	E200	2005	2005	UF	WM	Chromium	1	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix	Analyte
Mortandad Canyon	R-1	G01R	2006	2006	Regional	1031.1	F	WG	Chromium VI
Mortandad Canyon	R-1	G01R	2005	2005	Regional	1031.1	F	WG	Chromium
Mortandad Canyon	R-1	G01R	2006	2006	Regional	1031.1	UF	WG	Chromium VI
Mortandad Canyon	R-1	G01R	2005	2006	Regional	1031.1	UF	WG	Chromium
Mortandad Canyon	Test Well 8	G8WT	2006	2006	Regional	953	F	WG	Chromium VI
Mortandad Canyon	Test Well 8	G8WT	1993	1994	Regional	953	NA	WG	Chromium
Mortandad Canyon	Test Well 8	G8WT	1978	2005	Regional	953	UF	WG	Chromium
Mortandad Canyon	Test Well 8	G8WT	2006	2006	Regional	953	UF	WG	Chromium VI
Mortandad Canyon	PM-5	G5MP	2006	2006	Regional	1440	F	WG	Chromium VI
Mortandad Canyon	PM-5	G5MP	2006	2006	Regional	1440	F	WG	Chromium
Mortandad Canyon	PM-5	G5MP	1993	1994	Regional	1440	NA	WG	Chromium
Mortandad Canyon	PM-5	G5MP	1982	2006	Regional	1440	UF	WG	Chromium
Mortandad Canyon	PM-5	G5MP	2006	2006	Regional	1440	UF	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1204.5	F	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1204.5	F	WG	Chromium
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1204.5	UF	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1204.5	UF	WG	Chromium
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1288.5	F	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1288.5	F	WG	Chromium
Mortandad Canyon	R-14	G14R	2006	2006	Regional	1288.5	UF	WG	Chromium VI
Mortandad Canyon	R-14	G14R	2004	2005	Regional	1288.5	UF	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	995.5	F	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	995.5	F	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	995.5	UF	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	995.5	UF	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	1112.4	F	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	1112.4	F	WG	Chromium
Mortandad Canyon	R-33	G33R	2006	2006	Regional	1112.4	UF	WG	Chromium VI
Mortandad Canyon	R-33	G33R	2005	2005	Regional	1112.4	UF	WG	Chromium
Mortandad Canyon	R-15	MO-00051	2006	2006	Regional	958.6	F	WG	Chromium VI
Mortandad Canyon	R-15	MO-00051	2000	2005	Regional	958.6	F	WG	Chromium
Mortandad Canyon	R-15	MO-00051	2006	2006	Regional	958.6	UF	WG	Chromium VI
Mortandad Canyon	R-15	MO-00051	2000	2005	Regional	958.6	UF	WG	Chromium
Mortandad Canyon	R-15	MO-00051	1999	1999	Regional	1100	F	WG	Chromium
Mortandad Canyon	R-15	MO-00051	1999	1999	Regional	1100	UF	WG	Chromium
Mortandad Canyon	R-28	G28R	2006	2006	Regional	946.2	F	WG	Chromium VI
Mortandad Canyon	R-28	G28R	2005	2006	Regional	946.2	F	WG	Chromium
Mortandad Canyon	R-28	G28R	2006	2006	Regional	946.2	UF	WG	Chromium VI
Mortandad Canyon	R-28	G28R	2005	2006	Regional	946.2	UF	WG	Chromium
Mortandad Canyon	R-34	G34R	2006	2006	Regional	895.15	F	WG	Chromium VI
Mortandad Canyon	R-34	G34R	2005	2005	Regional	895.15	F	WG	Chromium
Mortandad Canyon	R-34	G34R	2006	2006	Regional	895.15	UF	WG	Chromium VI
Mortandad Canyon	R-34	G34R	2005	2006	Regional	895.15	UF	WG	Chromium
Mortandad Canyon	R-13	MO-10097	2006	2006	Regional	958.3	F	WG	Chromium VI
Mortandad Canyon	R-13	MO-10097	2002	2003	Regional	958.3	F	WG	Chromium
Mortandad Canyon	R-13	MO-10097	2006	2006	Regional	958.3	UF	WG	Chromium VI
Mortandad Canyon	R-13	MO-10097	2002	2005	Regional	958.3	UF	WG	Chromium
Mortandad Canyon	PM-4	G4MP	1993	1994	Regional	1260	NA	WG	Chromium

Mortandad Canyon	PM-4	G4MP	1982	2005	Regional	1260	UF	WG	Chromium
Mortandad Canyon	R-21	G21R	2004	2005	Regional	888.8	F	WG	Chromium
Mortandad Canyon	R-21	G21R	2004	2005	Regional	888.8	UF	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	866.1	F	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	866.1	UF	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	1018.4	F	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	1018.4	UF	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	1238	F	WG	Chromium
Mortandad Canyon	R-16	G16R	2004	2005	Regional	1238	UF	WG	Chromium
Mortandad Canyon	R-16a	GR16A	2005	2005	Regional		F	WG	Chromium
Mortandad Canyon	R-16a	GR16A	2005	2005	Regional		UF	WG	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
1	0	0	-	-	-
4	3	75	5.0	4.6	5.6
1	0	0	-	-	-
10	9	90	5.2	et	6.9
1	1	100	2.3	2.3	2.3
2	0	0	-	-	-
23	10	43	4.3	1.8	8.6
1	1	100	2.3	2.3	2.3
1	1	100	5.3	5.3	5.3
1	1	100	5.5	5.5	5.5
2	1	50	6	6	6
18	17	94	7	1	28
1	1	100	5.5	5.5	5.5
1	0	0	-	-	-
4	4	100	1.9	1.0	3.0
1	0	0	-	-	-
8	7	88	4.3	1.6	7.7
1	0	0	-	-	-
4	1	25	1.03	1.03	1.03
1	0	0	-	-	-
8	2	25	2.16	2.1	2.21
1	0	0	-	-	-
2	2	100	7.1	6	8.2
1	0	0	-	-	-
2	2	100	12.25	12.2	12.3
1	0	0	-	-	-
2	2	100	5.5	5.5	5.5
1	0	0	-	-	-
3	3	100	6.8	6.1	7.6
1	0	0	-	-	-
7	6	86	5.1	2.6	7.7
1	0	0	-	-	-
15	14	93	7.4	3.6	14.7
1	0	0	-	-	-
1	1	100	21.8	21.8	21.8
1	0	0	-	-	-
9	9	100	383	330	404
1	0	0	-	-	-
12	12	100	391	350	416
2	0	0	-	-	-
7	6	86	3.7	3.4	4
2	0	0	-	-	-
14	14	100	5.6	3.5	11
1	0	0	-	-	-
5	3	60	3.4	2.7	3.8
1	0	0	-	-	-
10	8	80	4.145	2.99	5.9
2	1	50	6	6	6

13	13	100	7.1	4.7	12
6	5	83	2.2	1.6	3
10	7	70	2.2	1.05	2.8
4	0	0	-	-	-
8	2	25	4.1	4.1	4.1
5	1	20	0.93	0.93	0.93
9	5	56	5.0	1.1	8.9
5	2	40	0.99	0.97	1
9	3	33	1.9	1.2	3.2
1	1	100	4.7	4.7	4.7
3	3	100	3.4	1.2	5.3

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix	Analyte
Mortandad Canyon	MCOI-8	I-8	2005	2005	Intermediate	686	UF	WG	Chromium
Mortandad Canyon	MCOI-4	I-4	2005	2005	Intermediate	499	F	WG	Chromium
Mortandad Canyon	MCOI-4	I-4	2005	2005	Intermediate	499	UF	WG	Chromium
Mortandad Canyon	MCOBT-4.4	G44M	2002	2003	Intermediate	485.4	F	WG	Chromium
Mortandad Canyon	MCOBT-4.4	G44M	2002	2005	Intermediate	485.4	UF	WG	Chromium
Mortandad Canyon	MCOI-5	I-5	2005	2005	Intermediate	689	F	WG	Chromium
Mortandad Canyon	MCOI-5	I-5	2005	2005	Intermediate	689	UF	WG	Chromium
Mortandad Canyon	MCOI-6	I-6	2006	2006	Intermediate	686	F	WG	Chromium VI
Mortandad Canyon	MCOI-6	I-6	2005	2005	Intermediate	686	F	WG	Chromium
Mortandad Canyon	MCOI-6	I-6	2006	2006	Intermediate	686	UF	WG	Chromium VI
Mortandad Canyon	MCOI-6	I-6	2005	2005	Intermediate	686	UF	WG	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
1	0	0	-	-	-
2	2	100	27.2	25	29.4
3	3	100	75.1	29	135
3	3	100	44.2	37.4	53.5
4	4	100	38	15	54
2	2	100	3.3	3.1	3.5
2	2	100	658	545	770
1	0	0	-	-	-
4	4	100	53.8	48.4	58.2
1	0	0	-	-	-
7	7	100	53.9	48	59

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix
Mortandad Canyon	MCO-0.6	GM06	2005	2005	Alluvial	1.05	F	WG
Mortandad Canyon	MCO-0.6	GM06	2005	2005	Alluvial	1.05	UF	WG
Mortandad Canyon	MCO-2	G2CM	2000	2000	Alluvial	2	F	WG
Mortandad Canyon	MCO-2	G2CM	1998	2000	Alluvial	2	UF	WG
Mortandad Canyon	MCA-4	A-4	2005	2005	Alluvial	1.75	F	WG
Mortandad Canyon	MCA-4	A-4	2005	2005	Alluvial	1.75	UF	WG
Mortandad Canyon	MCA-1	A-1	2005	2005	Alluvial	2.4	F	WG
Mortandad Canyon	MCA-1	A-1	2005	2005	Alluvial	2.4	UF	WG
Mortandad Canyon	MCA-5	A-5	2005	2005	Alluvial	3.4	F	WG
Mortandad Canyon	MCA-5	A-5	2005	2005	Alluvial	3.4	UF	WG
Mortandad Canyon	MCO-3	G3CM	1998	2004	Alluvial	2	F	WG
Mortandad Canyon	MCO-3	G3CM	1978	2004	Alluvial	2	UF	WG
Mortandad Canyon	MCO-4	G4CM	1993	1994	Alluvial	14	NA	WG
Mortandad Canyon	MCO-4	G4CM	1978	1992	Alluvial	14	UF	WG
Mortandad Canyon	MCO-4B	G4BM	1995	2005	Alluvial	8.9	F	WG
Mortandad Canyon	MCO-4B	G4BM	1990	2005	Alluvial	8.9	UF	WG
Mortandad Canyon	MCO-5	G5CM	1998	2005	Alluvial	21	F	WG
Mortandad Canyon	MCO-5	G5CM	1993	1994	Alluvial	21	NA	WG
Mortandad Canyon	MCO-5	G5CM	1978	2005	Alluvial	21	UF	WG
Mortandad Canyon	MCO-6B	G6BM	1995	1999	Alluvial	22	F	WG
Mortandad Canyon	MCO-6B	G6BM	1990	1999	Alluvial	22	UF	WG
Mortandad Canyon	MCO-6	G6CM	1995	2005	Alluvial	27	F	WG
Mortandad Canyon	MCO-6	G6CM	1993	1994	Alluvial	27	NA	WG
Mortandad Canyon	MCO-6	G6CM	1978	2005	Alluvial	27	UF	WG
Mortandad Canyon	MCWB-6.5E		1998	1998	Alluvial	35	UF	WG
Mortandad Canyon	MCA-2	A-2	2005	2005	Alluvial	45	F	WG
Mortandad Canyon	MCA-2	A-2	2005	2005	Alluvial	45	UF	WG
Mortandad Canyon	MCO-7A	G7AM	1995	1998	Alluvial	34.8	F	WG
Mortandad Canyon	MCO-7A	G7AM	1990	1998	Alluvial	34.8	UF	WG
Mortandad Canyon	MCO-7	G7CM	1995	2005	Alluvial	39	F	WG
Mortandad Canyon	MCO-7	G7CM	1993	1994	Alluvial	39	NA	WG
Mortandad Canyon	MCO-7	G7CM	1978	2005	Alluvial	39	UF	WG
Mortandad Canyon	MT-1	G1TM	2005	2005	Alluvial	39	F	WG
Mortandad Canyon	MT-1	G1TM	2005	2005	Alluvial	39	UF	WG
Mortandad Canyon	MCO-7.5	G57M	1998	2005	Alluvial	35	F	WG
Mortandad Canyon	MCO-7.5	G57M	1994	1994	Alluvial	35	NA	WG
Mortandad Canyon	MCO-7.5	G57M	1978	2005	Alluvial	35	UF	WG
Mortandad Canyon	MCO-7.5	G57M	1974	1974	Alluvial	35	UF	WG
Mortandad Canyon	MCWB-7.7B		1998	1998	Alluvial	55	UF	WG
Mortandad Canyon	MT-3	G3TM	1998	2005	Alluvial	44	F	WG
Mortandad Canyon	MT-3	G3TM	1998	2005	Alluvial	44	UF	WG
Mortandad Canyon	MT-4	G4TM	1995	2005	Alluvial	54	F	WG
Mortandad Canyon	MT-4	G4TM	1994	2005	Alluvial	54	UF	WG

Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Chromium	1	1	100	6	6	6
Chromium	1	1	100	12.9	12.9	12.9
Chromium	1	1	100	13	13	13
Chromium	2	2	100	47	17	77
Chromium	1	1	100	43	43	43
Chromium	1	1	100	101	101	101
Chromium	2	1	50	4.6	4.6	4.6
Chromium	2	1	50	6.5	6.5	6.5
Chromium	1	1	100	3.7	3.7	3.7
Chromium	1	1	100	5.6	5.6	5.6
Chromium	8	4	50	3.9	1.9	7
Chromium	14	9	64	6.8	1.4	18.8
Chromium	2	2	100	24	20	28
Chromium	10	5	50	18.8	2	51
Chromium	10	4	40	1.3	0.7	2.1
Chromium	14	4	29	5.7	1.34	17.3
Chromium	10	4	40	1.1	0.7	1.8
Chromium	2	1	50	13	13	13
Chromium	26	10	38	7	1	21
Chromium	3	0	0	-	-	-
Chromium	5	2	40	26.3	22.5	30
Chromium	15	4	27	1.4	0.9	1.8
Chromium	2	1	50	11	11	11
Chromium	26	9	35	19	1	103
Chromium	1	1	100	4.2	4.2	4.2
Chromium	3	1	33	1.1	1.1	1.1
Chromium	3	3	100	2.0	1.8	2.2
Chromium	4	0	0	-	-	-
Chromium	8	5	63	19	7	28
Chromium	13	4	31	3	1	6
Chromium	2	2	100	23.5	20	27
Chromium	27	12	44	9.4	1.3	23.2
Chromium	2	2	100	2.25	2.1	2.4
Chromium	2	2	100	2.45	2.1	2.8
Chromium	7	4	57	2	1	4
Chromium	1	1	100	17	17	17
Chromium	17	9	53	13	1	45
Chromium VI	1	1	100	1000	1000	1000
Chromium	1	0	0	-	-	-
Chromium	4	2	50	3.5	1.7	5.2
Chromium	5	3	60	3.2	1.4	6.1
Chromium	3	2	67	4.3	1.6	7
Chromium	4	3	75	7.3	1.9	11

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix
Los Alamos Canyon	Los Alamos above Ice Rink	E025	1997	2000	F	WT
Los Alamos Canyon	Los Alamos above Ice Rink	E025	1997	2000	UF	WT
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	F	WT
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	UF	WT
Los Alamos Canyon	DP above TA-21	E038	2001	2005	F	WT
Los Alamos Canyon	DP above TA-21	E038	2001	2005	UF	WT
Los Alamos Canyon	DP below Meadow at TA-21	E039	2000	2005	F	WT
Los Alamos Canyon	DP below Meadow at TA-21	E039	2000	2005	UF	WT
Los Alamos Canyon	DP above Los Alamos Canyon	E040	1999	2005	F	WT
Los Alamos Canyon	DP above Los Alamos Canyon	E040	1997	2005	UF	WT
Los Alamos Canyon	Los Alamos above DP Canyon	E030	2001	2005	F	WT
Los Alamos Canyon	Los Alamos above DP Canyon	E030	1999	2005	UF	WT
Los Alamos Canyon	Los Alamos above SR-4	E042	1995	2005	F	WT
Los Alamos Canyon	Los Alamos above SR-4	E042	1997	2005	UF	WT
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	F	WT
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	UF	WT
Los Alamos Canyon	Los Alamos Canyon near Otowi Bridge	E110	2003	2003	UF	WT

Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Chromium	4	1	25	0.75	0.75	0.75
Chromium	4	3	75	2.8	1.4	4.3
Chromium	6	0	0	-	-	-
Chromium	6	6	100	89	17	238
Chromium	19	11	58	4.9	1.7	27.9
Chromium	18	18	100	32	11	56
Chromium	13	10	77	2.5	1.7	4.4
Chromium	13	13	100	35	5	107
Chromium	13	7	54	4	2	11
Chromium	19	17	89	53	6	130
Chromium	14	5	36	2.2	1.5	4.2
Chromium	20	20	100	93	3	719
Chromium	31	11	35	4	1	25
Chromium	31	29	94	66	5	350
Chromium	7	4	57	2.7	1.2	6.2
Chromium	7	7	100	81	4	300
Chromium	1	1	100	528	528	528

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix
Los Alamos Canyon	Los Alamos above Reservoir	LA-10126	2001	2001	F	WS
Los Alamos Canyon	Los Alamos above Reservoir	LA-10126	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos below Reservoir	LA-10034	2002	2002	F	WS
Los Alamos Canyon	Los Alamos below Reservoir	LA-10034	2002	2002	UF	WS
Los Alamos Canyon	Los Alamos near LAO-B	LA-10006	2000	2000	F	WS
Los Alamos Canyon	Los Alamos near LAO-B	LA-10006	2000	2000	UF	WS
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2003	F	WS
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos near LAO-0.3	LA-10064	2001	2001	F	WS
Los Alamos Canyon	Los Alamos near LAO-0.3	LA-10064	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos near LAO-0.6	LA-10005	2000	2000	F	WS
Los Alamos Canyon	Los Alamos near LAO-0.6	LA-10005	2000	2000	UF	WS
Los Alamos Canyon	DP below Knights of Columbus	21-10929	2001	2002	F	WS
Los Alamos Canyon	DP below Knights of Columbus	21-10929	2001	2002	UF	WS
Los Alamos Canyon	DPS-1	W1PD	1997	2000	F	WS
Los Alamos Canyon	DPS-1	W1PD	1993	1994	NA	WS
Los Alamos Canyon	DPS-1	W1PD	1978	1996	UF	WS
Los Alamos Canyon	DPS-1	W1PD	1974	1974	UF	WS
Los Alamos Canyon	DPS-4	W4PD	1997	1998	F	WS
Los Alamos Canyon	DPS-4	W4PD	1994	1994	NA	WS
Los Alamos Canyon	DPS-4	W4PD	1978	1996	UF	WS
Los Alamos Canyon	Los Alamos near LAO-1	LA-10065	2001	2001	F	WS
Los Alamos Canyon	Los Alamos near LAO-1	LA-10065	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos at Upper GS	WGAL	1997	1999	F	WS
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2001	F	WS
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos Canyon Weir above SR-4	E049	2003	2003	F	WS
Los Alamos Canyon	Los Alamos at SR-4	W4SL	1997	1997	UF	WS
Los Alamos Canyon	Los Alamos near LLAO-1	LA-00218	2000	2002	F	WS
Los Alamos Canyon	Los Alamos near LLAO-1	LA-00218	2000	2002	UF	WS
Los Alamos Canyon	Los Alamos 125 ft. above Guaje	GU-10004	2001	2001	F	WS
Los Alamos Canyon	Los Alamos 125 ft. above Guaje	GU-10004	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos 285 ft. above Guaje	LA-10057	2001	2001	F	WS
Los Alamos Canyon	Los Alamos 285 ft. above Guaje	LA-10057	2001	2001	UF	WS
Los Alamos Canyon	Los Alamos at Rio Grande	WGRL	1993	1997	UF	WS

Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Chromium	2	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	3	3	100	18.2	5.6	30.1
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	3	1	33	7	7	7
Chromium	2	1	50	17	17	17
Chromium	7	4	57	49	1	177
Chromium VI	1	1	100	3000	3000	3000
Chromium	2	0	0	-	-	-
Chromium	1	1	100	8	8	8
Chromium	9	7	78	55	1	220
Chromium	3	0	0	-	-	-
Chromium	3	0	0	-	-	-
Chromium	2	1	50	9	9	9
Chromium	1	0	0	-	-	-
Chromium	1	1	100	4.77	4.77	4.77
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	8	0	0	-	-	-
Chromium	8	1	13	4.7	4.7	4.7
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	2	0	0	-	-	-
Chromium	2	1	50	4	4	4

Watershed	Station Name	Location Synonym	First Year	Last Year	F/UF	Field Martix
Los Alamos Canyon	Los Alamos above Ice Rink	E025	2001	2001	F	WM
Los Alamos Canyon	Los Alamos above Ice Rink	E025	2001	2001	UF	WM
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	F	WM
Los Alamos Canyon	Los Alamos below Ice Rink	E026	2001	2005	UF	WM
Los Alamos Canyon	DPS-1	W1PD	2001	2001	F	WM
Los Alamos Canyon	DP above Los Alamos Canyon	E040	2005	2005	UF	WM
Los Alamos Canyon	Los Alamos at Upper GS	WGAL	2001	2001	F	WM
Los Alamos Canyon	Los Alamos above DP Canyon	E030	2005	2005	F	WM
Los Alamos Canyon	Los Alamos above DP Canyon	E030	2005	2005	UF	WM
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2005	F	WM
Los Alamos Canyon	Los Alamos above SR-4	E042	2001	2005	UF	WM
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	F	WM
Los Alamos Canyon	Los Alamos below LA Weir	E050	2001	2005	UF	WM
Los Alamos Canyon	Los Alamos at SR-4	W4SL	2001	2001	F	WM
Los Alamos Canyon	Los Alamos Canyon near Otowi Bridge	E110	2005	2005	F	WM
Los Alamos Canyon	Los Alamos Canyon near Otowi Bridge	E110	2005	2005	UF	WM
Los Alamos Canyon	Los Alamos at Rio Grande	WGRL	2001	2001	F	WM

Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Chromium	6	0	0	-	-	-
Chromium	6	0	0	-	-	-
Chromium	4	0	0	-	-	-
Chromium	5	1	20	2.05	2.05	2.05
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	2	1	50	1.1	1.1	1.1
Chromium	6	0	0	-	-	-
Chromium	7	4	57	4.01	2.04	5.95
Chromium	7	1	14	1.68	1.68	1.68
Chromium	8	3	38	4.54	2.56	5.55
Chromium	1	0	0	-	-	-
Chromium	1	0	0	-	-	-
Chromium	2	2	100	12.9	9.2	16.6
Chromium	1	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	F/UF	Field Martix	Analyte
Los Alamos Canyon	DP Spring	GSPD	1997	2005	Spring	F	WG	Chromium
Los Alamos Canyon	DP Spring	GSPD	1997	2005	Spring	UF	WG	Chromium
Los Alamos Canyon	LA 5.19 Spring		1995	1995	Spring	F	WG	Chromium
Los Alamos Canyon	Los Alamos Spring		1995	1995	Spring	F	WG	Chromium
Los Alamos Canyon	Los Alamos Spring		1998	1998	Spring	UF	WG	Chromium
Los Alamos Canyon	Basalt Spring	GGSB	1998	2005	Spring	F	WG	Chromium
Los Alamos Canyon	Basalt Spring	GGSB	1993	1994	Spring	NA	WG	Chromium
Los Alamos Canyon	Basalt Spring	GGSB	1974	2005	Spring	UF	WG	Chromium
Los Alamos Canyon	Indian Spring	GGSI	1993	1994	Spring	NA	WG	Chromium
Los Alamos Canyon	Indian Spring	GGSI	1991	1995	Spring	UF	WG	Chromium
Los Alamos Canyon	LA-11.2 SPRING		1995	1995	Spring	F	WG	Chromium

Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
10	0	0	-	-	-
7	0	0	-	-	-
1	0	0	-	-	-
1	0	0	-	-	-
1	0	0	-	-	-
16	6	38	1.0	0.5	1.4
2	1	50	5	5	5
22	15	68	4.9	0.4	30
2	1	50	4	4	4
3	1	33	26	26	26
1	0	0	-	-	-

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Los Alamos Canyon	R-7	LA-10041	2001	2002	Regional	915.1	F	WG	Chromium	4	2	50	3.45	1.1	5.8
Los Alamos Canyon	R-7	LA-10041	2001	2005	Regional	915.1	UF	WG	Chromium	8	7	88	4.2	2.1	8.9
Los Alamos Canyon	R-6	G06R	2005	2005	Regional	1205	F	WG	Chromium	3	3	100	3.8	3.4	4
Los Alamos Canyon	R-6	G06R	2005	2005	Regional	1205	UF	WG	Chromium	7	7	100	3.6	3.1	4.2
Los Alamos Canyon	O-4	G4OW	1993	1994	Regional	1115	NA	WG	Chromium	2	1	50	5	5	5
Los Alamos Canyon	O-4	G4OW	1994	2005	Regional	1115	UF	WG	Chromium	9	6	67	5	3	10
Los Alamos Canyon	R-8	72-10000	2004	2004	Regional	711.1	F	WG	Chromium	4	2	50	3.5	2.9	4
Los Alamos Canyon	R-8	72-10000	2004	2005	Regional	711.1	UF	WG	Chromium	9	8	89	5.3	2.2	10.9
Los Alamos Canyon	R-8	72-10000	2004	2004	Regional	825	F	WG	Chromium	4	4	100	2.7	0.8	3.7
Los Alamos Canyon	R-8	72-10000	2004	2005	Regional	825	UF	WG	Chromium	9	9	100	4.2	1.1	10.9
Los Alamos Canyon	R-9	LA-00168	1997	2001	Regional	684	F	WG	Chromium	11	3	27	1.9	1.7	2.1
Los Alamos Canyon	R-9	LA-00168	1997	2005	Regional	684	UF	WG	Chromium	21	20	95	247	2.2	2980
Los Alamos Canyon	LA-5	G5AL	1998	1998	Regional	440	F	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LA-5	G5AL	1993	1994	Regional	440	NA	WG	Chromium	2	2	100	17	8	26
Los Alamos Canyon	LA-5	G5AL	1977	2005	Regional	440	UF	WG	Chromium	22	16	73	6	2	11
Los Alamos Canyon	LA-2	G2AL	1993	1993	Regional	105	NA	WG	Chromium	1	1	100	18	18	18
Los Alamos Canyon	LA-2	G2AL	1977	1991	Regional	105	UF	WG	Chromium	12	11	92	19	9	25
Los Alamos Canyon	LA-1A	GA1L	1993	1994	Regional		NA	WG	Chromium	2	2	100	20	16	23
Los Alamos Canyon	LA-1A	GA1L	1995	1995	Regional		UF	WG	Chromium	1	1	100	34	34	34
Los Alamos Canyon	LA-1B	GB1AL	1993	1994	Regional		NA	WG	Chromium	2	2	100	33	27	39
Los Alamos Canyon	LA-1B	GB1AL	1977	1997	Regional		UF	WG	Chromium	14	11	79	23	10	39
Los Alamos Canyon	Halladay House Well	GWHH	1993	1994	Regional		NA	WG	Chromium	2	2	100	16	13	18
Los Alamos Canyon	Halladay House Well	GWHH	1987	1997	Regional		UF	WG	Chromium	10	10	100	13	0.2	20

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Los Alamos Canyon	LAOI(A)-1.1	G11L	1995	2000	Intermediate	295.2	F	WG	Chromium	5	1	20	0.4	0.4	0.4
Los Alamos Canyon	LAOI(A)-1.1	G11L	1995	2005	Intermediate	295.2	UF	WG	Chromium	5	3	60	3.5	1.1	7.4
Los Alamos Canyon	R-7	LA-10041	2001	2001	Intermediate	350	F	WG	Chromium	2	2	100	1.675	0.95	2.4
Los Alamos Canyon	R-7	LA-10041	2001	2001	Intermediate	350	UF	WG	Chromium	2	2	100	166.5	33	300
Los Alamos Canyon	R-7	LA-10041	2001	2002	Intermediate	378	F	WG	Chromium	4	4	100	2	1	3
Los Alamos Canyon	R-7	LA-10041	2001	2002	Intermediate	378	UF	WG	Chromium	5	4	80	16.0	1.3	48.8
Los Alamos Canyon	LADP-3	G3PD	1995	1995	Intermediate	316	F	WG	Chromium	1	1	100	10	10	10
Los Alamos Canyon	R-6(i)	G6IR	2005	2005	Intermediate	602	F	WG	Chromium	2	1	50	2.2	2.2	2.2
Los Alamos Canyon	R-6(i)	G6IR	2005	2005	Intermediate	602	UF	WG	Chromium	5	4	80	4.0	2.2	8.9
Los Alamos Canyon	LAOI-3.2a	GI32A	2005	2006	Intermediate		UF	WG	Chromium	2	2	100	1.05	1	1.1
Los Alamos Canyon	LAOI-3.2	G32L	2005	2005	Intermediate	153.3	F	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LAOI-3.2	G32L	2005	2005	Intermediate	153.3	UF	WG	Chromium	4	0	0	-	-	-
Los Alamos Canyon	LAOI-7	LAOI7	2005	2005	Intermediate		UF	WG	Chromium	7	6	86	2.05	1.5	2.8
Los Alamos Canyon	R-9i	LA-10029	2000	2001	Intermediate	198.8	F	WG	Chromium	4	3	75	2.6	1.4	3.4
Los Alamos Canyon	R-9i	LA-10029	2000	2005	Intermediate	198.8	UF	WG	Chromium	8	6	75	3.8	0.4	9.6
Los Alamos Canyon	R-9i	LA-10029	2000	2001	Intermediate	278.8	F	WG	Chromium	4	1	25	1.1	1.1	1.1
Los Alamos Canyon	R-9i	LA-10029	2000	2004	Intermediate	278.8	UF	WG	Chromium	6	5	83	5.3	0.9	11

Watershed	Station Name	Location Synonym	First Year	Last Year	Hydro Zone	Port Depth (feet)	F/UF	Field Martix	Analyte	Number of Analyses	Number of Detects	Percent Detects %	Detect Average (ug/L)	Detect Minimum (ug/L)	Detect Maximum (ug/L)
Los Alamos Canyon	LAO-B	GBAL	1995	2005	Alluvial	11.84	F	WG	Chromium	17	1	6	0.64	0.64	0.64
Los Alamos Canyon	LAO-B	GBAL	1994	2005	Alluvial	11.84	UF	WG	Chromium	16	4	25	0.75	0.4	1.3
Los Alamos Canyon	LAO-C	GCOL	1995	2005	Alluvial	3	F	WG	Chromium	11	3	27	0.824	0.509	1.02
Los Alamos Canyon	LAO-C	GCOL	1993	1994	Alluvial	3	NA	WG	Chromium	2	1	50	2000	2000	2000
Los Alamos Canyon	LAO-C	GCOL	1978	2005	Alluvial	3	UF	WG	Chromium	29	8	28	27	0.78	197
Los Alamos Canyon	LAO-0.3		1994	1998	Alluvial	5.9	UF	WG	Chromium	2	0	0	-	-	-
Los Alamos Canyon	LAO-0.6		1994	1998	Alluvial		UF	WG	Chromium	2	0	0	-	-	-
Los Alamos Canyon	LAO-0.7	G7OL	1998	2003	Alluvial	15	F	WG	Chromium	5	1	20	0.885	0.885	0.885
Los Alamos Canyon	LAO-0.7	G7OL	1993	1993	Alluvial	15	NA	WG	Chromium	1	1	100	29	29	29
Los Alamos Canyon	LAO-0.7	G7OL	1994	2003	Alluvial	15	UF	WG	Chromium	13	1	8	30	30	30
Los Alamos Canyon	LAO-0.8		1994	1994	Alluvial		UF	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LAOR-1		1994	1994	Alluvial		UF	WG	Chromium	2	0	0	-	-	-
Los Alamos Canyon	LAO-0.91		1994	1998	Alluvial		UF	WG	Chromium	2	0	0	-	-	-
Los Alamos Canyon	LAO-1	G1OL	1995	2005	Alluvial	8	F	WG	Chromium	10	9	90	11	5	17
Los Alamos Canyon	LAO-1	G1OL	1993	1994	Alluvial	8	NA	WG	Chromium	2	1	50	4	4	4
Los Alamos Canyon	LAO-1	G1OL	1978	2005	Alluvial	8	UF	WG	Chromium	24	21	88	18	3	113
Los Alamos Canyon	LAO-1	G1OL	1974	1974	Alluvial	8	UF	WG	Chromium VI	2	2	100	1837500	1575000	2100000
Los Alamos Canyon	LAO-1.2		1998	1998	Alluvial		F	WG	Chromium	1	1	100	12	12	12
Los Alamos Canyon	LAUZ-1	G1ZL	1997	2005	Alluvial	5.35	F	WG	Chromium	11	2	18	0.541	0.39	0.692
Los Alamos Canyon	LAUZ-1	G1ZL	1995	2005	Alluvial	5.35	UF	WG	Chromium	15	5	33	6.6	0.3	28.9
Los Alamos Canyon	LAUZ-2		1997	1997	Alluvial	5.27	F	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LAUZ-2		1998	1998	Alluvial	5.27	UF	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LAO-1.6G	G16G	1996	2005	Alluvial	10.47	F	WG	Chromium	13	9	69	1.6	0.9	3.3
Los Alamos Canyon	LAO-1.6G	G16G	1997	2005	Alluvial	10.47	UF	WG	Chromium	10	6	60	2.1	0.9	3.6
Los Alamos Canyon	LAO-2	G2OL	1998	2005	Alluvial	7	F	WG	Chromium	9	4	44	4	1	12
Los Alamos Canyon	LAO-2	G2OL	1993	2000	Alluvial	7	NA	WG	Chromium	3	3	100	150	9	400
Los Alamos Canyon	LAO-2	G2OL	1978	2005	Alluvial	7	UF	WG	Chromium	26	11	42	2.9	1.1	9.0
Los Alamos Canyon	LAO-3A	GA3L	1995	2004	Alluvial	4.7	F	WG	Chromium	13	2	15	7.4	2.8	12.0
Los Alamos Canyon	LAO-3A	GA3L	1990	2004	Alluvial	4.7	UF	WG	Chromium	26	14	54	7	2	20
Los Alamos Canyon	LAO-3	G3OL	1995	1995	Alluvial	9	F	WG	Chromium	5	2	40	2351	2	4700
Los Alamos Canyon	LAO-3	G3OL	1993	1994	Alluvial	9	NA	WG	Chromium	2	1	50	10	10	10
Los Alamos Canyon	LAO-3	G3OL	1978	1995	Alluvial	9	UF	WG	Chromium	12	7	58	1004	2	7000
Los Alamos Canyon	LAO-4	G4OL	1998	2001	Alluvial	14	F	WG	Chromium	3	1	33	8	8	8
Los Alamos Canyon	LAO-4	G4OL	1993	1994	Alluvial	14	NA	WG	Chromium	2	0	0	-	-	-
Los Alamos Canyon	LAO-4	G4OL	1980	2001	Alluvial	14	UF	WG	Chromium	11	4	36	5	2	10
Los Alamos Canyon	LAO-4.5C	GC54	1995	2005	Alluvial	13.3	F	WG	Chromium	11	2	18	6.5	5	8
Los Alamos Canyon	LAO-4.5C	GC54	1990	2005	Alluvial	13.3	UF	WG	Chromium	15	9	60	7	0.8	20
Los Alamos Canyon	LAO-4.5	G54L	1995	1995	Alluvial	10	F	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LAO-4.5	G54L	1993	1994	Alluvial	10	NA	WG	Chromium	2	1	50	4	4	4
Los Alamos Canyon	LAO-4.5	G54L	1978	1995	Alluvial	10	UF	WG	Chromium	10	6	60	36	1	190
Los Alamos Canyon	LAO-5	G5OL	1999	1999	Alluvial		F	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LAO-5	G5OL	1998	1999	Alluvial		UF	WG	Chromium	2	0	0	-	-	-
Los Alamos Canyon	LAO-6A	GA6L	1995	2001	Alluvial	4.2	F	WG	Chromium	6	2	33	7	7	7
Los Alamos Canyon	LAO-6A	GA6L	1995	2001	Alluvial	4.2	UF	WG	Chromium	7	3	43	9.3	9	10
Los Alamos Canyon	LAO-6	G6OL	1995	1995	Alluvial	6	F	WG	Chromium	4	0	0	-	-	-
Los Alamos Canyon	LAO-6	G6OL	1995	1995	Alluvial	6	UF	WG	Chromium	4	0	0	-	-	-
Los Alamos Canyon	LLAO-1B	GL1B	1999	2005	Alluvial	11.32	F	WG	Chromium	10	5	50	0.7	0.4	1.3
Los Alamos Canyon	LLAO-1B	GL1B	1999	2005	Alluvial	11.32	UF	WG	Chromium	10	6	60	2.3	0.4	7.9
Los Alamos Canyon	BIA Wellpoint 3	G3IB	1993	1993	Alluvial		NA	WG	Chromium	1	1	100	100	100	100
Los Alamos Canyon	BIA Wellpoint 3	G3IB	1995	1995	Alluvial		UF	WG	Chromium	1	1	100	24	24	24
Los Alamos Canyon	LLAO-4	LA-00046	2005	2005	Alluvial	5.24	F	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LLAO-4	LA-00046	2005	2005	Alluvial	5.24	UF	WG	Chromium	1	0	0	-	-	-
Los Alamos Canyon	LLAO-5		1998	1998	Alluvial		F	WG	Chromium	1	0	0	-	-	-

2000 - Present Ground Water Screening to EPA MCL and NMED GW Standard

Watershed	Station Name	Port Depth	Port Depth	Field Matrix	F/UF	Sample Date	Analyte	Symbol	Result (ug/L)	NMED GW STD (ug/L)	Results > NMED GW STD	EPA MCL (ug/L)	Results > EPA MCL
Los Alamos Canyon	LAO-1	8	FT	WG	UF	9/18/2003	Chromium		16	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	F	9/18/2003	Chromium		15.7	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	F	6/2/2004	Chromium		7.26	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	6/2/2004	Chromium		8.96	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	F	5/10/2005	Chromium		5	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	5/10/2005	Chromium		6.6	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	6/23/2000	Chromium		3.5	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	6/23/2000	Chromium		3.3	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	6/23/2000	Chromium		2.9	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	7/25/2000	Chromium		3.6	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	7/25/2000	Chromium		1.4	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	9/5/2000	Chromium		2	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	9/5/2000	Chromium		1.5	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	10/5/2000	Chromium		3.9	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	10/5/2000	Chromium		0.94	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	10/5/2000	Chromium		0.88	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	3/29/2001	Chromium	<	1.9	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	3/29/2001	Chromium	<	1.9	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	6/19/2001	Chromium		1.1	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	6/19/2001	Chromium		1	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	6/19/2001	Chromium		1.3	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	11/8/2001	Chromium		1.42	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	11/8/2001	Chromium		1.58	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	F	5/4/2005	Chromium	<	2.2	50	No	100	No
Los Alamos Canyon	LAO-1.6G	10.47	FT	WG	UF	5/4/2005	Chromium	<	1.2	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG		6/26/2000	Chromium		9	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	6/26/2000	Chromium		9	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	F	6/26/2000	Chromium		12	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	3/29/2001	Chromium	<	3.781	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	F	3/29/2001	Chromium	<	3.781	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	6/26/2001	Chromium		1.9	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	F	6/26/2001	Chromium		1.7	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	8/7/2002	Chromium		1.57	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	8/7/2002	Chromium		1.6	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	8/7/2002	Chromium		1.05	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	8/7/2002	Chromium	<	1.83	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	F	8/7/2002	Chromium	<	1.66	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	F	9/19/2003	Chromium	<	1.12	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	9/19/2003	Chromium	<	0.79	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	F	6/4/2004	Chromium		2.34	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	6/4/2004	Chromium		4.15	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	F	5/2/2005	Chromium		1	50	No	100	No
Los Alamos Canyon	LAO-2	7	FT	WG	UF	5/2/2005	Chromium		1.2	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	6/26/2000	Chromium		13	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	F	6/26/2000	Chromium		12	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	F	3/29/2001	Chromium	<	0.727	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	F	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	4/25/2002	Chromium		4.52	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	4/25/2002	Chromium		3.91	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	4/25/2002	Chromium		3.8	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	F	4/25/2002	Chromium		2.8	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	4/25/2002	Chromium		3.33	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	6/5/2002	Chromium		3.85	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	6/5/2002	Chromium		3.75	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	6/5/2002	Chromium		3.66	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	6/5/2002	Chromium		3.83	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	F	9/17/2003	Chromium	<	2.44	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	9/17/2003	Chromium		13.9	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	6/2/2004	Chromium	<	2.44	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	F	6/2/2004	Chromium	<	1.92	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	UF	6/2/2004	Chromium	<	1.61	50	No	100	No
Los Alamos Canyon	LAO-3A	4.7	FT	WG	F	6/2/2004	Chromium	<	2.06	50	No	100	No
Los Alamos Canyon	LAO-4	14	FT	WG	UF	8/1/2000	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-4	14	FT	WG	UF	4/5/2001	Chromium	<	0.829	50	No	100	No
Los Alamos Canyon	LAO-4	14	FT	WG	F	4/5/2001	Chromium	<	0.687	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	UF	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	F	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	F	6/26/2001	Chromium	<	0.35	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	UF	6/26/2001	Chromium	<	0.35	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	UF	11/6/2001	Chromium		1.03	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	F	11/6/2001	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	UF	6/4/2004	Chromium		0.842	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	F	6/4/2004	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	UF	5/2/2005	Chromium		1.6	50	No	100	No
Los Alamos Canyon	LAO-4.5C	13.3	FT	WG	F	5/2/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAO-6A	4.2	FT	WG	UF	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-6A	4.2	FT	WG	F	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	1/10/2000	Chromium	<	0.41	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	1/10/2000	Chromium	<	0.41	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	3/24/2000	Chromium	<	0.37	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	6/21/2000	Chromium		0.64	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	6/21/2000	Chromium		0.73	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	7/24/2000	Chromium	<	0.33	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	7/24/2000	Chromium		0.4	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	9/5/2000	Chromium		0.57	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	9/5/2000	Chromium	<	0.33	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	10/5/2000	Chromium	<	0.52	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	10/5/2000	Chromium	<	0.52	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	3/29/2001	Chromium	<	0.59	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	3/29/2001	Chromium	<	0.34	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	6/18/2001	Chromium	<	0.21	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	6/18/2001	Chromium	<	0.21	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	11/7/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	11/7/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	11/7/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	3/26/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	3/26/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	5/30/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	5/30/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	5/30/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	3/3/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	5/10/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	F	5/10/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	5/10/2005	Chromium		1.3	50	No	100	No
Los Alamos Canyon	LAO-B	11.84	FT	WG	UF	8/17/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	8/1/2000	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	4/3/2001	Chromium	<	0.618	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	4/3/2001	Chromium	<	0.943	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	6/25/2001	Chromium	<	0.21	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	6/25/2001	Chromium	<	0.21	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	11/5/2001	Chromium	<	0.592	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	11/5/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	4/23/2002	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	4/23/2002	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	4/23/2002	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	4/23/2002	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	4/23/2002	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	6/4/2002	Chromium		7.09	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	6/4/2002	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	6/4/2002	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	6/4/2002	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	6/4/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	6/4/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	7/9/2003	Chromium		0.887	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	7/9/2003	Chromium		1.02	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	6/3/2004	Chromium		0.784	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	6/3/2004	Chromium		0.509	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	F	5/5/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAO-C	3	FT	WG	UF	5/5/2005	Chromium		2.2	50	No	100	No
Los Alamos Canyon	LAOI(A)-1.1	295.2	FT	WG	F	1/20/2000	Chromium		0.4	50	No	100	No
Los Alamos Canyon	LAOI(A)-1.1	295.2	FT	WG	F	4/13/2000	Chromium	<	0.38	50	No	100	No
Los Alamos Canyon	LAOI(A)-1.1	295.2	FT	WG	UF	6/3/2004	Chromium		1.89	50	No	100	No
Los Alamos Canyon	LAOI(A)-1.1	295.2	FT	WG	UF	3/4/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAOI(A)-1.1	295.2	FT	WG	UF	5/7/2005	Chromium		1.1	50	No	100	No
Los Alamos Canyon	LAOI-3.2	153.3	FT	WG	UF	7/23/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAOI-3.2	153.3	FT	WG	UF	7/23/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAOI-3.2	153.3	FT	WG	UF	11/15/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAOI-3.2	153.3	FT	WG	UF	11/15/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAOI-3.2	153.3	FT	WG	F	11/15/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAOI-3.2a	0	FT	WG	UF	7/30/2005	Chromium		1	50	No	100	No
Los Alamos Canyon	LAOI-3.2a	0	FT	WG	UF	2/2/2006	Chromium		1.1	50	No	100	No
Los Alamos Canyon	LAOI-7	0	FT	WG	UF	8/23/2005	Chromium		1.5	50	No	100	No
Los Alamos Canyon	LAOI-7	0	FT	WG	UF	8/29/2005	Chromium		2.6	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	6/27/2000	Chromium		1.4	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	6/27/2000	Chromium		1.4	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	7/25/2000	Chromium	<	5	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	7/26/2000	Chromium		0.66	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	7/26/2000	Chromium		1.2	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	9/1/2000	Chromium	<	0.89	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	9/1/2000	Chromium	<	1	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	10/6/2000	Chromium		0.56	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	10/6/2000	Chromium	<	0.52	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	3/15/2001	Chromium	<	0.34	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	3/15/2001	Chromium		0.36	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	7/27/2001	Chromium		0.48	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	7/27/2001	Chromium		1.3	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	10/23/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	11/1/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	11/1/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	5/29/2002	Chromium		0.784	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	5/29/2002	Chromium		0.867	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	6/25/2002	Chromium	<	0.836	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	7/22/2003	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	8/25/2004	Chromium		1.3	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	F	5/11/2005	Chromium		1.2	50	No	100	No
Los Alamos Canyon	Basalt Spring	0	FT	WG	UF	5/11/2005	Chromium		1.4	50	No	100	No
Los Alamos Canyon	DP Spring	0	FT	WG	F	4/3/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	DP Spring	0	FT	WG	UF	4/3/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	DP Spring	0	FT	WG	F	6/22/2001	Chromium	<	0.21	50	No	100	No
Los Alamos Canyon	DP Spring	0	FT	WG	UF	6/22/2001	Chromium	<	0.21	50	No	100	No
Los Alamos Canyon	DP Spring	0	FT	WG	F	8/27/2003	Chromium		1.08	50	No	100	No
Los Alamos Canyon	DP Spring	0	FT	WG	UF	5/6/2005	Chromium		1	50	No	100	No
Los Alamos Canyon	DP Spring	0	FT	WG	F	5/6/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LA-5	440	FT	WG	UF	9/19/2001	Chromium		4.72	50	No	100	No
Los Alamos Canyon	LA-5	440	FT	WG	UF	6/24/2002	Chromium		4.9	50	No	100	No
Los Alamos Canyon	LA-5	440	FT	WG	UF	7/23/2002	Chromium		4.98	50	No	100	No
Los Alamos Canyon	LA-5	440	FT	WG	UF	5/25/2004	Chromium		4.01	50	No	100	No
Los Alamos Canyon	LA-5	440	FT	WG	UF	5/25/2004	Chromium		4.09	50	No	100	No
Los Alamos Canyon	LA-5	440	FT	WG	UF	7/12/2005	Chromium		5.6	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	UF	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	F	3/29/2001	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	F	4/24/2002	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	UF	4/24/2002	Chromium	<	0.781	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	UF	6/4/2002	Chromium	<	0.829	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	UF	6/4/2002	Chromium	<	0.682	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	UF	6/4/2002	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	UF	6/4/2002	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	UF	7/9/2003	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	LAO-0.7	15	FT	WG	F	7/9/2003	Chromium		0.885	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	4/5/2001	Chromium		8.86	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	F	4/5/2001	Chromium		8.9	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	6/25/2001	Chromium		5.4	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	F	6/25/2001	Chromium		6.4	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	F	11/5/2001	Chromium		14.3	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	11/5/2001	Chromium		15.4	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	F	8/5/2002	Chromium		16.7	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	8/5/2002	Chromium		16.3	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	8/5/2002	Chromium		19.2	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	8/5/2002	Chromium		19.4	50	No	100	No
Los Alamos Canyon	LAO-1	8	FT	WG	UF	8/5/2002	Chromium		17	50	No	100	No
Los Alamos Canyon	LAOI-7	0	FT	WG	UF	8/29/2005	Chromium		2.4	50	No	100	No
Los Alamos Canyon	LAOI-7	0	FT	WG	UF	8/30/2005	Chromium		2.8	50	No	100	No
Los Alamos Canyon	LAOI-7	0	FT	WG	UF	9/1/2005	Chromium		1.5	50	No	100	No
Los Alamos Canyon	LAOI-7	0	FT	WG	UF	9/6/2005	Chromium		1.5	50	No	100	No
Los Alamos Canyon	LAOI-7	0	FT	WG	UF	10/3/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	F	4/2/2001	Chromium	<	0.34	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	UF	4/2/2001	Chromium		0.5	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	F	6/19/2001	Chromium		0.39	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	UF	6/19/2001	Chromium		0.26	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	F	11/13/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	UF	11/13/2001	Chromium		2.54	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	F	5/22/2002	Chromium		0.692	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	UF	5/22/2002	Chromium		0.796	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	F	5/2/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LAUZ-1	5.35	FT	WG	UF	5/2/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	6/27/2000	Chromium		7.9	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	6/27/2000	Chromium		1	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	7/26/2000	Chromium	<	0.33	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	7/26/2000	Chromium		0.41	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	9/1/2000	Chromium		0.45	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	9/1/2000	Chromium		0.63	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	10/6/2000	Chromium		0.54	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	10/6/2000	Chromium	<	0.52	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	3/30/2001	Chromium		0.62	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	3/30/2001	Chromium		0.39	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	6/26/2001	Chromium		1.3	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	6/26/2001	Chromium		2.1	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	11/1/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	11/1/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	5/29/2002	Chromium		1.91	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	5/29/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	UF	5/11/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LLAO-1B	11.32	FT	WG	F	5/11/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LLAO-4	5.24	FT	WG	UF	5/11/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	LLAO-4	5.24	FT	WG	F	5/11/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	O-4	1115	FT	WG	UF	9/25/2000	Chromium		3	50	No	100	No
Los Alamos Canyon	O-4	1115	FT	WG	UF	10/9/2002	Chromium		3.34	50	No	100	No
Los Alamos Canyon	O-4	1115	FT	WG	UF	12/17/2002	Chromium		5.71	50	No	100	No
Los Alamos Canyon	O-4	1115	FT	WG	UF	5/20/2004	Chromium		4.5	50	No	100	No
Los Alamos Canyon	O-4	1115	FT	WG	UF	5/18/2005	Chromium		4.4	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	UF	8/23/2005	Chromium		3.3	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	F	8/23/2005	Chromium		4	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	UF	8/23/2005	Chromium		3.5	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	UF	8/23/2005	Chromium		4.2	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	UF	8/23/2005	Chromium		3.1	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	F	8/23/2005	Chromium		4	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	UF	8/23/2005	Chromium		4.2	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	UF	11/17/2005	Chromium		3.3	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	UF	11/17/2005	Chromium		3.4	50	No	100	No
Los Alamos Canyon	R-6	1205	FT	WG	F	11/17/2005	Chromium		3.4	50	No	100	No
Los Alamos Canyon	R-6(i)	602	FT	WG	F	8/24/2005	Chromium		2.2	50	No	100	No
Los Alamos Canyon	R-6(i)	602	FT	WG	UF	8/24/2005	Chromium		3.9	50	No	100	No
Los Alamos Canyon	R-6(i)	602	FT	WG	UF	8/24/2005	Chromium		2.5	50	No	100	No
Los Alamos Canyon	R-6(i)	602	FT	WG	UF	8/24/2005	Chromium		2.2	50	No	100	No
Los Alamos Canyon	R-6(i)	602	FT	WG	UF	11/17/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	R-6(i)	602	FT	WG	UF	11/17/2005	Chromium		2.5	50	No	100	No
Los Alamos Canyon	R-6(i)	602	FT	WG	F	11/17/2005	Chromium	<	1	50	No	100	No
Los Alamos Canyon	R-7	350	FT	WG	F	1/6/2001	Chromium		2.4	50	No	100	No
Los Alamos Canyon	R-7	350	FT	WG	F	1/10/2001	Chromium		0.85	50	No	100	No
Los Alamos Canyon	R-7	350	FT	WG	UF	1/12/2001	Chromium		33	50	No	100	No
Los Alamos Canyon	R-7	350	FT	WG	UF	2/7/2001	Chromium		300	50	Yes	100	Yes
Los Alamos Canyon	R-7	378	FT	WG	F	5/29/2001	Chromium		1	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	UF	5/29/2001	Chromium		12	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	F	8/8/2001	Chromium		1.2	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	UF	8/8/2001	Chromium		1.3	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	UF	11/19/2001	Chromium	<	4.55	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	F	11/28/2001	Chromium		1.82	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	UF	2/19/2002	Chromium		49.8	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	F	2/19/2002	Chromium		2.91	50	No	100	No
Los Alamos Canyon	R-7	378	FT	WG	UF	8/5/2002	Chromium		2.01	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	5/20/2001	Chromium		3.9	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	F	5/20/2001	Chromium		5.8	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	8/9/2001	Chromium		5.4	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	F	8/9/2001	Chromium		1.1	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	F	11/20/2001	Chromium	<	5	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	11/20/2001	Chromium		3.23	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	2/20/2002	Chromium		2.1	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	F	2/21/2002	Chromium	<	5	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	8/6/2002	Chromium	<	0.503	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	12/18/2002	Chromium		2.55	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	2/26/2004	Chromium		4.06	50	No	100	No
Los Alamos Canyon	R-7	915.1	FT	WG	UF	4/26/2005	Chromium		2.3	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	2/25/2004	Chromium		2.4	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	2/25/2004	Chromium	<	3.73	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	F	2/25/2004	Chromium	<	3.35	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	F	4/26/2004	Chromium		4	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	4/26/2004	Chromium		2.4	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	4/26/2004	Chromium		8.6	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	F	8/24/2004	Chromium	<	2.5	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	8/24/2004	Chromium		2.4	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	8/24/2004	Chromium		5	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	12/8/2004	Chromium		10.9	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	F	12/8/2004	Chromium		2.9	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	12/8/2004	Chromium		2.2	50	No	100	No
Los Alamos Canyon	R-8	711.1	FT	WG	UF	4/27/2005	Chromium		7.4	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	2/20/2004	Chromium		2.58	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	F	2/20/2004	Chromium		0.8	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	2/20/2004	Chromium		1.1	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	4/27/2004	Chromium		3.2	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	4/27/2004	Chromium		2.7	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	F	4/27/2004	Chromium		2.8	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	8/25/2004	Chromium		10.9	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	8/25/2004	Chromium		3.4	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	F	8/25/2004	Chromium		3.5	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	F	12/9/2004	Chromium		3.7	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	12/9/2004	Chromium		7.3	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	12/9/2004	Chromium		3	50	No	100	No
Los Alamos Canyon	R-8	825	FT	WG	UF	4/28/2005	Chromium		3.1	50	No	100	No
Los Alamos Canyon	R-8A	158	FT	WG	UF	12/17/2003	Chromium	<	1.54	50	No	100	No
Los Alamos Canyon	R-8A	158	FT	WG	F	12/17/2003	Chromium	<	5	50	No	100	No
Los Alamos Canyon	R-8A	188	FT	WG	UF	12/17/2003	Chromium	<	5	50	No	100	No
Los Alamos Canyon	R-8A	188	FT	WG	F	12/17/2003	Chromium	<	5	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	2/28/2000	Chromium		18	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	F	2/28/2000	Chromium	<	1.6	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	8/29/2000	Chromium		3.1	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	F	8/29/2000	Chromium		2.1	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	2/13/2001	Chromium		2.2	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	F	2/13/2001	Chromium		1.7	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	5/15/2001	Chromium		2.4	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	F	5/15/2001	Chromium		2	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	12/12/2002	Chromium	<	2.95	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	5/27/2004	Chromium		2.63	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	3/19/2005	Chromium		3.1	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	4/6/2005	Chromium		2.8	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	4/6/2005	Chromium		3	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	F	4/28/2005	Chromium		2.4	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	4/28/2005	Chromium		2.9	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	8/16/2005	Chromium		2.6	50	No	100	No
Los Alamos Canyon	R-9	684	FT	WG	UF	8/16/2005	Chromium		2.6	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	F	9/14/2000	Chromium		1.4	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	9/14/2000	Chromium		0.36	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	2/2/2001	Chromium		1.4	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	F	2/20/2001	Chromium		3	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	6/11/2001	Chromium	<	0.69	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	F	6/11/2001	Chromium	<	0.25	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	F	9/5/2001	Chromium		3.4	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	9/5/2001	Chromium		6.91	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	7/26/2002	Chromium		1.43	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	2/6/2004	Chromium		9.83	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	5/27/2004	Chromium		3.17	50	No	100	No
Los Alamos Canyon	R-9i	198.8	FT	WG	UF	4/29/2005	Chromium	<	3.8	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	UF	9/15/2000	Chromium		7.9	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	F	9/15/2000	Chromium	<	0.33	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	UF	2/21/2001	Chromium		11	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	F	2/21/2001	Chromium		1.1	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	F	6/12/2001	Chromium	<	0.46	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	UF	6/12/2001	Chromium	<	1.6	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	UF	9/6/2001	Chromium		3.12	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	F	9/6/2001	Chromium	<	0.57	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	UF	7/29/2002	Chromium		0.941	50	No	100	No
Los Alamos Canyon	R-9i	278.8	FT	WG	UF	2/6/2004	Chromium		3.7	50	No	100	No
Mortandad Canyon	MCA-1	2.4	FT	WG	UF	4/26/2005	Chromium		6.5	50	No	100	No
Mortandad Canyon	MCA-1	2.4	FT	WG	F	4/26/2005	Chromium		4.6	50	No	100	No
Mortandad Canyon	MCA-1	2.4	FT	WG	UF	8/31/2005	Chromium	<	4.4	50	No	100	No
Mortandad Canyon	MCA-1	2.4	FT	WG	F	8/31/2005	Chromium	<	2.8	50	No	100	No
Mortandad Canyon	MCA-2	45	FT	WG	F	4/27/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	MCA-2	45	FT	WG	UF	4/27/2005	Chromium		1.8	50	No	100	No
Mortandad Canyon	MCA-2	45	FT	WG	UF	9/19/2005	Chromium		1.9	50	No	100	No
Mortandad Canyon	MCA-2	45	FT	WG	F	9/19/2005	Chromium		1.1	50	No	100	No
Mortandad Canyon	MCA-2	45	FT	WG	UF	9/19/2005	Chromium		2.2	50	No	100	No
Mortandad Canyon	MCA-2	45	FT	WG	F	9/19/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	MCA-4	1.75	FT	WG	F	9/16/2005	Chromium		43	50	No	100	No
Mortandad Canyon	MCA-4	1.75	FT	WG	UF	9/16/2005	Chromium		101	50	Yes	100	Yes
Mortandad Canyon	MCA-5	3.6	FT	WG	F	4/25/2005	Chromium		3.7	50	No	100	No
Mortandad Canyon	MCA-5	3.6	FT	WG	UF	4/25/2005	Chromium		1.6	50	No	100	No
Mortandad Canyon	MCO-0.6	1.05	FT	WG	F	9/19/2005	Chromium		6	50	No	100	No
Mortandad Canyon	MCO-0.6	1.05	FT	WG	UF	9/19/2005	Chromium		12.9	50	No	100	No
Mortandad Canyon	MCO-2	2	FT	WG	UF	7/17/2000	Chromium		17	50	No	100	No
Mortandad Canyon	MCO-2	2	FT	WG	F	7/17/2000	Chromium		13	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	UF	7/17/2000	Chromium	<	5	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	F	7/17/2000	Chromium	<	5	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	UF	7/31/2001	Chromium		1.82	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	F	7/31/2001	Chromium		1.88	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	F	5/1/2002	Chromium		3.98	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	UF	5/1/2002	Chromium		4.77	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	F	7/8/2003	Chromium	<	4.63	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	UF	7/8/2003	Chromium	<	5.35	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	UF	7/12/2004	Chromium		3.27	50	No	100	No
Mortandad Canyon	MCO-3	2	FT	WG	F	7/12/2004	Chromium		2.72	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	UF	9/30/2002	Chromium	<	3.76	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	F	9/30/2002	Chromium	<	2.71	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	F	7/8/2004	Chromium		0.707	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	UF	7/8/2004	Chromium		1.34	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	UF	4/21/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	F	4/21/2005	Chromium		1.2	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	F	9/14/2005	Chromium		2.1	50	No	100	No
Mortandad Canyon	MCO-4B	8.9	FT	WG	UF	9/14/2005	Chromium		2.5	50	No	100	No
Mortandad Canyon	MCO-5	21	FT	WG	F	7/7/2000	Chromium	<	1.7	50	No	100	No
Mortandad Canyon	MCO-5	21	FT	WG	UF	7/7/2000	Chromium	<	1.5	50	No	100	No
Mortandad Canyon	MCO-5	21	FT	WG	UF	8/2/2001	Chromium	<	0.759	50	No	100	No
Mortandad Canyon	MCO-5	21	FT	WG	F	8/2/2001	Chromium		1.03	50	No	100	No
Mortandad Canyon	MCO-5	21	FT	WG	UF	12/20/2002	Chromium	<	1.2	50	No	100	No
Mortandad Canyon	MCO-5	21	FT	WG	UF	12/20/2002	Chromium	<	1.06	50	No	100	No
Mortandad Canyon	MCO-5	21	FT	WG	UF	12/20/2002	Chromium	<	1.34	50	No	100	No

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Mortandad Canyon	R-14	1204.5	FT	WG	UF	5/11/2005	Chromium		6.5	50	No	100	No
Mortandad Canyon	R-14	1204.5	FT	WG	F	1/24/2006	Chromium V	<	3.4	50	No	100	No
Mortandad Canyon	R-14	1204.5	FT	WG	UF	1/24/2006	Chromium V	<	3.4	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	2/11/2004	Chromium		2.21	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	2/11/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	F	2/17/2004	Chromium		1.03	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	7/12/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	7/14/2004	Chromium	<	2.64	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	F	7/14/2004	Chromium	<	0.596	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	11/3/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	11/3/2004	Chromium	<	3.56	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	11/3/2004	Chromium	<	3.93	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	F	5/12/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	5/12/2005	Chromium		2.1	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	5/12/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	F	1/25/2006	Chromium V	<	3.4	50	No	100	No
Mortandad Canyon	R-14	1288.5	FT	WG	UF	1/25/2006	Chromium V	<	3.4	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	2/24/2000	Chromium		4.6	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	2/24/2000	Chromium		2.6	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	10/10/2000	Chromium		5.2	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	10/10/2000	Chromium		5.3	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	2/15/2001	Chromium		4.1	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	2/15/2001	Chromium		3.8	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	5/22/2001	Chromium		3.6	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	5/22/2001	Chromium		3.8	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	12/15/2002	Chromium		9.83	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	12/15/2002	Chromium		9.07	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	6/10/2004	Chromium		14.7	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	6/10/2004	Chromium		9.2	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	11/19/2004	Chromium		6.3	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	3/9/2005	Chromium		7.1	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	5/25/2005	Chromium		7.3	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	5/25/2005	Chromium		7.7	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	5/25/2005	Chromium		7.5	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	5/25/2005	Chromium		8	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	8/31/2005	Chromium		7.3	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	8/31/2005	Chromium	<	7.9	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	8/31/2005	Chromium		7.3	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	8/31/2005	Chromium	<	7.2	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	F	1/30/2006	Chromium V		7	50	No	100	No
Mortandad Canyon	R-15	858.6	FT	WG	UF	1/30/2006	Chromium V		7.1	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	3/15/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	5/12/2004	Chromium		4.1	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	5/12/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	F	5/12/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	F	10/13/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	10/13/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	10/13/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	F	12/2/2004	Chromium	<	0.78	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	12/2/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	12/2/2004	Chromium	<	4.4	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	F	6/13/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	866.1	FT	WG	UF	6/13/2005	Chromium		4.1	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	F	3/16/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	3/16/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	3/16/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	5/13/2004	Chromium		8.6	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	F	5/13/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	5/13/2004	Chromium		1.1	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	F	10/14/2004	Chromium		3.93	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	10/14/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	10/14/2004	Chromium		1.3	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	F	12/3/2004	Chromium	<	0.78	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	12/3/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	12/3/2004	Chromium		5	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	F	6/13/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1018.4	FT	WG	UF	6/13/2005	Chromium		3.9	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	3/18/2004	Chromium		1.41	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	3/18/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	F	3/19/2004	Chromium		1	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	F	5/13/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	5/13/2004	Chromium		1.2	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	5/13/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	F	10/15/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	10/15/2004	Chromium	<	0.503	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	10/18/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	F	12/7/2004	Chromium		0.97	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	12/7/2004	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	12/7/2004	Chromium		3.2	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	F	6/14/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16	1238	FT	WG	UF	6/14/2005	Chromium	<	1	50	No	100	No
Mortandad Canyon	R-16a	0	FT	WG	UF	9/26/2005	Chromium		1.2	50	No	100	No
Mortandad Canyon	R-16a	0	FT	WG	UF	10/17/2005	Chromium		3.8	50	No	100	No
Mortandad Canyon	R-16a	0	FT	WG	UF	12/19/2005	Chromium		5.3	50	No	100	No
Mortandad Canyon	R-16a	0	FT	WG	F	12/19/2005	Chromium		4.7	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	F	3/31/2004	Chromium		1.78	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	3/31/2004	Chromium		2.5	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	3/31/2004	Chromium		1.05	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	6/30/2004	Chromium		2.42	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	F	6/30/2004	Chromium		2.36	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	6/30/2004	Chromium		1.9	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	9/23/2004	Chromium		2.3	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	9/23/2004	Chromium	<	2.8	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	F	9/23/2004	Chromium	<	3.9	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	12/14/2004	Chromium		2.8	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	12/14/2004	Chromium		2.2	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	F	12/14/2004	Chromium		2	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	6/6/2005	Chromium	<	2.6	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	F	6/6/2005	Chromium		1.6	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	UF	6/6/2005	Chromium	<	3.2	50	No	100	No
Mortandad Canyon	R-21	888.8	FT	WG	F	6/6/2005	Chromium		2.4	50	No	100	No
Mortandad Canyon	R-28	946.2	FT	WG	UF	5/20/2005	Chromium		389	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	5/20/2005	Chromium		360	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	5/20/2005	Chromium		375	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	9/1/2005	Chromium		370	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	9/1/2005	Chromium		380	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	9/1/2005	Chromium		404	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	9/1/2005	Chromium		397	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	11/10/2005	Chromium		404	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	11/10/2005	Chromium		250	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	11/10/2005	Chromium		416	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	1/26/2006	Chromium		370	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	1/26/2006	Chromium		380	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	1/26/2006	Chromium		410	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	1/26/2006	Chromium		400	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	1/26/2006	Chromium		230	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	1/26/2006	Chromium		400	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	1/26/2006	Chromium		410	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	1/26/2006	Chromium		400	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	1/26/2006	Chromium		290	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	1/26/2006	Chromium		400	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	1/26/2006	Chromium		400	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	F	1/26/2006	Chromium V		405	50	Yes	100	Yes
Mortandad Canyon	R-28	946.2	FT	WG	UF	1/26/2006	Chromium V		403	50	Yes	100	Yes
Mortandad Canyon	R-33	995.5	FT	WG	UF	6/27/2005	Chromium		12.2	50	No	100	No
Mortandad Canyon	R-33	995.5	FT	WG	F	6/27/2005	Chromium		6	50	No	100	No
Mortandad Canyon	R-33	995.5	FT	WG	UF	9/14/2005	Chromium		12.3	50	No	100	No
Mortandad Canyon	R-33	995.5	FT	WG	F	9/14/2005	Chromium		8.2	50	No	100	No
Mortandad Canyon	R-33	995.5	FT	WG	F	2/16/2006	Chromium V		4.9	50	No	100	No
Mortandad Canyon	R-33	995.5	FT	WG	UF	2/16/2006	Chromium V		4.8	50	No	100	No
Mortandad Canyon	R-33	1112.4	FT	WG	F	6/24/2005	Chromium		5.5	50	No	100	No
Mortandad Canyon	R-33	1112.4	FT	WG	UF	6/24/2005	Chromium		6.8	50	No	100	No
Mortandad Canyon	R-33	1112.4	FT	WG	UF	6/24/2005	Chromium		7.6	50	No	100	No
Mortandad Canyon	R-33	1112.4	FT	WG	F	9/15/2005	Chromium		5.5	50	No	100	No
Mortandad Canyon	R-33	1112.4	FT	WG	UF	9/15/2005	Chromium		6.1	50	No	100	No
Mortandad Canyon	R-33	1112.4	FT	WG	UF	2/14/2006	Chromium V		4.1	50	No	100	No
Mortandad Canyon	R-33	1112.4	FT	WG	F	2/14/2006	Chromium V		4.8	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		8.3	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		5.4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	9/7/2005	Chromium	<	3.8	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		5.2	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	9/7/2005	Chromium		3.4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	9/7/2005	Chromium		3.5	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		4.4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	9/7/2005	Chromium		3.7	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		4.8	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	9/7/2005	Chromium		3.8	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		3.8	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		4.4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	9/7/2005	Chromium		4.7	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	11/29/2005	Chromium		6.3	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	11/29/2005	Chromium		3.5	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	11/29/2005	Chromium		4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	11/29/2005	Chromium		6.9	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	11/29/2005	Chromium		4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	11/29/2005	Chromium		3.6	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	1/31/2006	Chromium V		4.1	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	1/31/2006	Chromium V		3.9	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	F	1/31/2006	Chromium V		4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	1/31/2006	Chromium V		4	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	1/31/2006	Chromium		11	50	No	100	No
Mortandad Canyon	R-34	895.15	FT	WG	UF	1/31/2006	Chromium		6.6	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	9/2/2000	Chromium	<	5	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	9/4/2001	Chromium		3.73	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	5/17/2002	Chromium		4.33	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	5/17/2002	Chromium		3.98	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	7/31/2003	Chromium		3.91	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	7/31/2003	Chromium		4.28	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	6/16/2004	Chromium		7.92	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	3/28/2005	Chromium		2.9	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	10/3/2005	Chromium		1.8	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	F	1/24/2006	Chromium V		2.3	50	No	100	No
Mortandad Canyon	Test Well 8	953	FT	WG	UF	1/24/2006	Chromium V		2.3	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	UF	9/27/2000	Chromium		3	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	UF	11/24/2003	Chromium		3.83	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	UF	5/20/2004	Chromium		3.87	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	UF	5/18/2005	Chromium		3.5	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	UF	1/19/2006	Chromium V		3.9	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	F	1/19/2006	Chromium		3.9	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	UF	1/19/2006	Chromium		3.3	50	No	100	No
Sandia Canyon	PM-1	945	FT	WG	F	1/19/2006	Chromium V		4.1	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	9/27/2000	Chromium		3	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	11/24/2003	Chromium		4.37	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	5/20/2004	Chromium		4.59	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	1/19/2005	Chromium		4.4	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	5/18/2005	Chromium		4.4	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	1/19/2006	Chromium V		4.5	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	F	1/19/2006	Chromium		4.4	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	F	1/19/2006	Chromium V		4.5	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	1/19/2006	Chromium V		4.6	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	F	1/19/2006	Chromium		4.4	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	UF	1/19/2006	Chromium		4	50	No	100	No
Sandia Canyon	PM-3	956	FT	WG	F	1/19/2006	Chromium V		4.7	50	No	100	No
Sandia Canyon	R-10	0	FT	WG	UF	9/8/2005	Chromium		5.2	50	No	100	No
Sandia Canyon	R-10	0	FT	WG	UF	10/11/2005	Chromium		3	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	7/19/2005	Chromium		2.7	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	7/28/2005	Chromium		1.2	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	7/30/2005	Chromium		1.5	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	9/7/2005	Chromium		3.9	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	11/30/2005	Chromium		6.5	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	11/30/2005	Chromium		4.6	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	F	11/30/2005	Chromium		4.5	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	2/1/2006	Chromium V		4.3	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	F	2/1/2006	Chromium V		4.2	50	No	100	No
Sandia Canyon	R-10a	0	FT	WG	UF	2/1/2006	Chromium		8.9	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	5/17/2005	Chromium		17	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	5/17/2005	Chromium		22.3	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	F	5/17/2005	Chromium		17.2	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	5/17/2005	Chromium		17	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	5/17/2005	Chromium		19.5	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	F	5/17/2005	Chromium		18.4	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	8/3/2005	Chromium		21	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	8/3/2005	Chromium		22	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	F	8/3/2005	Chromium		20.5	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	8/3/2005	Chromium		20.4	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	11/8/2005	Chromium		21.8	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	11/8/2005	Chromium		21.3	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	F	11/8/2005	Chromium		21.2	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	11/8/2005	Chromium		18	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	F	11/8/2005	Chromium		20.7	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	11/8/2005	Chromium		19	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	F	2/3/2006	Chromium V		26	50	No	100	No
Sandia Canyon	R-11	855	FT	WG	UF	2/3/2006	Chromium V		26.4	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	F	9/18/2000	Chromium	<	0.33	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	9/18/2000	Chromium	<	0.33	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	3/14/2001	Chromium	<	0.34	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	F	3/14/2001	Chromium	<	0.34	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	F	6/13/2001	Chromium	<	0.21	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	6/13/2001	Chromium	<	2	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	F	9/7/2001	Chromium	<	0.57	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	9/7/2001	Chromium		6.33	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	7/31/2002	Chromium		1.83	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	2/2/2004	Chromium		6.03	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	6/2/2004	Chromium		0.528	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	6/16/2005	Chromium	<	1	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	F	6/16/2005	Chromium	<	1	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	F	2/2/2006	Chromium V	<	3.4	50	No	100	No
Sandia Canyon	R-12	468.1	FT	WG	UF	2/2/2006	Chromium V	<	3.33	50	No	100	No
Sandia Canyon	R-12	507	FT	WG	F	9/19/2000	Chromium	<	0.33	50	No	100	No
Sandia Canyon	R-12	507	FT	WG	UF	9/19/2000	Chromium	<	0.33	50	No	100	No
Sandia Canyon	R-12	507	FT	WG	F	3/15/2001	Chromium	<	0.34	50	No	100	No
Sandia Canyon	R-12	507	FT	WG	UF	3/15/2001	Chromium		3.7	50	No	100	No
Sandia Canyon	R-12	507	FT	WG	F	6/13/2001	Chromium	<	0.21	50	No	100	No
Sandia Canyon	R-12	507	FT	WG	UF	6/13/2001	Chromium	<	0.21	50	No	100	No
Sandia Canyon	R-12	507	FT	WG	UF	9/10/2001	Chromium	<	0.57	50	No	100	No

2000 - Present Ground Water Screening to EPA MCL and NMED GW Standard

Watershed	Station Name	Port Depth	Port Depth	Field Matrix	F/UF	Sample Date	Analyte	Symbol	Result (ug/L)	NMED GW STD (ug/L)	Results > NMED GW STD	EPA MCL (ug/L)	Results > EPA MCL
Sandia Canyon	R-12	607	FT	WG	F	9/10/2001	Chromium	<	0.57	50	No	100	No
Sandia Canyon	R-12	607	FT	WG	UF	8/1/2002	Chromium		7.61	50	No	100	No
Sandia Canyon	R-12	607	FT	WG	UF	1/28/2004	Chromium	<	0.503	50	No	100	No
Sandia Canyon	R-12	607	FT	WG	F	2/1/2006	Chromium V	<	3.4	50	No	100	No
Sandia Canyon	R-12	607	FT	WG	UF	2/1/2006	Chromium V		3.5	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	9/20/2000	Chromium		2.1	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	F	9/20/2000	Chromium	<	0.33	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	F	3/15/2001	Chromium		0.78	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	3/15/2001	Chromium		9.3	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	6/14/2001	Chromium		4.9	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	F	6/14/2001	Chromium	<	0.21	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	F	9/11/2001	Chromium	<	0.57	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	9/11/2001	Chromium		1.06	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	8/1/2002	Chromium		1.39	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	1/27/2004	Chromium		2.39	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	8/3/2004	Chromium		2.98	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	F	8/20/2005	Chromium	<	1	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	8/20/2005	Chromium	<	1	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	F	1/31/2006	Chromium V		3.3	50	No	100	No
Sandia Canyon	R-12	810.8	FT	WG	UF	1/31/2006	Chromium V		3.5	50	No	100	No
Sandia Canyon	Sandia Sprin	0	FT	WG	F	9/24/2001	Chromium	<	1.44	50	No	100	No
Sandia Canyon	Sandia Sprin	0	FT	WG	F	9/24/2001	Chromium	<	1.48	50	No	100	No
Sandia Canyon	Sandia Sprin	0	FT	WG	F	9/13/2004	Chromium		1.1	50	No	100	No
Sandia Canyon	Sandia Sprin	0	FT	WG	F	1/28/2005	Chromium	<	2.7	50	No	100	No
Sandia Canyon	Sandia Sprin	0	FT	WG	F	9/8/2005	Chromium		3	50	No	100	No
Sandia Canyon	Sandia Sprin	0	FT	WG	UF	9/8/2005	Chromium		2.9	50	No	100	No

Appendix 4

Sediment-Data Screening Tables
(on CD included with this document)

Appendix 4 includes summary screening tables for sediment collected from Los Alamos, Sandia, and Mortandad canyons as part of geomorphic investigations conducted for the canyons' work plans. The frequency of detection tables are included in hard copy in this appendix, and the data from which they are derived are included as Excel tables in electronic format on the enclosed CD.

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Table A4-1
Los Alamos Canyon Sediment Summary

Reach	Analyte Name	Number of Samples	Number of Detects	Min Detect	Avg Detect	Max Detect	Number of NDs[a]	Min ND	Avg ND	Max ND	Frequency of Detects	Number of D[b]>BV[c] (10.5 mg/kg)
LA-0	Chromium[d]	2	2	3.16	4.28	5.39	—[e]	—	—	—	2/2	0
LA-1C	Chromium	12	12	2.1	5.02	14.1	—	—	—	—	12/12	1
LA-1E	Chromium	6	6	3.1	6.33	10.6	—	—	—	—	6/6	1
LA-1FW	Chromium	4	3	3.12	3.34	3.5	1	1.3	1.3	1.3	3/4	0
LA-1W	Chromium	14	14	2.56	4.52	6.55	—	—	—	—	14/14	0
LA-1W+	Chromium	5	5	2.3	4.48	6.5	—	—	—	—	5/5	0
LA-2E	Chromium	6	6	4.8	8.50	18.9	—	—	—	—	6/6	1
LA-2E (excavated data)	Chromium	2	2	4.7	21.55	38.4	—	—	—	—	2/2	1
LA-2FE	Chromium	6	6	3.4	8.25	15	—	—	—	—	6/6	1
LA-2W	Chromium	6	6	4.4	9.99	19.5	—	—	—	—	6/6	2
LA-3E	Chromium	8	8	2.2	6.55	12.2	—	—	—	—	8/8	2
LA-3FE	Chromium	13	13	1.4	7.36	11.8	—	—	—	—	13/13	3
LA-3W	Chromium	7	7	1.85	5.55	11	—	—	—	—	7/7	1
LA-4E	Chromium	7	5	1.9	3.42	5.3	2	1.7	2.15	2.6	5/7	0
LA-4FE	Chromium	16	16	1.1	5.17	9	—	—	—	—	16/16	0
LA-4W	Chromium	6	6	2.15	3.41	4.7	—	—	—	—	6/6	0
LA-5	Chromium	8	8	2.46	6.55	9.4	—	—	—	—	8/8	0
LA-5E	Chromium	12	12	0.94	3.25	5.9	—	—	—	—	12/12	0
LA-BKG	Chromium	7	7	4.3	6.36	10	—	—	—	—	7/7	0

Note: All values are in mg/kg.

[a] ND = Non-detected.

[b] D = Detected.

[c] BV = Background value.

[d] Chromium refers to total chromium.

[e] — = Not applicable.

SAMPLE_ID	LOCATION_ID	BEGIN_DEPTH	END_DEPTH	DEPTH_UNITS	ANALYTE_NAME	SAMPLE_VALUE	REPORTING_UNITS	QUALIFIER
CALA-03-49797	LA-00143	0	30	cm	Chromium	6.55	MG/KG	
CALA-03-49796	LA-00141	0	30	cm	Chromium	4.94	MG/KG	
CALA-02-47941	LA-02-20915	0	5	cm	Chromium	3.12	MG/KG	
CALA-02-47939	LA-02-20914	0	5	cm	Chromium	3.16	MG/KG	
CALA-02-47937	LA-02-20913	0	5	cm	Chromium	2.13	MG/KG	J
CALA-02-47935	LA-02-20912	0	5	cm	Chromium	1.85	MG/KG	J
CALA-02-47933	LA-02-20911	0	5	cm	Chromium	2.32	MG/KG	J
CALA-02-47931	LA-02-20910	0	5	cm	Chromium	2.56	MG/KG	J
CALA-02-47929	LA-02-20909	0	5	cm	Chromium	2.15	MG/KG	
CALA-02-47927	LA-02-20908	0	5	cm	Chromium	2.46	MG/KG	
CALA-02-47909	LA-10009	0	30	cm	Chromium	11.3	MG/KG	
CALA-02-47906	21-10931	0	22	cm	Chromium	18.4	MG/KG	J
CALA-02-47900	21-05500	0	30	cm	Chromium	7.52	MG/KG	
CALA-02-47897	LA-10009	0	30	cm	Chromium	11.8	MG/KG	
CALA-02-47894	LA-00221	0	30	cm	Chromium	5.39	MG/KG	
CALA-02-47891	LA-00146	0	30	cm	Chromium	5.78	MG/KG	
CALA-02-47888	LA-00179	0	30	cm	Chromium	14.1	MG/KG	
CALA-02-47885	LA-00041	0	30	cm	Chromium	9.53	MG/KG	
CALA-02-47844	LA-02-20865	0	15	cm	Chromium	3.72	MG/KG	
CALA-02-47843	LA-02-20864	0	15	cm	Chromium	3.82	MG/KG	
CALA-02-47842	LA-02-20863	0	15	cm	Chromium	3.97	MG/KG	
CALA-02-47841	LA-02-20862	0	15	cm	Chromium	4.49	MG/KG	
CALA-02-47840	LA-02-20861	0	15	cm	Chromium	3.7	MG/KG	
CALA-02-47839	LA-02-20860	0	15	cm	Chromium	3.74	MG/KG	
CALA-01-0528	LA-10125	9	10	cm	Chromium	8.5	MG/KG	
CALA-01-0527	LA-10125	0	9	cm	Chromium	8.8	MG/KG	
CALA-01-0526	LA-10124	15	22	cm	Chromium	9.2	MG/KG	
CALA-01-0212	LA-10124	2	12	cm	Chromium	9.3	MG/KG	
CALA-01-0211	LA-10123	17	20	cm	Chromium	5.3	MG/KG	
CALA-01-0210	LA-10122	0	14	cm	Chromium	1.4	MG/KG	
CALA-01-0209	LA-10121	0	3	cm	Chromium	5.7	MG/KG	
CALA-01-0208	LA-10120	23	39	cm	Chromium	1.4	MG/KG	
CALA-01-0207	LA-10120	19	23	cm	Chromium	3.1	MG/KG	
CALA-01-0206	LA-10119	0	5	cm	Chromium	2.2	MG/KG	
CALA-01-0205	LA-10118	0	5	cm	Chromium	2.3	MG/KG	
CALA-01-0204	LA-10117	0	15	cm	Chromium	0.94	MG/KG	
CALA-01-0203	LA-10116	16	23	cm	Chromium	1.9	MG/KG	
CALA-01-0202	LA-10116	0	15	cm	Chromium	2.2	MG/KG	
CALA-01-0201	LA-10115	0	5	cm	Chromium	3	MG/KG	
CALA-01-0200	LA-10114	0	3	cm	Chromium	4.4	MG/KG	
CALA-01-0199	LA-10113	3	6	cm	Chromium	1.1	MG/KG	
CALA-01-0198	LA-10112	0	5	cm	Chromium	5.4	MG/KG	
CALA-01-0197	LA-10111	0	3	cm	Chromium	2.1	MG/KG	
CALA-01-0196	LA-10110	0	2	cm	Chromium	5.1	MG/KG	
CALA-01-0195	LA-10109	0	3	cm	Chromium	4.7	MG/KG	
CALA-01-0194	LA-10108	4	10	cm	Chromium	2.5	MG/KG	
CALA-01-0193	LA-10108	0	4	cm	Chromium	3.8	MG/KG	
CALA-01-0078	LA-10105	0	15	cm	Chromium	3.2	MG/KG	
CALA-01-0077	LA-10102	18	40	cm	Chromium	6.6	MG/KG	
CALA-01-0076	LA-10102	0	13	cm	Chromium	6.1	MG/KG	
CALA-01-0075	LA-10101	25	50	cm	Chromium	11	MG/KG	
CALA-01-0074	LA-10093	5	32	cm	Chromium	8.3	MG/KG	
CALA-01-0073	LA-10092	0	17	cm	Chromium	3.4	MG/KG	
CALA-01-0072	LA-10144	36	50	cm	Chromium	9.5	MG/KG	
CALA-01-0071	LA-10140	0	22	cm	Chromium	6.6	MG/KG	
CALA-01-0070	LA-10101	0	12	cm	Chromium	3.4	MG/KG	
CALA-01-0069	LA-10099	0	15	cm	Chromium	6.7	MG/KG	
CALA-01-0068	LA-10082	6	28	cm	Chromium	6.7	MG/KG	
CALA-01-0067	LA-10081	51	73	cm	Chromium	15	MG/KG	
CALA-01-0011	LA-10047	0	9	cm	Chromium	6	MG/KG	
CALA-01-0010	LA-10049	0	7	cm	Chromium	5.9	MG/KG	
CALA-01-0009	LA-10048	2	5	cm	Chromium	4.3	MG/KG	
CALA-01-0008	LA-10046	0	8	cm	Chromium	6.2	MG/KG	
CALA-01-0007	LA-10045	0	5	cm	Chromium	8.6	MG/KG	
CALA-01-0006	LA-10044	0	6	cm	Chromium	9	MG/KG	
CALA-01-0005	LA-10043	0	2	cm	Chromium	7.2	MG/KG	
CALA-01-0004	LA-10042	0	6	cm	Chromium	6.4	MG/KG	
CALA-00-0113	LA-10004	14	26	cm	Chromium	5.8	MG/KG	
CALA-00-0112	LA-10010	0	3	cm	Chromium	8.9	MG/KG	
CALA-00-0111	LA-10009	0	12	cm	Chromium	11	MG/KG	
CALA-00-0110	LA-10004	0	14	cm	Chromium	4.6	MG/KG	
CALA-00-0109	LA-10003	13	33	cm	Chromium	5.2	MG/KG	
CALA-00-0108	LA-10002	0	10	cm	Chromium	1.3	MG/KG	
CALA-00-0107	LA-10001	0	14	cm	Chromium	3.6	MG/KG	
CALA-00-0106	LA-10000	21	29	cm	Chromium	5.9	MG/KG	
04LA-97-0625	LA-00178	0	19	cm	Chromium	4.8	MG/KG	
04LA-97-0624	LA-00172	4	39	cm	Chromium	3.4	MG/KG	
04LA-97-0623	LA-00185	0	23	cm	Chromium	10.1	MG/KG	
04LA-97-0622	LA-00186	0	18	cm	Chromium	10.6	MG/KG	
04LA-97-0613	LA-00181	0	10	cm	Chromium	6.6	MG/KG	
04LA-97-0602	LA-00179	0	24	cm	Chromium	8.6	MG/KG	
04LA-97-0590	LA-00176	0	16	cm	Chromium	3.4	MG/KG	
04LA-97-0579	LA-00171	0	5	cm	Chromium	1.3	MG/KG	U
04LA-97-0577	LA-00175	39	52	cm	Chromium	3.5	MG/KG	
04LA-97-0576	LA-00175	18	39	cm	Chromium	3.9	MG/KG	
04LA-97-0575	LA-00175	0	18	cm	Chromium	6.2	MG/KG	
04LA-97-0574	LA-00174	0	5	cm	Chromium	2.3	MG/KG	
04LA-97-0573	LA-00173	0	24	cm	Chromium	6.5	MG/KG	
04LA-97-0572	LA-00160	0	27	cm	Chromium	4.3	MG/KG	
04LA-97-0571	LA-00143	33	53	cm	Chromium	5	MG/KG	
04LA-97-0570	LA-00041	20	28	cm	Chromium	19.5	MG/KG	
04LA-97-0569	LA-00041	0	12	cm	Chromium	11	MG/KG	
04LA-97-0568	LA-00170	0	30	cm	Chromium	3.5	MG/KG	
04LA-97-0553	LA-00133	0	5	cm	Chromium	2.8	MG/KG	J
04LA-97-0552	LA-00124	0	15	cm	Chromium	4.3	MG/KG	
04LA-97-0538	LA-00212	16	59	cm	Chromium	1.7	MG/KG	U
04LA-97-0526	LA-00212	0	15	cm	Chromium	5.3	MG/KG	
04LA-97-0514	LA-00208	65	90	cm	Chromium	2.6	MG/KG	U
04LA-97-0279	LA-00162	32	47	cm	Chromium	6.5	MG/KG	
04LA-97-0273	LA-00158	34	48	cm	Chromium	3.4	MG/KG	
04LA-97-0272	LA-00158	0	34	cm	Chromium	3.1	MG/KG	
04LA-97-0257	LA-00151	29	37	cm	Chromium	2.1	MG/KG	J
04LA-97-0256	LA-00151	18	29	cm	Chromium	2.7	MG/KG	
04LA-97-0255	LA-00151	0	18	cm	Chromium	2.7	MG/KG	
04LA-97-0245	LA-00146	49	71	cm	Chromium	4.6	MG/KG	
04LA-97-0244	LA-00146	28	49	cm	Chromium	4.8	MG/KG	
04LA-97-0243	LA-00146	0	28	cm	Chromium	4.7	MG/KG	
04LA-97-0237	LA-00141	10	35	cm	Chromium	3.9	MG/KG	
04LA-97-0236	LA-00141	0	10	cm	Chromium	4.3	MG/KG	
04LA-97-0228	LA-00137	0	10	cm	Chromium	4.1	MG/KG	
04LA-97-0227	LA-00135	23	51	cm	Chromium	2.99	MG/KG	
04LA-97-0225	LA-00132	59	72	cm	Chromium	1.9	MG/KG	
04LA-97-0224	LA-00129	20	39	cm	Chromium	3	MG/KG	
04LA-97-0223	LA-00128	20	30	cm	Chromium	4.7	MG/KG	
04LA-97-0222	LA-00125	70	91	cm	Chromium	3.8	MG/KG	
04LA-97-0221	LA-00122	35	44	cm	Chromium	2.5	MG/KG	
04LA-97-0150	LA-00116	0	5	cm	Chromium	2.2	MG/KG	
04LA-97-0149	LA-00115	28	41	cm	Chromium	5.7	MG/KG	
04LA-97-0148	LA-00114	16	32	cm	Chromium	7.5	MG/KG	
04LA-97-0147	LA-00111	28	34	cm	Chromium	5	MG/KG	
04LA-97-0146	LA-00110	28	41	cm	Chromium	4.9	MG/KG	
04LA-97-0145	LA-00110	28	41	cm	Chromium	4.3	MG/KG	
04LA-97-0144	LA-00109	41	49	cm	Chromium	12.2	MG/KG	
04LA-97-0143	LA-00109	41	49	cm	Chromium	10.6	MG/KG	
04LA-97-0053	LA-00022	20	30	cm	Chromium	7.8	MG/KG	
04LA-97-0052	LA-00092	14	32	cm	Chromium	10	MG/KG	
04LA-96-0181	LA-00038	0	5	cm	Chromium	9.4	MG/KG	
04LA-96-0180	LA-00037	0	8	cm	Chromium	3.5	MG/KG	
04LA-96-0179	LA-00036	0	8	cm	Chromium	9.1	MG/KG	
04LA-96-0178	LA-00035	0	10	cm	Chromium	8	MG/KG	
04LA-96-0177	LA-00034	0	10	cm	Chromium	9.4	MG/KG	
04LA-96-0176	LA-00033	0	10	cm	Chromium	2.7	MG/KG	
04LA-96-0175	LA-00032	0	8	cm	Chromium	7.8	MG/KG	
04LA-96-0149	LA-00024	66	81	cm	Chromium	38.4	MG/KG	
04LA-96-0148	LA-00024	0	15	cm	Chromium	4.7	MG/KG	
04LA-96-0147	LA-00023	0	10	cm	Chromium	6.3	MG/KG	
04LA-96-0146	LA-00022	0	10	cm	Chromium	6.5	MG/KG	
04LA-96-0145	LA-00020	63	73	cm	Chromium	18.9	MG/KG	
04LA-96-0144	LA-00020	0	15	cm	Chromium	6.7	MG/KG	
04LA-96-0143	LA-00019	0	15	cm	Chromium	4.8	MG/KG	
04LA-96-0142	LA-00018	0	8	cm	Chromium	5.5	MG/KG	
04LA-96-0141	LA-00017	0	8	cm	Chromium	4.4	MG/KG	
04LA-96-0140	LA-00016	0	8	cm	Chromium	5.8	MG/KG	
04LA-96-0056	LA-00011	2	20	cm	Chromium	10	MG/KG	
04LA-96-0055	LA-00010	2	20	cm	Chromium	4.3	MG/KG	
04LA-96-0054	LA-00009	10	38	cm	Chromium	5.1	MG/KG	
04LA-96-0053	LA-00008	5	23	cm	Chromium	6.4	MG/KG	
04LA-96-0052	LA-00007	10	20	cm	Chromium	7	MG/KG	
04LA-96-0051	LA-00006	0	10	cm	Chromium	6.1	MG/KG	
04LA-96-0050	LA-00005	2	16	cm	Chromium	5.6	MG/KG	

Table A4-2
Sandia Canyon Sediment Summary

Reach	Analyte Name	Number of Samples	Number of Detects	Min Detect	Avg Detect	Max Detect	Number of NDs[a]	Min ND	Avg ND	Max ND	Frequency of Detects	Number of D[b]>BV[c] (10.5 mg/kg)
S-1N	Chromium[d]	3	3	5	5.43	5.9	—[e]	—	—	—	3/3	0
S-1S	Chromium	6	5	9.2	52.84	160	1	9.1	9.1	9.1	5/6	4
S-1S	Chromium hexavalent ion	1	—	—	—	—	1	0.64	0.64	0.64	0/1	—
S-2	Chromium	30	30	5.6	448.73	3200	—	—	—	—	30/30	27
S-2	Chromium hexavalent ion	4	—	—	—	—	4	0.63	0.95	1.5	0/4	—
S-3	Chromium	9	9	7	91.64	330	—	—	—	—	9/9	7
S-5W	Chromium	7	7	4	18.39	42	—	—	—	—	7/7	4

Note: All values are in mg/kg.

[a] ND = Non-detected.

[b] D = Detected.

[c] BV = Background value.

[d] Chromium refers to total chromium.

[e] — = Not applicable.

SAMPLE_ID	LOCATION_ID	BEGIN_DEPTH	END_DEPTH	DEPTH_UNITS	ANALYTE_NAME	SAMPLE_VALUE	QUALIFIER
RESA-98-0055	SA-00023	0.49	1.12	in	Chromium	5 mg/kg	NQ
RESA-98-0057	SA-00023	1.44	1.57	in	Chromium	5.4 mg/kg	NQ
RESA-98-0059	SA-00023	2	2.23	in	Chromium	5.9 mg/kg	NQ
RESA-98-0061	SA-00025	0	0.66	in	Chromium	15 mg/kg	J-
CASA-98-0075	SA-00026	0.72	1.87	in	Chromium	37 mg/kg	J
RESA-98-0063	SA-00026	0.72	1.87	in	Chromium	160 mg/kg	J-
RESA-98-0066	SA-00027	0	0.33	in	Chromium	9.2 mg/kg	J-
RESA-98-0069	SA-00028	1.05	1.61	in	Chromium	43 mg/kg	J-
RESA-98-0076	SA-00030	0	0.33	in	Chromium	9.1 mg/kg	U
RESA-98-0002	SA-00008	0	0.16	in	Chromium	22 mg/kg	J
RESA-98-0003	SA-00008	0.16	0.62	in	Chromium	11 mg/kg	J
RESA-98-0005	SA-00008	0.95	1.12	in	Chromium	19 mg/kg	J
RESA-98-0007	SA-00008	1.9	2.23	in	Chromium	13 mg/kg	J
RESA-98-0008	SA-00009	0	0.85	in	Chromium	13 mg/kg	J
RESA-98-0009	SA-00009	0.85	1.05	in	Chromium	7.9 mg/kg	J
RESA-98-0011	SA-00009	1.57	1.74	in	Chromium	20 mg/kg	J
RESA-98-0013	SA-00009	3.12	3.87	in	Chromium	5.6 mg/kg	J
RESA-98-0014	SA-00009	3.87	4.36	in	Chromium	48 mg/kg	J
RESA-98-0015	SA-00010	0	0.72	in	Chromium	7.5 mg/kg	J
RESA-98-0019	SA-00010	1.57	1.97	in	Chromium	11 mg/kg	J
RESA-98-0022	SA-00011	0	0.33	in	Chromium	14 mg/kg	J
CASA-98-0076	SA-00013	0	1.31	in	Chromium	969 mg/kg	J
RESA-98-0026	SA-00013	0	1.31	in	Chromium	2000 mg/kg	J
RESA-98-0028	SA-00013	1.67	2.23	in	Chromium	48 mg/kg	NQ
RESA-98-0029	SA-00013	2.23	2.66	in	Chromium	24 mg/kg	NQ
RESA-98-0031	SA-00014	0.85	1.51	in	Chromium	42 mg/kg	NQ
RESA-98-0033	SA-00014	1.74	2.23	in	Chromium	28 mg/kg	NQ
CASA-98-0077	SA-00017	0	0.72	in	Chromium	1250 mg/kg	J
RESA-98-0041	SA-00017	0	0.72	in	Chromium	300 mg/kg	NQ
RESA-98-0044	SA-00017	1.41	1.8	in	Chromium	380 mg/kg	NQ
RESA-98-0045	SA-00017	1.8	2.59	in	Chromium	180 mg/kg	NQ
RESA-98-0046	SA-00018	0	0.33	in	Chromium	50 mg/kg	NQ
RESA-98-0047	SA-00019	0	0.33	in	Chromium	91 mg/kg	J-
RESA-98-0048	SA-00020	0	0.66	in	Chromium	71 mg/kg	J-
CASA-98-0078	SA-00021	0	1.18	in	Chromium	1270 mg/kg	J
CASA-98-0079	SA-00021	1.2	2.1	in	Chromium	682 mg/kg	J
RESA-98-0049	SA-00021	0	1.18	in	Chromium	2600 mg/kg	NQ
RESA-98-0050	SA-00021	1.18	2.1	in	Chromium	3200 mg/kg	NQ
RESA-98-0051	SA-00021	2.1	2.92	in	Chromium	85 mg/kg	NQ
CASA-00-0002	SA-10000	0.23	0.66	in	Chromium	88 mg/kg	J-
CASA-00-0003	SA-10001	0	0.2	in	Chromium	7 mg/kg	J-
CASA-00-0004	SA-10002	0.66	1.25	in	Chromium	71 mg/kg	J-
CASA-00-0005	SA-10002	1.25	2	in	Chromium	330 mg/kg	J-
CASA-00-0018	SA-10002	0.66	1.25	in	Chromium	45 mg/kg	J-
CASA-00-0006	SA-10003	0.82	1.18	in	Chromium	160 mg/kg	J-
CASA-00-0007	SA-10004	0	0.33	in	Chromium	73 mg/kg	J-
CASA-00-0008	SA-10005	0	0.2	in	Chromium	9.8 mg/kg	J-
CASA-00-0009	SA-10006	0	0.33	in	Chromium	41 mg/kg	J-
CASA-00-0010	SA-10007	0	0.39	in	Chromium	21 mg/kg	J-
CASA-00-0011	SA-10008	0	0.2	in	Chromium	4 mg/kg	J-
CASA-00-0012	SA-10009	0.92	1.15	in	Chromium	26 mg/kg	J-
CASA-00-0013	SA-10010	0	0.39	in	Chromium	24 mg/kg	J-
CASA-00-0014	SA-10011	0	0.3	in	Chromium	42 mg/kg	J-
CASA-00-0015	SA-10011	0.3	0.76	in	Chromium	6.7 mg/kg	J-
CASA-00-0016	SA-10011	0	0.3	in	Chromium	5 mg/kg	J-
CASA-98-0075	SA-00026	0.72	1.87	in	Chromium	0.64 mg/kg	U
CASA-98-0076	SA-00013	0	1.31	in	Chromium	0.86 mg/kg	U
CASA-98-0077	SA-00017	0	0.72	in	Chromium	0.63 mg/kg	U
CASA-98-0078	SA-00021	0	1.18	in	Chromium	1.5 mg/kg	U
CASA-98-0079	SA-00021	1.2	2.1	in	Chromium	0.81 mg/kg	U

Table A4-3
Mortandad Canyon Sediment Summary

Reach	Analyte Name	Number of Samples	Number of Detects	Min Detect	Avg Detect	Max Detect	Number of NDs[a]	Min ND	Avg ND	Max ND	Frequency of Detects	Number of D[b]>BV[c] (10.5 mg/kg)
E-1E	Chromium[d]	47	46	1.3	18.93	140	1	1.14	1.14	1.14	46/47	14
E-1FW	Chromium	20	20	5	363.25	2210	—[e]	—	—	—	20/20	19
E-1FW	Chromium hexavalent ion	7	3	0.531	1.10	1.99	4	0.53	1.095	1.46	3/7	—
E-1W	Chromium	29	29	1.4	33.05	636	—	—	—	—	29/29	13
E-1W	Chromium hexavalent ion	1	—	—	—	—	1	0.14	0.14	0.14	0/1	—
LA-BKG	Chromium	3	3	3.45	4.27	5.3	—	—	—	—	3/3	0
M-1C	Chromium	9	9	4	11.70	19.6	—	—	—	—	9/9	6
M-1E	Chromium	24	24	1.56	13.13	18.8	—	—	—	—	24/24	19
M-1W	Chromium	18	18	2.27	5.24	9.7	—	—	—	—	18/18	0
M-2E	Chromium	46	46	1.1	6.30	14	—	—	—	—	46/46	6
M-2W	Chromium	71	71	1.31	8.34	22	—	—	—	—	71/71	18
M-3	Chromium	93	93	1.2	6.07	17.5	—	—	—	—	93/93	13
M-4	Chromium	80	80	1.29	4.81	14.5	—	—	—	—	80/80	6
M-4 (excavated data)	Chromium	8	7	1.4	5.13	11.9	1	1.3	1.3	1.3	7/8	1
M-5E	Chromium	19	19	0.96	3.67	5.4	—	—	—	—	19/19	0
M-5W	Chromium	9	9	1.8	5.34	7.3	—	—	—	—	9/9	0
M-6	Chromium	14	14	2.86	5.49	8.14	—	—	—	—	14/14	0
MCW-1	Chromium	8	8	2.28	5.38	8.96	—	—	—	—	8/8	0
MCW-2E	Chromium	7	7	2.14	5.68	8.59	—	—	—	—	7/7	0
MCW-2N	Chromium	9	9	1.7	4.63	6.34	—	—	—	—	9/9	0
MCW-2W	Chromium	9	8	0.713	4.18	7.24	1	0.78	0.78	0.78	8/9	0

Table A4-3 (continued)

Reach	Analyte Name	Number of Samples	Number of Detects	Min Detect	Avg Detect	Max Detect	Number of NDs[a]	Min ND	Avg ND	Max ND	Frequency of Detects	Number of D[b]>BV[c] (10.5 mg/kg)
TS-1C	Chromium	80	80	1.2	4.61	10.4	—	—	—	—	80/80	0
TS-1E	Chromium	18	18	1.22	4.47	9.05	—	—	—	—	18/18	0
TS-1W	Chromium	26	26	1.5	4.82	10.3	—	—	—	—	26/26	0
TS-2C	Chromium	17	17	1.3	6.61	22.3	—	—	—	—	17/17	1
TS-2E	Chromium	14	14	1.8	8.03	26.8	—	—	—	—	14/14	2
TS-2W	Chromium	14	14	2.5	5.08	7.3	—	—	—	—	14/14	0
TS-3	Chromium	17	17	1.6	5.22	9.1	—	—	—	—	17/17	0

Note: All values are in mg/kg.

[a] ND = Nondetected.

[b] D = Detected.

[c] BV = Background value.

[d] Chromium refers to total chromium.

[e] — = Not applicable.

SAMPLE_ID	LOCATION_ID	BEGIN_DEPTH	END_DEPTH	DEPTH_UNITS	ANALYTE_NAME	SAMPLE_VALUE	REPORTING_UNITS	QUALIFIER
CAMO-98-0028	MO-00023	0	0.72	FT	Chromium	53	MG/KG	
CAMO-98-0029	MO-00024	0	0.72	FT	Chromium	31	MG/KG	
CAMO-98-0030	MO-00025	0	0.3	FT	Chromium	52	MG/KG	
CAMO-98-0031	MO-00025	1.21	1.64	FT	Chromium	140	MG/KG	
CAMO-01-0083	MO-10077	0.82	1.67	FT	Chromium	86	MG/KG	
CAMO-01-0144	MO-10073	1.16	1.72	FT	Chromium	15	MG/KG	
CAMO-01-0080	MO-10073	0.53	1.16	FT	Chromium	31	MG/KG	
CAMO-01-0151	MO-10078	0.73	1.22	FT	Chromium	45	MG/KG	
CAMO-01-0096	MO-00025	0.76	1.22	FT	Chromium	34	MG/KG	
CAMO-01-0148	MO-00023	1.49	2.31	FT	Chromium	12	MG/KG	
CAMO-01-0147	MO-00023	0.73	1.49	FT	Chromium	72	MG/KG	
CAMO-05-61157	MO-00023	0	0.98	FT	Chromium	49.1	MG/KG	
CAMO-01-0155	MO-00024	1.02	1.42	FT	Chromium	12	MG/KG	J-
CAMO-01-0154	MO-00024	0.73	1.02	FT	Chromium	84	MG/KG	J-
CAMO-98-0027	MO-00022	0	0.16	FT	Chromium	2.2	MG/KG	
CAMO-01-0094	MO-10081	0	0.33	FT	Chromium	2.5	MG/KG	
CAMO-01-0093	MO-10080	0	0.56	FT	Chromium	3.3	MG/KG	
CAMO-01-0086	MO-10082	0.56	1.25	FT	Chromium	6.6	MG/KG	
CAMO-01-0085	MO-10082	0	0.56	FT	Chromium	4.1	MG/KG	
CAMO-01-0084	MO-10078	0	0.73	FT	Chromium	7.2	MG/KG	
CAMO-01-0082	MO-10075	0	0.5	FT	Chromium	3.9	MG/KG	
CAMO-01-0145	MO-10074	0	0.36	FT	Chromium	3.6	MG/KG	
CAMO-01-0143	MO-10073	0	0.53	FT	Chromium	6.6	MG/KG	
CAMO-01-0081	MO-10074	0.36	1.09	FT	Chromium	1.6	MG/KG	
CAMO-01-0142	MO-10072	0.92	1.39	FT	Chromium	2.5	MG/KG	
CAMO-01-0079	MO-10072	1.39	2.01	FT	Chromium	9.3	MG/KG	
CAMO-01-0078	MO-10070	1.19	1.65	FT	Chromium	10	MG/KG	
CAMO-01-0077	MO-10070	0	0.59	FT	Chromium	10	MG/KG	
CAMO-01-0152	MO-10079	0.17	0.63	FT	Chromium	3.9	MG/KG	
CAMO-01-0153	MO-10079	0.63	0.89	FT	Chromium	4.6	MG/KG	
CAMO-01-0149	MO-10076	0	0.33	FT	Chromium	4.7	MG/KG	
CAMO-01-0150	MO-10077	0	0.83	FT	Chromium	1.3	MG/KG	
CAMO-01-0140	MO-10071	0	4.62	FT	Chromium	2.7	MG/KG	
CAMO-01-0141	MO-10072	0	0.53	FT	Chromium	7.8	MG/KG	
CAMO-01-0139	MO-10070	1.7	2.08	FT	Chromium	5.6	MG/KG	
CAMO-01-0138	MO-10070	0.59	1.19	FT	Chromium	3.9	MG/KG	
CAMO-01-0095	MO-00025	0.3	0.76	FT	Chromium	3.1	MG/KG	
CAMO-01-0146	MO-10074	1.58	2.48	FT	Chromium	5.4	MG/KG	
CAMO-04-55064	MO-23345	0	0.39	FT	Chromium	6.05	MG/KG	
CAMO-04-55065	MO-23346	0	0.33	FT	Chromium	1.61	MG/KG	
CAMO-04-55066	MO-23347	0	0.33	FT	Chromium	3.89	MG/KG	
CAMO-04-55084	MO-23347	0	0.33	FT	Chromium	4.96	MG/KG	
CAMO-05-61173	MO-24788	0	0.49	FT	Chromium	1.77	MG/KG	
CAMO-01-0160	MO-00025	0.3	0.76	FT	Chromium	4.9	MG/KG	J-
CAMO-01-0156	MO-00024	1.7	2.48	FT	Chromium	6.4	MG/KG	J-
CAMO-01-0159	MO-10073	0	0.53	FT	Chromium	8.7	MG/KG	J-
CAMO-04-55063	MO-23344	0	0.33	FT	Chromium	1.14	MG/KG	U
CAMO-04-53352	MO-22805	0.52	1.44	FT	Chromium	299	MG/KG	
CAMO-04-53353	MO-22806	0	0.56	FT	Chromium	225	MG/KG	
CAMO-04-53354	MO-22807	0.56	0.92	FT	Chromium	12	MG/KG	
CAMO-04-53355	MO-22808	0	1.05	FT	Chromium	52	MG/KG	
CAMO-04-53356	MO-22809	0.49	1.15	FT	Chromium	107	MG/KG	
CAMO-04-53357	MO-22809	1.15	1.54	FT	Chromium	365	MG/KG	
CAMO-04-53358	MO-22811	1.57	2.3	FT	Chromium	253	MG/KG	
CAMO-05-61161	MO-22804	0	0.98	FT	Chromium	524	MG/KG	
CAMO-05-63629	MO-25183	0	0.36	FT	Chromium	451	MG/KG	
CAMO-05-63630	MO-25183	0.36	0.72	FT	Chromium	1060	MG/KG	
CAMO-05-63631	MO-25185	0.26	1.05	FT	Chromium	2210	MG/KG	
CAMO-05-63632	MO-25186	0	0.49	FT	Chromium	125	MG/KG	
CAMO-05-63633	MO-25187	0	0.33	FT	Chromium	45.2	MG/KG	
CAMO-05-63626	MO-25180	0.07	0.69	FT	Chromium	59.2	MG/KG	
CAMO-05-63627	MO-25180	0.82	1.21	FT	Chromium	294	MG/KG	
CAMO-05-63628	MO-25182	0	0.49	FT	Chromium	20.1	MG/KG	
CAMO-05-63635	MO-25187	0	0.33	FT	Chromium	28.5	MG/KG	
CAMO-04-53351	MO-22804	0	0.85	FT	Chromium	450	MG/KG	J
CAMO-05-61163	MO-22804	0	0.98	FT	Chromium	680	MG/KG	NQ
CAMO-04-53395	MO-22804	0	0.85	FT	Chromium	5	MG/KG	
CAMO-98-0033	MO-00026	0.49	0.76	FT	Chromium	13	MG/KG	
CAMO-98-0034	MO-00027	0	0.66	FT	Chromium	30	MG/KG	
CAMO-98-0035	MO-00028	0	1.08	FT	Chromium	17	MG/KG	
CAMO-01-0092	MO-10086	0	0.66	FT	Chromium	19	MG/KG	
CAMO-01-0089	MO-10084	0	0.73	FT	Chromium	15	MG/KG	
CAMO-01-0090	MO-10085	0	0.23	FT	Chromium	50	MG/KG	
CAMO-04-53359	MO-22812	0	0.95	FT	Chromium	12.3	MG/KG	
CAMO-04-53360	MO-22812	0.95	1.61	FT	Chromium	12.8	MG/KG	
CAMO-04-53364	MO-22816	1.54	2.62	FT	Chromium	636	MG/KG	
CAMO-05-61158	MO-00027	0	0.98	FT	Chromium	20.2	MG/KG	
CAMO-05-63554	MO-25171	0	0.49	FT	Chromium	11.9	MG/KG	
CAMO-05-63637	MO-25188	0	0.49	FT	Chromium	27.5	MG/KG	
CAMO-05-63638	MO-25189	0	0.98	FT	Chromium	12.7	MG/KG	
CAMO-98-0032	MO-00026	0	0.49	FT	Chromium	8.9	MG/KG	
CAMO-98-0036	MO-00029	0	0.43	FT	Chromium	6.4	MG/KG	
CAMO-01-0091	MO-10085	0.23	0.66	FT	Chromium	1.6	MG/KG	
CAMO-01-0088	MO-10083	0.79	1.12	FT	Chromium	1.4	MG/KG	
CAMO-01-0087	MO-10083	0	0.79	FT	Chromium	1.8	MG/KG	
CAMO-04-53361	MO-22814	0	0.66	FT	Chromium	8.1	MG/KG	
CAMO-04-53362	MO-22814	0.89	1.35	FT	Chromium	3.9	MG/KG	
CAMO-04-53363	MO-22816	0.89	1.54	FT	Chromium	8.9	MG/KG	
CAMO-05-61171	MO-24787	0	0.49	FT	Chromium	2.1	MG/KG	
CAMO-05-63641	MO-25192	0	0.79	FT	Chromium	8.27	MG/KG	
CAMO-05-63642	MO-25193	0	0.98	FT	Chromium	6.09	MG/KG	
CAMO-05-63643	MO-25194	0	0.33	FT	Chromium	3.44	MG/KG	
CAMO-05-63644	MO-25195	0	0.69	FT	Chromium	4.3	MG/KG	
CAMO-05-63639	MO-25190	0.89	1.54	FT	Chromium	4.73	MG/KG	
CAMO-05-63640	MO-25191	0	0.33	FT	Chromium	6.93	MG/KG	
CAMO-05-63645	MO-25195	0	0.69	FT	Chromium	4.24	MG/KG	
CALA-05-63718	LA-25251	0	0.49	FT	Chromium	3.45	MG/KG	
CALA-05-61181	LA-24809	0	0.49	FT	Chromium	4.07	MG/KG	J
CALA-05-61183	LA-24798	0	0.98	FT	Chromium	5.3	MG/KG	J
CAMO-04-53287	MO-22752	0.16	1.44	FT	Chromium	14.8	MG/KG	
CAMO-04-53288	MO-22753	0	1.05	FT	Chromium	15.1	MG/KG	
CAMO-04-53289	MO-22754	0.23	0.98	FT	Chromium	10.8	MG/KG	
CAMO-04-53290	MO-22755	0.3	1.15	FT	Chromium	16.8	MG/KG	
CAMO-04-53294	MO-22759	0.1	0.49	FT	Chromium	12	MG/KG	
CAMO-04-53332	MO-22752	0.16	1.44	FT	Chromium	19.6	MG/KG	
CAMO-04-53291	MO-22756	0	0.82	FT	Chromium	4.8	MG/KG	
CAMO-04-53292	MO-22757	0.16	0.89	FT	Chromium	4	MG/KG	
CAMO-04-53293	MO-22758	0.2	1.05	FT	Chromium	7.4	MG/KG	
CAMO-98-0001	MO-00001	0	1.12	FT	Chromium	17	MG/KG	
CAMO-98-0002	MO-00002	0	0.2	FT	Chromium	13	MG/KG	
CAMO-98-0003	MO-00003	0	0.49	FT	Chromium	18	MG/KG	
CAMO-98-0004	MO-00003	0	0.49	FT	Chromium	16	MG/KG	
CAMO-98-0005	MO-00003	0.49	0.92	FT	Chromium	14	MG/KG	
CAMO-98-0006	MO-00004	0.1	0.66	FT	Chromium	18	MG/KG	
CAMO-04-53303	MO-22768	0	0.49	FT	Chromium	12	MG/KG	
CAMO-04-53304	MO-22769	0	0.62	FT	Chromium	16.1	MG/KG	
CAMO-04-53306	MO-22771	0.13	1.05	FT	Chromium	16.5	MG/KG	
CAMO-04-53307	MO-22772	0	0.49	FT	Chromium	14.6	MG/KG	
CAMO-04-53310	MO-22775	0.16	0.82	FT	Chromium	11.1	MG/KG	
CAMO-04-53335	MO-22775	0.16	0.82	FT	Chromium	11.5	MG/KG	
CAMO-05-63653	MO-25203	0.26	0.98	FT	Chromium	12	MG/KG	
CAMO-05-63655	MO-25205	0	0.85	FT	Chromium	12.1	MG/KG	
CAMO-05-63648	MO-25198	0.3	0.69	FT	Chromium	15.8	MG/KG	
CAMO-05-63650	MO-25200	0	0.69	FT	Chromium	16	MG/KG	
CAMO-05-63651	MO-25201	0	0.79	FT	Chromium	18.8	MG/KG	
CAMO-05-63652	MO-25202	0	0.89	FT	Chromium	14.2	MG/KG	
CAMO-05-63656	MO-25198	0.3	0.69	FT	Chromium	18	MG/KG	
CAMO-04-53305	MO-22769	0.62	1.94	FT	Chromium	6.1	MG/KG	
CAMO-04-53308	MO-22773	0	0.52	FT	Chromium	7.3	MG/KG	
CAMO-04-53309	MO-22773	1.54	2.1	FT	Chromium	5.4	MG/KG	
CAMO-05-63654	MO-25204	0	0.49	FT	Chromium	1.56	MG/KG	
CAMO-05-63649	MO-22768	0.49	1.25	FT	Chromium	10.1	MG/KG	
CAMO-98-0011	MO-00011	0	1.08	FT	Chromium	4.3	MG/KG	
CAMO-98-0012	MO-00012	0	0.33	FT	Chromium	4.8	MG/KG	
CAMO-98-0013	MO-00013	0	1.15	FT	Chromium	3.9	MG/KG	
CAMO-98-0014	MO-00013	0	1.15	FT	Chromium	5	MG/KG	
CAMO-98-0015	MO-00014	0.56	1.18	FT	Chromium	4.6	MG/KG	
CAMO-98-0016	MO-00015	0	0.85	FT	Chromium	8.2	MG/KG	
CAMO-04-53283	MO-22748	0.23	0.72	FT	Chromium	9.7	MG/KG	
CAMO-04-53284	MO-22749	0.56	1.25	FT	Chromium	2.8	MG/KG	
CAMO-04-53285	MO-22750	0	1.31	FT	Chromium	3.3	MG/KG	
CAMO-04-53286	MO-22751	0	0.43	FT	Chromium	5.9	MG/KG	
CAMO-05-61175	MO-24789	0	0.49	FT	Chromium	2.27	MG/KG	
CAMO-05-63646	MO-25196	0	0.33	FT	Chromium	4.49	MG/KG	
CAMO-05-63647	MO-25197	0.26	1.57	FT	Chromium	3.6	MG/KG	
CAMO-05-63625	MO-25179	0.72	1.25	FT	Chromium	8.97	MG/KG	
CAMO-05-63623	MO-25177	0	0.3	FT	Chromium	7.51	MG/KG	
CAMO-05-63624	MO-25177	0.3	1.18	FT	Chromium	2.81	MG/KG	
CAMO-05-63622	MO-25176	0.23	0.56	FT	Chromium	8.79	MG/KG	
CAMO-05-63634	MO-25177	0.3	1.18	FT	Chromium	3.41	MG/KG	
CAMO-01-0062	MO-10046	0	0.5	FT	Chromium	11	MG/KG	
CAMO-01-0058	MO-10044	2.24	3.6	FT	Chromium	14	MG/KG	
CAMO-01-0059	MO-10045	0.26	0.63	FT	Chromium	11	MG/KG	
CAMO-01-0052	MO-10040	1.6	2	FT	Chromium	11	MG/KG	
CAMO-01-0053	MO-10040	2.21	3.3	FT	Chromium	11	MG/KG	
CAMO-01-0050	MO-10039	0.86	1.7	FT	Chromium	14	MG/KG	
CAMO-01-0036	MO-10028	0	0.33	FT	Chromium	1.8	MG/KG	
CAMO-01-0054	MO-10041	1.45	1.85	FT	Chromium	3.9	MG/KG	
CAMO-01-0051	MO-10040	0	0.66	FT	Chromium	7.4	MG/KG	
CAMO-01-0056	MO-10044	0	0.5	FT	Chromium	6.9	MG/KG	
CAMO-01-0038	MO-10030	0	0.56	FT	Chromium	4.1	MG/KG	
CAMO-01-0037	MO-10029	0	0.86	FT	Chromium	6.1	MG/KG	
CAMO-01-0041	MO-10032	0	0.99	FT	Chromium	4.8	MG/KG	
CAMO-01-0039	MO-10030	0.56	0.76	FT	Chromium	9.8	MG/KG	
CAMO-01-0026	MO-10038	0	0.33	FT	Chromium	2.1	MG/KG	
CAMO-01-0027	MO-10039	0	0.53	FT	Chromium	6.7	MG/KG	
CAMO-01-0063	MO-10047	0.6	1.58	FT	Chromium	3.2	MG/KG	
CAMO-01-0040	MO-10030	0.76	1.22	FT	Chromium	5.8	MG/KG	
CAMO-01-0042	MO-10033	0	0.33	FT	Chromium	5.7	MG/KG	
CAMO-01-0045	MO-10034	0	0.4	FT	Chromium	3.4	MG/KG	
CAMO-01-0043	MO-10033	0.33	1.32	FT	Chromium	6.1	MG/KG	
CAMO-01-0044	MO-10033	1.32	2.46	FT	Chromium	3.3	MG/KG	
CAMO-01-0064	MO-10048	0	0.33	FT	Chromium	1.6	MG/KG	
CAMO-01-0046	MO-10034	0.4	1.72	FT	Chromium	2.4	MG/KG	
CAMO-01-0047	MO-10035	0	0.33	FT	Chromium	6	MG/KG	
CAMO-01-0025	MO-00031	0	0.76	FT	Chromium	6.1	MG/KG	
CAMO-01-0060	MO-10045	0.63	1.35	FT	Chromium	8.8	MG/KG	
CAMO-01-0061	MO-10045	1.35	1.62	FT	Chromium	3.9	MG/KG	
CAMO-01-0048	MO-10036	0	0.7	FT	Chromium	1.3	MG/KG	
CAMO-01-0034	MO-10047	0	0.59	FT	Chromium	5.5	MG/KG	
CAMO-01-0035	MO-10027	0	0.76	FT	Chromium	5.9	MG/KG	
CAMO-01-0033	MO-10044	1.52	2.24	FT	Chromium	10	MG/KG	
CAMO-01-0057	MO-10044	0.86	1.52	FT	Chromium	6.6	MG/KG	
CAMO-01-0049	MO-10037	0	0.33	FT	Chromium	8.7	MG/KG	
CAMO-01-0031	MO-10042	0	0.66	FT	Chromium	5.4	MG/KG	
CAMO-01-0032	MO-10043	0	0.36	FT	Chromium	8.2	MG/KG	
CAMO-01-0030	MO-10041	0.73	1.45	FT	Chromium	10	MG/KG	
CAMO-01-0028	MO-10040	0.86	1.58	FT	Chromium	5.4	MG/KG	
CAMO-01-0029	MO-10041	0	0.73	FT	Chromium	8.6	MG/KG	
CAMO-04-55079	MO-23352	0	0.33	FT	Chromium	1.74	MG/KG	

CAMO-03-49859	MO-03-21451	0	0.3	FT	Chromium	0.713	MG/KG	
CAMO-03-49846	MO-03-21451	0	0.3	FT	Chromium	0.78	MG/KG	U
CAMO-99-0046	MO-00065	0	0.76	FT	Chromium	6.4	MG/KG	
CAMO-99-0047	MO-00065	1.25	1.61	FT	Chromium	8.2	MG/KG	
CAMO-99-0048	MO-00065	2.1	3.12	FT	Chromium	9.3	MG/KG	
CAMO-99-0049	MO-00066	0	0.33	FT	Chromium	7	MG/KG	
AAA2650	50-06535	0	0.5	FT	Chromium	5.2	MG/KG	
AAA2651	50-06536	0	0.5	FT	Chromium	2.3	MG/KG	
AAA2652	50-06537	0	0.5	FT	Chromium	4.7	MG/KG	
AAA2653	50-06538	0	0.5	FT	Chromium	4.8	MG/KG	
AAA2655	50-06540	0	0.5	FT	Chromium	5.2	MG/KG	
AAA2656	50-06541	0	0.5	FT	Chromium	3.6	MG/KG	
AAA2657	50-06542	0	0.5	FT	Chromium	2.3	MG/KG	
AAA2658	50-06543	0	0.5	FT	Chromium	4.7	MG/KG	
AAA2659	50-06535	1.5	2.5	FT	Chromium	5.7	MG/KG	
AAA2660	50-06535	3	4	FT	Chromium	3.1	MG/KG	
AAA2661	50-06536	1.5	2.5	FT	Chromium	8	MG/KG	
AAA2662	50-06536	3	4	FT	Chromium	5.2	MG/KG	
AAA2663	50-06537	1.5	2.5	FT	Chromium	3.1	MG/KG	
AAA2664	50-06537	3	4	FT	Chromium	3.1	MG/KG	
AAA2665	50-06538	1.5	2.5	FT	Chromium	4	MG/KG	
AAA2666	50-06538	3	4	FT	Chromium	2.7	MG/KG	
AAA2667	50-06539	1.5	2.5	FT	Chromium	3.7	MG/KG	
AAA2668	50-06539	3	4	FT	Chromium	3.7	MG/KG	
AAA2669	50-06540	1.5	2.5	FT	Chromium	4.6	MG/KG	
AAA2670	50-06540	3	4	FT	Chromium	3.7	MG/KG	
AAA2671	50-06541	1.5	2.5	FT	Chromium	3.6	MG/KG	
AAA2672	50-06541	3	4	FT	Chromium	3.7	MG/KG	
AAA2673	50-06542	1.5	2.5	FT	Chromium	5.4	MG/KG	
AAA2674	50-06542	3	4	FT	Chromium	5.9	MG/KG	
AAA2675	50-06543	1.5	2.5	FT	Chromium	4.9	MG/KG	
AAA2676	50-06543	3	4	FT	Chromium	4.3	MG/KG	
AAA2638	50-06523	0	0.5	FT	Chromium	5.5	MG/KG	
AAA2639	50-06524	0	0.5	FT	Chromium	3	MG/KG	
AAA2640	50-06525	0	0.5	FT	Chromium	5.6	MG/KG	
AAA2642	50-06527	0	0.5	FT	Chromium	4.3	MG/KG	
AAA2643	50-06528	0	0.5	FT	Chromium	7.3	MG/KG	
AAA2644	50-06529	0	0.5	FT	Chromium	2.4	MG/KG	
AAA2645	50-06530	0	0.5	FT	Chromium	4.5	MG/KG	
AAA2646	50-06531	0	0.5	FT	Chromium	6.7	MG/KG	
AAA2647	50-06532	0	0.5	FT	Chromium	4.6	MG/KG	
AAA2648	50-06533	0	0.5	FT	Chromium	5.4	MG/KG	
AAA2649	50-06534	0	0.5	FT	Chromium	5.6	MG/KG	
AAA2681	50-06533	1.5	2.5	FT	Chromium	4.3	MG/KG	
AAA2682	50-06528	1.5	2.5	FT	Chromium	7.5	MG/KG	
AAA2685	50-06528	3	4	FT	Chromium	2.6	MG/KG	
AAA2686	50-06533	3	4	FT	Chromium	3.1	MG/KG	
AAA2705	50-06531	1.5	2.5	FT	Chromium	3.6	MG/KG	
AAA2706	50-06531	3	4	FT	Chromium	3.8	MG/KG	
AAA2539	50-06520	0	0.5	FT	Chromium	3.4	MG/KG	
AAA2540	50-06521	0	0.5	FT	Chromium	4.2	MG/KG	
AAA2637	50-06522	0	0.5	FT	Chromium	4.2	MG/KG	
AAA2707	50-06522	1.5	2.5	FT	Chromium	3.3	MG/KG	
AAA2710	50-06520	1.5	2.5	FT	Chromium	3.8	MG/KG	
AAA2712	50-06522	3	4	FT	Chromium	2.3	MG/KG	
AAA2713	50-06520	3	4	FT	Chromium	3.2	MG/KG	
CAMO-04-53373	MO-22826	0	1.12	FT	Chromium	1.8	MG/KG	
CAMO-04-53374	MO-22826	1.74	2.36	FT	Chromium	3.7	MG/KG	
CAMO-04-53375	MO-22828	0.43	1.21	FT	Chromium	5.8	MG/KG	
CAMO-04-53376	MO-22829	0.59	0.98	FT	Chromium	5.7	MG/KG	
CAMO-04-53377	MO-22829	1.21	1.97	FT	Chromium	7.3	MG/KG	
CAMO-04-53378	MO-22829	1.97	2.36	FT	Chromium	8	MG/KG	
AAA2677	50-06540	0	0.5	FT	Chromium	5.2	MG/KG	
AAA2678	50-06540	1.5	2.5	FT	Chromium	4.8	MG/KG	
AAA2679	50-06540	3	4	FT	Chromium	4.7	MG/KG	
AAA2680	50-06523	0	0.5	FT	Chromium	4.6	MG/KG	
CAMO-04-53397	MO-22829	1.21	1.97	FT	Chromium	6.7	MG/KG	
CAMO-05-61156	MO-06520	0	0.98	FT	Chromium	4.17	MG/KG	
CAMO-05-61177	MO-24792	0	0.49	FT	Chromium	3.44	MG/KG	
CAMO-05-63733	MO-25218	0	0.72	FT	Chromium	2.83	MG/KG	
CAMO-05-63734	MO-25219	0	0.72	FT	Chromium	5.34	MG/KG	
CAMO-05-63735	MO-25220	0	0.52	FT	Chromium	9	MG/KG	
CAMO-05-63736	MO-25220	0.72	1.18	FT	Chromium	2.52	MG/KG	
CAMO-05-63737	MO-25222	0.72	1.38	FT	Chromium	9.42	MG/KG	
CAMO-05-63738	MO-25222	1.38	2	FT	Chromium	2.06	MG/KG	
CAMO-05-63739	MO-25224	0	0.49	FT	Chromium	10.4	MG/KG	
CAMO-05-63740	MO-22829	0	0.59	FT	Chromium	3.97	MG/KG	
CAMO-05-63741	MO-22829	0	0.59	FT	Chromium	4.92	MG/KG	
AAA2654	50-06539	0	0.5	FT	Chromium	1.7	MG/KG	J
AAA2641	50-06526	0	0.5	FT	Chromium	1.2	MG/KG	J
AAA2683	50-06529	1.5	2.5	FT	Chromium	1.7	MG/KG	J
AAA2684	50-06529	3	4	FT	Chromium	1.7	MG/KG	J
CAMO-99-0030	MO-00053	0	0.49	FT	Chromium	5	MG/KG	
CAMO-99-0031	MO-00053	0.49	1.02	FT	Chromium	6.8	MG/KG	
CAMO-99-0032	MO-00054	0	0.43	FT	Chromium	6.1	MG/KG	
CAMO-04-53379	MO-22832	0	0.49	FT	Chromium	4.8	MG/KG	
CAMO-04-53380	MO-22833	0	0.72	FT	Chromium	2.7	MG/KG	
CAMO-04-53381	MO-22833	0.72	1.38	FT	Chromium	6.2	MG/KG	
CAMO-04-53382	MO-22835	0.2	0.52	FT	Chromium	3.7	MG/KG	
CAMO-05-61179	MO-24794	0	0.49	FT	Chromium	3.16	MG/KG	
CAMO-05-63725	MO-25212	0	0.66	FT	Chromium	2.07	MG/KG	
CAMO-05-63726	MO-25213	0.1	0.49	FT	Chromium	5.42	MG/KG	
CAMO-05-63727	MO-25214	0	0.49	FT	Chromium	4.92	MG/KG	
CAMO-05-63728	MO-25214	0.49	1.18	FT	Chromium	9.05	MG/KG	
CAMO-05-63729	MO-25216	0.66	1.97	FT	Chromium	5.06	MG/KG	
CAMO-05-63730	MO-22832	0.72	2.2	FT	Chromium	3.02	MG/KG	
CAMO-05-63745	MO-25226	0	0.52	FT	Chromium	6.85	MG/KG	
CAMO-05-63746	MO-25227	0	0.49	FT	Chromium	1.22	MG/KG	
CAMO-05-63731	MO-25216	0.66	1.97	FT	Chromium	2.32	MG/KG	
CAMO-99-0033	MO-00055	0	0.82	FT	Chromium	2	MG/KG	J
AAA2530	50-06511	0	0.5	FT	Chromium	3.9	MG/KG	
AAA2532	50-06513	0	0.5	FT	Chromium	3.8	MG/KG	
AAA2534	50-06515	0	0.5	FT	Chromium	5.5	MG/KG	
AAA2535	50-06516	0	0.5	FT	Chromium	5.6	MG/KG	
AAA2536	50-06517	0	0.5	FT	Chromium	6.3	MG/KG	
AAA2538	50-06519	0	0.5	FT	Chromium	4.1	MG/KG	
AAA2708	50-06518	1.5	2.5	FT	Chromium	2.8	MG/KG	
AAA2709	50-06511	1.5	2.5	FT	Chromium	2.6	MG/KG	
AAA2711	50-06517	3	4	FT	Chromium	2.9	MG/KG	
AAA2714	50-06518	3	4	FT	Chromium	2.9	MG/KG	
CAMO-04-53368	MO-22821	0.13	0.66	FT	Chromium	3.8	MG/KG	
CAMO-04-53369	MO-22822	0	0.36	FT	Chromium	3.1	MG/KG	
CAMO-04-53370	MO-22823	0	0.82	FT	Chromium	3.3	MG/KG	
CAMO-04-53371	MO-22823	0.82	1.8	FT	Chromium	1.9	MG/KG	
CAMO-04-53372	MO-22825	0.26	1.31	FT	Chromium	4.2	MG/KG	
CAMO-04-53365	MO-22818	0	1.05	FT	Chromium	6.7	MG/KG	
CAMO-04-53366	MO-22819	0.13	0.56	FT	Chromium	4.8	MG/KG	
CAMO-04-53367	MO-22820	0	0.82	FT	Chromium	10.3	MG/KG	
CAMO-04-53396	MO-22825	0.26	1.31	FT	Chromium	4.3	MG/KG	
CAMO-05-63719	MO-25206	0	0.52	FT	Chromium	7.22	MG/KG	
CAMO-05-63720	MO-22822	0.36	0.79	FT	Chromium	9.81	MG/KG	
CAMO-05-63721	MO-25208	0	0.59	FT	Chromium	7.39	MG/KG	
CAMO-05-63722	MO-25209	0	0.39	FT	Chromium	6.58	MG/KG	
CAMO-05-63723	MO-22825	0	0.26	FT	Chromium	7.81	MG/KG	
CAMO-05-63724	MO-25211	0	0.33	FT	Chromium	2.14	MG/KG	
AAA2537	50-06518	0	0.5	FT	Chromium	1.5	MG/KG	J
CAMO-04-53390	MO-22841	1.51	2.03	FT	Chromium	22.3	MG/KG	
CAMO-99-0039	MO-00060	0	1.15	FT	Chromium	7.4	MG/KG	
CAMO-99-0040	MO-00060	2.17	2.79	FT	Chromium	2.5	MG/KG	
CAMO-99-0041	MO-00061	0	0.43	FT	Chromium	6.7	MG/KG	
CAMO-04-53387	MO-22840	0.26	1.31	FT	Chromium	7.2	MG/KG	
CAMO-04-53388	MO-22841	0	0.75	FT	Chromium	5.7	MG/KG	
CAMO-04-53389	MO-22841	1.02	1.31	FT	Chromium	6.3	MG/KG	
CAMO-04-53398	MO-22841	0	0.75	FT	Chromium	5.2	MG/KG	
CAMO-05-61162	MO-22840	0	0.98	FT	Chromium	6.7	MG/KG	
CAMO-05-61165	MO-24795	0	0.49	FT	Chromium	2.79	MG/KG	
CAMO-05-63766	MO-25244	0	0.39	FT	Chromium	6.32	MG/KG	
CAMO-05-63767	MO-25245	0	0.56	FT	Chromium	8.62	MG/KG	
CAMO-05-63749	MO-25230	0.56	1.25	FT	Chromium	7.61	MG/KG	
CAMO-05-63750	MO-25231	0.1	0.56	FT	Chromium	2.33	MG/KG	
CAMO-05-63765	MO-25230	0	0.56	FT	Chromium	6.18	MG/KG	
CAMO-05-63768	MO-25246	0.03	0.33	FT	Chromium	7.2	MG/KG	
CAMO-99-0038	MO-00059	0	0.16	FT	Chromium	1.3	MG/KG	J
CAMO-05-63769	MO-25247	0.26	0.59	FT	Chromium	18.8	MG/KG	
CAMO-05-63771	MO-25248	0.62	1.15	FT	Chromium	26.8	MG/KG	
CAMO-99-0042	MO-00062	0	0.69	FT	Chromium	9.8	MG/KG	
CAMO-99-0043	MO-00063	0.23	0.76	FT	Chromium	7	MG/KG	
CAMO-99-0044	MO-00063	0.76	1.41	FT	Chromium	7.8	MG/KG	
CAMO-99-0045	MO-00064	0	0.66	FT	Chromium	2.8	MG/KG	
CAMO-04-53391	MO-22845	0	1.64	FT	Chromium	1.8	MG/KG	
CAMO-04-53392	MO-22845	2.36	3.35	FT	Chromium	6.7	MG/KG	
CAMO-04-53393	MO-22846	0.26	1.25	FT	Chromium	4.2	MG/KG	
CAMO-04-53394	MO-22847	0.66	2.46	FT	Chromium	5.6	MG/KG	
CAMO-05-63751	MO-25232	0	0.98	FT	Chromium	1.95	MG/KG	
CAMO-05-63752	MO-25233	0.39	1.18	FT	Chromium	6.23	MG/KG	
CAMO-05-63770	MO-25248	0	0.62	FT	Chromium	5.91	MG/KG	
CAMO-05-63772	MO-25250	0.33	1.02	FT	Chromium	6.96	MG/KG	
CAMO-99-0034	MO-00056	0.33	0.95	FT	Chromium	6.3	MG/KG	
CAMO-99-0035	MO-00056	0.95	1.28	FT	Chromium	4.8	MG/KG	
CAMO-99-0036	MO-00057	0.89	1.9	FT	Chromium	5.9	MG/KG	
CAMO-99-0037	MO-00058	0	0.16	FT	Chromium	2.7	MG/KG	
CAMO-04-53383	MO-22836	0.43	1.08	FT	Chromium	5.7	MG/KG	
CAMO-04-53384	MO-22836	1.38	2.17	FT	Chromium	2.5	MG/KG	
CAMO-04-53385	MO-22838	0.23	1.44	FT	Chromium	2.6	MG/KG	
CAMO-04-53386	MO-22838	2.69	3.18	FT	Chromium	5	MG/KG	
CAMO-05-63747	MO-25228	0	0.59	FT	Chromium	6.23	MG/KG	
CAMO-05-63748	MO-25229	0	0.79	FT	Chromium	3.34	MG/KG	
CAMO-05-63762	MO-25228	0.75	1.21	FT	Chromium	7.3	MG/KG	
CAMO-05-63763	MO-25241	0.33	0.72	FT	Chromium	4.77	MG/KG	
CAMO-05-63764	MO-25241	0.72	1.08	FT	Chromium	6.81	MG/KG	
CAMO-05-63773	MO-25228	0.75	1.21	FT	Chromium	7.17	MG/KG	
CAMO-01-0016	MO-10021	0.03	0.43	FT	Chromium	5.2	MG/KG	
CAMO-01-0014	MO-10020	1.02	1.72	FT	Chromium	4.1	MG/KG	
CAMO-01-0010	MO-10016	0.1	0.43	FT	Chromium	4	MG/KG	
CAMO-01-0009	MO-10015	0	0.83	FT	Chromium	1.6	MG/KG	
CAMO-01-0013	MO-10019	0.23	1.22	FT	Chromium	7.8	MG/KG	
CAMO-01-0008	MO-10014	0.73	1.12	FT	Chromium	5.5	MG/KG	
CAMO-01-0007	MO-10014	0.23	0.73	FT	Chromium	5.4	MG/KG	
CAMO-01-0011	MO-10017	0.33	0.92	FT	Chromium	6.6	MG/KG	
CAMO-01-0012	MO-10018	0.07	0.36	FT	Chromium	2.6	MG/KG	
CAMO-01-0015	MO-10020	1.72	2.31	FT	Chromium	9.1	MG/KG	
CAMO-05-63753	MO-25234	0.2	0.66	FT	Chromium	6.81	MG/KG	
CAMO-05-63754	MO-25234	0.82	1.41	FT	Chromium	6.37	MG/KG	
CAMO-05-63755	MO-25234	1.41	3.28	FT	Chromium	4.02	MG/KG	
CAMO-05-63756	MO-25237	0.1	0.46	FT	Chromium	4.53	MG/KG	
CAMO-05-63757	MO-25238	0.36	0.92	FT	Chromium	2.85	MG/KG	
CAMO-05-63758	MO-25239	0.07	0.89	FT	Chromium	7.68	MG/KG	
CAMO-05-63759	MO-25234	0.2	0.66	FT	Chromium	4.65	MG/KG	
CAMO-05-63561	MO-22806	0	0.56	FT	Chromium hexavalent ion	1.99	MG/KG	
CAMO-05-63559	MO-22804	0	0.85	FT	Chromium hexavalent ion	0.531	MG/KG	J
CAMO-05-63560	MO-22805	0.52	1.44	FT	Chromium hexavalent ion	0.784	MG/KG	J
CAMO-05-63562	MO-22809	0.49	1.15	FT	Chromium hexavalent ion	0.53	MG/KG	U
CAMO-05-63563	MO-22811	1.57	2.3	FT	Chromium hexavalent ion	1.3	MG/KG	U
CAMO-05-63565	MO-22809	1.15	1.54	FT	Chromium hexavalent ion	1.46	MG/KG	U
CAMO-05-63558	MO-22804	0	0.85	FT	Chromium hexavalent ion	1.09	MG/KG	U
CAMO-05-63564	MO-22816	1.54	2.62	FT	Chromium hexavalent ion	0.14	MG/KG	U

Appendix 5

Water-Level Data

The groundwater-level data presented in this work plan are provided to support an assessment of potential variations in the regional piezometric surface related to pumping cycles in production wells. Data from a single day are provided to represent a snapshot of the groundwater levels and to avoid potential ambiguity that might arise if the data were collected over a longer time period, such as those caused by variations in aquifer recharge rate, barometric pressure, or the water-supply pumping schedule.

Groundwater levels are reported for January 30, 2006, for the wells that were sampled as part of the interim action and for additional monitoring wells in adjacent watersheds. Groundwater-level data are reported for wells sampled in Mortandad Canyon and Sandia Canyon and for monitoring wells in the adjacent watersheds of Los Alamos Canyon to the north and Pajarito Canyon to the south. Groundwater-level data are reported for both intermediate groundwater and the regional aquifer.

Pressure transducers are used in most monitoring wells at Los Alamos National Laboratory (LANL or the Laboratory) to measure groundwater levels at 60-min intervals. The mean daily (MD) water level was calculated for each well from the 24 hourly measurements; the MD value is reported for each well in Table A5-1. The MD value is used to create the potentiometric water-level maps included in Section 3 (Figures 3-4 and 3-5). Standard deviations of the MD values are also shown in Table A5-1. The accuracy of the transducer and of the manual groundwater level measurements is also provided in Table A5-1.

The Los Alamos County water-supply wells are routinely operated during off-peak electric usage hours to take advantage of lower electric utility rates. These wells usually operate during nighttime hours and are turned off during daytime hours. Table A5-2 lists the water-supply well operational status on the nights of January 29 and 30, the on/off times, and the run times for the wells in operation. During the early morning hours of January 30, wells in operation in the vicinity of Sandia and Mortandad canyons included O-4, PM-1, PM-2, and PM-5.

In an effort to evaluate the potential effect of water-supply well pumping on each monitoring well, two additional mean values were calculated from the hourly transducer groundwater level data for each well on January 30, 2006. The mean groundwater levels for two 6-h periods, from midnight to 6:01 am (nighttime value was used to evaluate water levels during pumping) and from noon to 6:01 pm (daytime value was used to evaluate water levels during nonpumping), were calculated for each monitoring well; these mean values and associated standard deviations are also shown in Table A5-1.

Daily atmospheric temperature changes cause diurnal atmospheric pressure fluctuations, which in turn affect water levels in intermediate-depth and regional-aquifer single-completion wells that are open to the atmosphere. Borehole barometric efficiency describes how efficiently a change in barometric pressure changes the water level in a borehole but not necessarily the water level within the formation. The barometric efficiency approximates 100% in the Laboratory intermediate and regional aquifer wells (e.g., Kleinfelder and Associates 2005, 91693); thus, atmospheric pressure fluctuations cause significant water-level variability (generally, up to 0.5 ft in magnitude) in most intermediate and regional aquifer wells at the Laboratory. The effects of barometric efficiency are not observed in the Westbay-completed wells that are not open to the atmosphere. The water-level change in single completion wells that could be attributable to atmospheric pressure differences during midnight to 6:01 am and noon to 6:01 pm periods on January 30 was calculated from atmospheric pressure data obtained from the Laboratory Technical Area 06 meteorological tower.

The water-level change in these wells that was attributable to atmospheric pressure fluctuations on January 30, 2006, was calculated to be 0.02 ft higher in the afternoon than during the early morning hours. This water-level change was subtracted from the difference between the mean afternoon water levels (noon to 6:01 pm) and the mean early morning water level (midnight to 6:01 am) for the single completion wells only to estimate the water-level change in the aquifer, which can be potentially attributed to pumping of the water-supply wells. This correction was not applied to Westbay-completed wells, where the mean afternoon water level was subtracted from the mean early morning water level to determine the water-level change in the aquifer (Table A5-1).

The results of the evaluation done on January 30, 2006, for the potential effects of water-supply pumping on monitoring wells are shown in Table A5-1. The results indicate that all except two of the monitoring-well screens do not show a significant difference (less than 0.1 ft) between afternoon groundwater levels and early morning groundwater levels; therefore, they do not seem to be influenced by the supply-well pumping on January 30, 2006. The deeper regional aquifer screens in two wells, R-5 in Pueblo Canyon and R-20 in Pajarito Canyon, do show changes in afternoon water levels compared with the early morning water levels. Screen 4 in R-5 shows a higher mean afternoon water level of 0.48 ft, and screen 3 in R-20 shows a higher mean afternoon water level of 0.26 ft, both of which are attributable to supply-well pumping. Monitoring well R-20 is near supply well PM-2, and monitoring well R-5 is near supply wells O-1 and PM-1. However, it is important to note that the measurements at both screens are associated with uncertainty of ±0.58 ft (Table A5-1). Therefore, the observed water-level differences might be statistically insignificant. The screens in wells R-5 and R-20 that are located at the top of the regional aquifer do not show an apparent impact from supply-well pumping. Thus, it appears that impacts to the gradients in the shallow, water-table zone of the regional aquifer by water-supply pumping on January 30, 2006, are negligible.

The above evaluation of pumping effects on monitoring wells applies only to the groundwater levels observed on January 30, 2006, and is not a comprehensive evaluation of monitoring-well response to supply-well pumping. Additional discussion of the effects of pumping supply wells on monitoring wells at the Laboratory is addressed in Section 3.

REFERENCE

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the ENV-ERS Program Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the ENV-ERS Program. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Kleinfelder and Associates, April 2005. “Final Completion Report, Characterization Wells R-6/R-6i, Los Alamos National Laboratory, Los Alamos, New Mexico Project No. 37151, Appendix E, Aquifer Testing Report and Aquifer Test Data,” by David Schafer, Los Alamos, New Mexico. (Kleinfelder 2005, 91693)

Table A5-1
Groundwater Level Data from Selected Monitoring Wells during Groundwater Sampling Event for Chromium, January 30, 2006

Well Name	Port Common Name	Date Time	Type of Measurement[a]	Well Elevation (ft)	Mean Daily Water Elevation (ft amsl)	Std Dev of MD (ft)	Measurement Uncertainty (ft)[b]	Midnight to 6:00 am Mean Water Level (ft)	Midnight to 6:00 am Std Dev (ft)	Noon to 6:00 pm Mean Water Level (ft)	Noon to 6:00 pm Std Dev (ft)	Daytime Mean WL minus Nightime Mean WL (ft)[c]	WL Change due to Atmospheric Pressure (ft)	Daytime Minus Nightime Aquifer WL Change (ft)[c]	Comment
Intermediate-Depth Groundwater (Mortandad)															
MCOBT-4.4	SC	1/30/2006	MD	6836.20	6313.86	0.083	0.07	6313.86	0.045	6313.83	0.081	-0.02	0.02	-0.04	
MCOI-1	SC	1/30/2006	Manual	7106.20	Dry										
MCOI-4	SC	1/30/2006	MD	6837.20	6317.82	0.060	0.07	6317.85	0.045	6317.79	0.053	-0.06	0.02	-0.09	
MCOI-5	SC	1/30/2006	MD	6819.70	6129.77	0.033	0.07	No Data		6129.76	0.030				
MCOI-6	SC	1/30/2006	MD	6811.10	6146.71	0.033	0.07	6146.69	0.007	6146.73	0.036	0.04	0.02	0.01	
MCOI-8	SC	1/30/2006	Transducer	6859.20	Dry (water in sump)										
Regional Groundwater (Mortandad)															
R-1	SC	1/30/2006	MD	6881.21	5879.14	0.044	0.07	5879.13	0.007	5879.15	0.034	0.02	0.02	-0.01	
R-10a	SC	1/30/06 8:57	Manual	6363.7	6741.03		0.06								
R-13	SC	1/30/2006	MD	6673.05	5836.63	0.033	0.07	5836.62	0.006	5836.64	0.033	0.02	0.02	0.00	
R-14, screen 1	MP1A	1/30/2006	MD	7062.08	5883.59	0.029	0.23	5883.62	0.013	5883.57	0.018	-0.05		-0.05	
R-14, screen 2	MP2A	1/30/2006	MD	7062.08	5883.06	0.032	0.23	5883.07	0.035	5883.04	0.029	-0.03		-0.03	
R-15	SC	1/30/2006	MD	6820.00	5850.74	1.172	0.07	5851.06	0.004	5849.93	2.045	-1.13	0.02	-1.15	Well sampled on 1/30/06
R-28	SC	1/30/2006	MD	6728.61	5839.28	0.037	0.07	5839.27	0.005	5839.29	0.032	0.02	0.02	0.00	
R-33, screen 1	Screen 1			6853.33	No Data										Groundwater level data unavailable
R-33, screen 2	Screen 2			6853.33	No Data										Groundwater level data unavailable
R-34	SC	1/30/2006	MD	6629.99	5835.71	0.029	0.07	5835.69	0.014	5835.72	0.027	0.03	0.02	0.00	
TW-8	SC	1/30/2006	MD	6873.5	5875.25	0.031	0.07	5875.25	0.005	5875.25	0.028	0.00	0.02	-0.02	

Table A5-1 (continued)

Well Name	Port Common Name	Date Time	Type of Measurement[a]	Well Elevation (ft)	Mean Daily Water Elevation (ft amsl)	Std Dev of MD (ft)	Measurement Uncertainty (ft)[b]	Midnight to 6:00 am Mean Water Level (ft)	Midnight to 6:00 am Std Dev (ft)	Noon to 6:00 pm Mean Water Level (ft)	Noon to 6:00 pm Std Dev (ft)	Daytime Mean WL minus Nightime Mean WL (ft)[c]	WL Change due to Atmospheric Pressure (ft)	Daytime Minus Nightime Aquifer WL Change (ft)[c]	Comment
Sandia Canyon															
R-11	SC	1/30/2006	MD	6673.72	5838.57	0.038	0.07	5838.56	0.006	5838.58	0.031	0.03	0.02	0.00	
R-12 Screen 1 (Intermed)	MP1B	1/30/2006	MD	6499.6	6073.10	0.009	0.23	6073.09	0.004	6073.11	0.000	0.02		0.02	
R-12 Screen 2 (Intermed)	MP2B	1/30/2006	MD	6499.6	6073.57	0.008	0.23	6073.57	0.007	6073.57	0.010	0.00		0.00	
R-12 Screen 3	MP3B	1/30/2006	MD	6499.6	5695.27	0.008	0.58	5695.28	0.010	5695.27	0.000	-0.01		-0.01	
Regional Groundwater Cañada del Buey															
R-16 Screen 2	MP2A	1/30/2006	MD	6256.87	5641.87	0.036	0.58	5641.87	0.020	5641.86	0.010	-0.01		-0.01	
R-16 Screen 3	MP3A	1/30/2006	MD	6256.87	5557.24	0.039	0.58	5557.24	0.029	5557.24	0.018	0.01		0.01	
R-16 Screen 4	MP4A	1/30/2006	MD	6256.87	5545.22	0.042	1.15	5545.21	0.044	5545.22	0.027	0.00		0.00	
R-21	SC	1/30/2006	MD	6656.24	5854.59	0.034	0.07	5854.59	0.017	5854.60	0.042	0.01	0.02	-0.01	
R-22		1/30/2006	MD	6650.5											Data logger failure, no data
Los Alamos Canyon															
LADP-3 (Intermed)	SC	1/30/2006	MD	6756.7	6436.49	0.045	0.07	6436.46	0.006	6436.51	0.031	0.04	0.02	0.02	
LAOI(A)-1.1 (Intermed)	SC	1/30/2006	MD	6835.2	6544.38	0.036	0.07	6544.37	0.007	6544.40	0.029	0.03	0.02	0.00	
LAOI-3.2 (Intermed)	SC	1/30/2006	MD	6622.6	6477.46	0.128	0.07	6477.32	0.027	6477.52	0.058	0.20	0.02	0.18	WL impacted by nearby drilling
R-6	SC	1/30/2006	MD	6995.8	5839.90	0.040	0.07	5839.89	0.004	5839.90	0.035	0.01	0.02	-0.01	
R-6i (Intermed)	SC	1/30/2006	MD	6996.9	6403.79	0.037	0.07	6403.78	0.006	6403.80	0.028	0.02	0.02	0.00	
R-8 Screen 1	MP1A	1/30/2006	MD	6544.74	5855.64	0.005	0.23	5855.64	0.005	5855.65	0.005	0.00		0.00	
R-8 Screen 2	MP2A	1/30/2006	MD	6544.74	5837.33	0.006	0.23	5837.33	0.000	5837.33	0.005	0.00		0.00	

Table A5-1 (continued)

Well Name	Port Common Name	Date Time	Type of Measurement[a]	Well Elevation (ft)	Mean Daily Water Elevation (ft amsl)	Std Dev of MD (ft)	Measurement Uncertainty (ft)[b]	Midnight to 6:00 am Mean Water Level (ft)	Midnight to 6:00 am Std Dev (ft)	Noon to 6:00 pm Mean Water Level (ft)	Noon to 6:00 pm Std Dev (ft)	Daytime Mean WL minus Nightime Mean WL (ft)[c]	WL Change due to Atmospheric Pressure (ft)	Daytime Minus Nightime Aquifer WL Change (ft)[c]	Comment
R-9	SC	1/30/2006	MD	6382.8	5692.05	0.045	0.07	5692.05	0.006	5692.07	0.027	0.02	0.02	0.00	
R-9i (Intermed)	MP1A	1/30/2006	MD	6383.2	6238.63	0.018	0.23	6238.62	0.010	6238.64	0.016	0.02		0.02	
R-9i (Intermed)	MP2A	1/30/2006	MD	6383.2	6128.47	0.017	0.23	6128.47	0.008	6128.48	0.008	0.01		0.01	
TW-3	SC	1/30/2006	MD	6626.9	5840.08	0.053	0.07	5840.06	0.013	5840.09	0.043	0.03	0.02	0.01	
Pueblo Canyon															
R-2	SC	1/30/2006	MD	6770.38	5872.00	0.045	0.07	5872.00	0.008	5871.98	0.049	-0.02	0.02	-0.05	
R-4	SC	1/30/2006	MD	6577.49	5833.58	0.045	0.07	5833.56	0.008	5833.60	0.034	0.04	0.02	0.02	
R-5 (Intermed)	MP2A	1/30/2006	MD	6472.6	6133.99	0.012	0.58	6133.99	0.012	6133.99	0.011	0.00		0.00	
R-5 Screen 3	MP3B	1/30/2006	MD	6472.6	5768.15	0.011	0.58	5768.15	0.011	5768.15	0.011	0.00		0.00	
R-5 Screen 4	MP4A	1/30/2006	MD	6472.6	5749.70	0.192	0.58	5749.42	0.038	5749.90	0.047	0.48		0.48	Response to PM-1 pumping
TW-1	SC	1/30/2006	MD	6369.19	5855.57	0.132	0.07	5855.59	0.074	5855.53	0.083	-0.06	0.02	-0.08	
TW-2A (Intermed)	SC	1/30/2006	MD	6650.4	6538.10	0.036	0.23	6538.10	0.024	6538.07	0.012	-0.03	0.02	-0.05	
TW-4	SC	1/30/2006	MD	7244.6	6071.52	0.033	0.07	6071.51	0.007	6071.52	0.029	0.01	0.02	-0.02	
POI-4 (Intermed)	SC	1/30/2006	MD	6372.29	6213.49	0.015	0.07	6213.50	0.006	6213.50	0.010	0.00	0.02	-0.03	
Pajarito Canyon															
R-18	SC	1/30/2006	MD	7404.83	6117.95	0.031	0.07	6117.95	0.017	6117.96	0.038	0.01	0.02	-0.01	
R-19 (Intermed)	MP2A	1/30/2006	MD	7066.3	6168.75	0.007	0.23	6168.75	0.005	6168.75	0.005	-0.01		-0.01	
R-19 Screen 3	MP3B	1/30/2006	MD	7066.3	5887.66	0.004	0.23	5887.66	0.004	5887.66	0.005	0.00		0.00	
R-19 Screen 4	MP4A	1/30/2006	MD	7066.3	5880.31	0.025	0.58	5880.30	0.010	5880.30	0.030	0.00		0.00	
R-19 Screen 5	MP5A	1/30/2006	MD	7066.3	5877.39	0.027	0.58	5877.38	0.030	5877.37	0.017	-0.01		-0.01	
R-19 Screen 6	MP6A	1/30/2006	MD	7066.3	5870.80	0.031	0.58	5870.78	0.020	5870.80	0.015	0.02		0.02	
R-19 Screen 7	MP7A	1/30/2006	MD	7066.3	5866.43	0.038	1.15	5866.42	0.028	5866.42	0.036	0.00		0.00	
R-20 Screen 1	MP1A	1/30/2006	MD	6694.35	5866.12	0.050	0.23	5866.10	0.047	5866.15	0.021	0.05		0.05	

Table A5-1 (continued)

Well Name	Port Common Name	Date Time	Type of Measurement[a]	Well Elevation (ft)	Mean Daily Water Elevation (ft amsl)	Std Dev of MD (ft)	Measurement Uncertainty (ft)[b]	Midnight to 6:00 am Mean Water Level (ft)	Midnight to 6:00 am Std Dev (ft)	Noon to 6:00 pm Mean Water Level (ft)	Noon to 6:00 pm Std Dev (ft)	Daytime Mean WL minus Nightime Mean WL (ft)[c]	WL Change due to Atmospheric Pressure (ft)	Daytime Minus Nightime Aquifer WL Change (ft)[c]	Comment
R-20 Screen 2	MP2A	1/30/2006	MD	6694.35	5861.26	0.060	0.58	5861.29	0.022	5861.24	0.055	-0.05		-0.05	
R-20 Screen 3	MP3A	1/30/2006	MD	6694.35	5836.15	0.726	0.58	5836.03	0.601	5836.29	0.333	0.26		0.26	Response to PM-2 pumping
R-23	SC	1/30/2006	MD	6527.75	5697.90	0.043	0.07	5697.89	0.007	5697.92	0.034	0.03	0.02	0.01	
R-23i (Intermed) Screen 1	SC	1/30/06 14:10	Manual	6527.9	6121.99		0.04								
R-32 Screen 1	MP1A	1/30/2006	MD	6637.63	5859.42	0.010	0.23	5859.42	0.009	5859.42	0.004	0.00		0.00	
R-32 Screen 2	MP2	1/30/2006	MD	6637.63	5849.01	0.035	0.23	5849.01	0.028	5848.99	0.015	-0.03		-0.03	
R-32 Screen 3	MP3A	1/30/2006	MD	6637.63	5849.31	0.030	0.23	5849.32	0.018	5849.29	0.015	-0.03		-0.03	

Note: All groundwater-level data are preliminary and subject to change pending further data review and validation.

[a] MD = mean daily groundwater level; Manual = manual measurement; WL = water level.

[b] Measurement uncertainty of transducer measurements represents 0.1% of full scale transducer rating. Uncertainty of manual measurements represents 0.01 ft per 100 ft of measurement or 0.01%.

[c] Positive numbers indicate higher mean afternoon groundwater levels, negative numbers indicate lower mean afternoon groundwater levels.

Table A5-2
Los Alamos County Water-Supply Well Status January 30, 2006

Well Name	Status	Time On (Day Hr:Min)	Time Off (Day Hr:Min)	Run Time (Hr:Min)
G-1A	Off			
G-2A	On	1/30/2006 0:08	1/30/2006 5:49	5:40
G-3A	On	1/30/2006 0:10	1/30/2006 5:48	5:38
G-4A	Off			
G-5A	Off			
O-1	Off			
O-4	On	1/30/2006 0:01	1/30/2006 6:30	6:28
PM-1	On	1/29/2006 7:11	1/30/2006 0:38	0:38
PM-2	On	1/30/2006 0:01	1/30/2006 6:43	6:42
PM-3	Off			
PM-4	Off			
PM-5	On	1/30/2006 0:07	1/30/2006 6:09	6:02

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Appendix 6

Groundwater Data for
First Chromium Interim Measures Sampling Round
(on CD included with this document)

Appendix 6 includes four tables related to the data set for the group of wells and analytical suite presented in Table 2-1 of this work plan. All the tables are included in the attached CD. These analytical data are presented in Table A6-1. Supporting tables are provided for reference to the analytical data. Table A6-2 is an explanation of the validation qualifiers. Table A6-3 is a dictionary of analytical lab qualifiers. Table A6-4 lists the results that have not been received from the analytical laboratory as of the submittal date of this work plan.

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Lab Qualifiers

Lab Qualifier	Lab Qualifier Description
*	* (Inorganic) - The result for this analyte in the Laboratory Replicate analysis was outside acceptance criteria.
**	** (Organic) and (Inorganic) - The result for this analyte in the Laboratory Control Sample analysis was outside acceptance criteria.
*E	* (Inorganic) - The result for this analyte in the Laboratory Replicate analysis was outside acceptance criteria. (E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES)
ABJ	A (Organic) The Tenatively Identified Compound is an aldol condensate. (B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample.(J) (Organic) - The reported analyte is a tentitively idenififed compound (TIC).
AJ	A (Organic) The Tenatively Identified Compound is an aldol condensate. (J) (Organic) - The reported analyte is a tentitively idenififed compound (TIC).
B	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit.
B*	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. * (Ino
B*E	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. * (Ino
BE	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (E) (O
BE*	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (E) (O
BEN	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (E) (O
BEN*	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (E) (O
BJ	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (J) (O
BJN	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (J) (Organic) - The reported analyte is a tentitively idenififed compound (TIC). (N) (Organic) - The reported analyte is a tentitively idenififed compoun
BJP	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (J) (O
BN	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (N) (O
BN*	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (N) (O
BNE	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (N) (O
BP	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (P) (P
BPX	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (P) (P
BW	(B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than the Instrument Detection Limit but less than the Contract Required Detection Limit. (W) (I
D	(D) (Organic) - The result for this analyte was reported from a dilution.
DJ	(D) (Organic) - The result for this analyte was reported from a dilution. (J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL).
DP	(D) (Organic) - The result for this analyte was reported from a dilution. (P) (Pesticides/PCBs) - The quantitative results for this analyte between the primary and secondary GC columns were greater than 25% difference. (P) (SW-846 EPA Method 8310 High P
DPX	(D) (Organic) - The result for this analyte was reported from a dilution. (P) (Pesticides/PCBs) - The quantitative results for this analyte between the primary and secondary GC columns were greater than 25% difference. (P) (SW-846 EPA Method 8310 High P
E	(E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (G
E*	(E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (G
EJ	(E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (G
EJ*	(E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (G
EJN	(E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (G
EN	(E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (G
EN*	(E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (G
H	(H) (Organic/Inorganic) - The required extraction or analysis holding time for this result was exceeded.
H*	(H) (Organic/Inorganic) - The required extraction or analysis holding time for this result was exceeded. * (Organic) and (Inorganic) - The result for this analyte in the Laboratory Control Sample analysis was outside acceptance criteria.
HJ	(H) (Organic/Inorganic) - The required extraction or analysis holding time for this result was exceeded. (J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantit
HJ*	(H) (Organic/Inorganic) - The required extraction or analysis holding time for this result was exceeded. (J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantit
I	(I) (DIOXIN) The lab is reporting an interference for the associated congener. The reported concentration is an Estimated Maximum Possible Concentration (EMPC) due to the reported interference.
J	(J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL).
J*	(J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL). * (Inorganic) - The result for this analyte in the Laboratory Replicate analysis was out
JN	(J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL). (N) (Organic) - The reported analyte is a tentitively idenififed compound (TIC). (N) (I
JN*	(J) (Organic/Inorganic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL). (N) (Organic) - The reported analyte is a tentitively idenififed compound (TIC)
JP	(J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL). (P) (Pesticides/PCBs) - The quantitative results for this analyte between the primary an
JPX	(J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL). (P) (Pesticides/PCBs) - The quantitative results for this analyte between the primary an
JX	(J) (Organic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitaion Limit (PQL). (X) (Organic/Inorganic) - The result for this analyte should be regarded as not detected
L	(L) (Inorganic) - The result for this analyte in the serial dilution sample indicates physical and chemical interferences are present.
LT	(LT) (Rad) - The result for this analyte is affected by spectral interferance.
N	(N) (Organic) - The reported analyte is a tentitively idenififed compound (TIC). (N) (Inorganic) - The result for this anlayte in the matrix spike sample was outside acceptance criteria.
N*	(N) (Organic) - The reported analyte is a tentitively idenififed compound (TIC). (N) (Inorganic) - The result for this anlayte in the matrix spike sample was outside acceptance criteria. * (Inorganic) - The result for this analyte in the Laboratory Repl
P	(P) (Pesticides/PCBs) - The quantitative results for this analyte between the primary and secondary GC columns were greater than 25% difference. (P) (SW-846 EPA Method 8310 High Pressure Liquid Chromotography, HPLC results) - The quantitative results for
PJ	(P) (Pesticides/PCBs) - The quantitative results for this analyte between the primary and secondary GC columns were greater than 25% difference. (P) (SW-846 EPA Method 8310 High Pressure Liquid Chromotography, HPLC results) - The quantitative results for
PX	(P) (Pesticides/PCBs) - The quantitative results for this analyte between the primary and secondary GC columns were greater than 25% difference. (P) (SW-846 EPA Method 8310 High Pressure Liquid Chromotography, HPLC results) - The quantitative results for
Q	(Q) The result for this analyte was reported at an elevated reporting limit.
SI	(SI) (Rad) - Gamma spectrocopy result should be regarded as an uncertain idenification due to spectral interferance.
SQ	(SQ) (Rad) - Gamma spectrocopy result should be regarded as an uncertain idenification due to spectral interferance.
TI	(TI) (Rad) - Gamma spectrocopy result should be regarded as an uncertain idenification due to spectral interferance.
U	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit.
U*	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. * (Inorganic) - The result for this analyte in the Laboratory Replicate analysis was outside acceptance criteria.
UE	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The re
UE*	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (E) (Inorganic) (ICP-AES) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (E) (Inorganic) (GFAA) - Th
UEN	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (E) (Organic) - The result for this anlayte exceeded the upper range of the instrument initial calibration curve. (E) (Inorganic) (ICP-AES) - The re
UH	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (H) (Organic/Inorganic) - The required extraction or analysis holding time for this result was exceeded.
UH*	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (H) (Organic/Inorganic) - The required extraction or analysis holding time for this result was exceeded. * (Inorganic) - The result for this analyte
UI	(UI) (Rad) - Gamma spectrocopy result should be regarded as an uncertain idenification.
UJ	(UJ) (Organic) Legacy CST lab code should not be used.
UL	UL (all suites) Not detected legacy - This lab qual code is applied by WQ personnel for CST data and other legacy data that was reported as not detected using the less than symbol without the laboratory assigning a U lab code.
UN	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (N) (Organic) - The reported analyte is a tentitively idenififed compound (TIC). (N) (Inorganic) - The result for this anlayte in the matrix spike s
UN*	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (N) (Organic) - The reported analyte is a tentitively idenififed compound (TIC). (N) (Inorganic) - The result for this anlayte in the matrix spike s
UUI	(UUI) (Rad) - Gamma spectrocopy result should be regarded as an uncertain idenification and the lab assigned these gamma spectroscopy results as not detected.
UW	(U) (Organic/Inorganic) - The result for this analyte was not detected at the specified reporting limit. (W) (Inorganic GFAA CLP) - The result for this analyte in the post-digestion spike sample was outside acceptance criterea.
UY2	(UY2) (Rad) - Result should be regarded as an uncertain idenification due to spectral interferance.
W	(W) (Inorganic GFAA CLP) - The result for this analyte in the post-digestion spike sample was outside acceptance criterea.
X	(X) (Organic/Inorganic) - The result for this analyte should be regarded as not detected.
XB	(X) (Organic/Inorganic) - The result for this analyte should be regarded as not detected. (B) (Organic) - This analyte was detected in the associated Laboratory Method Blank and the sample. (B) (Inorganic) - The result for this analyte was greater than

Validation Flag	Validation Flag Description
A	The contractually-required supporting documentation for this datum is absent.
GUP	Matrix and Units are inconsistent
IUP	Matrix and Units are inconsistent A
J	The analyte is classified as detected but the reported concentration value is expected to be more uncertain than usual.
J+	The analyte is classified as detected but the reported concentration value is expected to be more uncertain than usual with a potential positive bias.
J-	The analyte is classified as detected but the reported concentration value is expected to be more uncertain than usual with a potential negative bias.
JN+	Presumptive evidence of the presence of the material at an an estimated quantity with a suspected positive bias.
JN-	Presumptive evidence of the presence of the material at an an estimated quantity with a suspected negative bias.
LIMIT	The limit type is uncertain.
MS	Invalid validation flag. MS indicates a laboratory matrix spike sample.
MSD	Invalid validation flag. MSD indicates a laboratory matrix spike duplicate sample.
N	Presumptive evidence of the presence of the material.
NJ	(Organic) -Analyte has been tentatively identified and the associated numerical value is estimated based upon 1:1 response factor to the nearest eluting internal standard
NQ	No validation qualifier flag is associated with this result, and the analyte is classified as detected.
NUP	Matrix and Units are inconsistent B
PM	Manual review of raw data is recommended to determine if the observed non-compliances with quality acceptance criteria adversely impacts data use.
R	The reported sample result is classified as rejected due to serious noncompliances regarding quality control acceptance criteria. The presence or absence of the analyte cannot be verified based on routine validation alone
RPM	The reported sample result is classified as rejected due to serious noncompliances regarding quality control acceptance criteria. The presence or absence of the analyte cannot be verified based on routine validation alone.
RUP	Matrix and Units are inconsistent C
U	The analyte is classified as not detected.
UA	Invalid validation flag of unknown meaning.
UJ	The analyte is classified as not detected, with an expectation that the reported result is more uncertain than usual.
VUP	Matrix and Units are inconsistent D

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft bgs)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Reason

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Alkalinity-CO3+HCO3		70.5	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Alkalinity-CO3+HCO3		69.5	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Ammonia as Nitrogen	<	0.01	mg/L			U	GELC	[illegible]
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Bromide		0.331	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Calcium		47.6	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Calcium		46.8	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Calcium		47.2	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Chloride		22.1	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Cyanide (Total)	<	0.005	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Cyanide (Total)	<	0.005	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Fluoride		0.582	mg/L				GELC	J+
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Hardness		156	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Hardness		157	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Magnesium		9.61	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Magnesium		9.49	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Magnesium		9.56	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Nitrate-Nitrite as N		19.7	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Nitrate-Nitrite as N		19	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Perchlorate		176	ug/L				GELC	J
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Perchlorate		166	ug/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	pH		7.33	SU			H	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	pH		7.32	SU			H	GELC	J
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Potassium		0.755	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Potassium		0.759	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Potassium		0.736	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Silicon Dioxide		68.1	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Silicon Dioxide		68.3	mg/L				GELC	J+
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Silicon Dioxide		67.2	mg/L				GELC	J+
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Sodium		21.4	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Sodium		20.7	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Sodium		21	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Specific Conductance		458	uS/cm				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Sulfate		26.5	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Inorganic	Total Dissolved Solids		382	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Inorganic	Total Dissolved Solids		338	mg/L				GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Total Kjeldahl Nitrogen	<	[illegible]	mg/L			U	GELC	[illegible]
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Inorganic	Total Phosphate as Phosphorus	<	[illegible]	mg/L				GELC	J
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Metals	Aluminum	<	0.068	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Metals	Aluminum	<	0.068	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Metals	Aluminum	<	0.068	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Metals	Antimony	<	0.0005	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	CS	Metals	Antimony	<	0.0005	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		UF	WG	CS	Metals	Antimony	<	0.0005	mg/L			U	GELC	
MCOI-6	Mortandad	[illegible]	###	[illegible]	Intermediate	[illegible]	[illegible]	[illegible]		F	WG	DUP	Metals	Arsenic	<	0.006	mg/L			U	GELC	

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Location Name	Watershed	Port Depth	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Location Name	Watershed	Port Depth (ft bgs)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Flag

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft-bgs)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Qual

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Rsn
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Rea
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Naphthalene	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Propionitrile	<	5	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Propylbenzene[1-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Styrene	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Tetrachloroethane[1,1,1,2-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Tetrachloroethane[1,1,2,2-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Tetrachloroethene	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Toluene	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichloro-1,2,2-trifluoroethane[1,1,2-]	<	5	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichlorobenzene[1,2,3-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichlorobenzene[1,2,4-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichloroethane[1,1,1-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichloroethane[1,1,2-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichloroethene	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichlorofluoromethane	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trichloropropane[1,2,3-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trimethylbenzene[1,2,4-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Trimethylbenzene[1,3,5-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Vinyl acetate	<	5	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Vinyl Chloride	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Xylene[1,2-]	<	1	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	156760	GU06010116R201	1/25/2006		UF	WG	CS	VOA	Xylene[1,3-]+Xylene[1,4-]	<	2	ug/L			U	GELC	
R-11	Mortandad	1289	171	S1	Regional	06A2N0243	GU06010116R201	1/25/2006		F	WG	CS	MetalsSpec	Chromium hexavalent ion	<	0.0004	mg/L				STLA	
R-11	Mortandad	1289	171	S1	Regional	06A2N0243	GU06010116R201	1/25/2006		UF	WG	CS	MetalsSpec	Chromium hexavalent ion	<	0.0004	mg/L				STLA	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Regional	[illegible]	[illegible]	[illegible]		F	WG	CS	MetalsSpec	Chromium hexavalent ion		[illegible]	mg/L				STLA	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	MetalsSpec	Chromium hexavalent ion		[illegible]	mg/L				STLA	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	2,4-Diamino-6-nitrotoluene	<	1.3	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	2,6-Diamino-4-nitrotoluene	<	1.3	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	3,5-Dinitroaniline	<	1.3	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Amino-2,6-dinitrotoluene[4-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Amino-4,6-dinitrotoluene[2-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Dinitrobenzene[1,3-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Dinitrotoluene[2,4-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Dinitrotoluene[2,6-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	HMX	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Nitrobenzene	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Nitrotoluene[2-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Nitrotoluene[3-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Nitrotoluene[4-]	<	0.813	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	PETN	<	1.3	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	RDX	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	TATB	<	1.3	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Tetryl	<	0.813	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Trinitrobenzene[1,3,5-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Trinitrotoluene[2,4,6-]	<	0.325	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	HEXP	Tris-o-cresylphosphate (TOCP)	<	1.3	ug/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GP06010015R01	1/30/2006		F	WG	CS	Inorganic	Alkalinity-CO3	<	1.45	mg/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GP06010015R01	1/30/2006		F	WG	CS	Inorganic	Alkalinity-CO3+HCO3		53.1	mg/L				GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	DUP	Inorganic	Ammonia as Nitrogen		[illegible]	mg/L			J	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	Inorganic	Ammonia as Nitrogen		[illegible]	mg/L				GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GP06010015R01	1/30/2006		F	WG	CS	Inorganic	Bromide		[illegible]	mg/L				GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GP06010015R01	1/30/2006		F	WG	CS	Inorganic	Calcium		14.6	mg/L				GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	Inorganic	Calcium		14.2	mg/L				GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GP06010015R01	1/30/2006		F	WG	CS	Inorganic	Chloride		[illegible]	mg/L				GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GP06010015R01	1/30/2006		F	WG	CS	Inorganic	Cyanide (Total)	<	0.0025	mg/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	DUP	Inorganic	Cyanide (Total)	<	0.0025	mg/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GU06010015R01	1/30/2006		UF	WG	CS	Inorganic	Cyanide (Total)	<	0.0025	mg/L			U	GELC	
R-15	Mortandad	958.6	###	122	Regional	156991	GP06010015R01	1/30/2006		F	WG	CS	Inorganic	Fluoride		[illegible]	mg/L				GELC	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Reason
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	RAD	Technetium-99	<	0.828	pCi/L	1.07	1.56	U	GELC	U
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	RAD	Uranium-234		0.761	pCi/L	[illegible]	[illegible]		GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	RAD	Uranium-235/236		[illegible]	pCi/L	[illegible]	[illegible]	U	GELC	[illegible]
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	RAD	Uranium-238		[illegible]	pCi/L	[illegible]	[illegible]		GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Acenaphthene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Acenaphthylene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Aniline	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Anthracene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Atrazine	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Azobenzene	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzidine	<	[illegible]	ug/L			U	GELC	[illegible]
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzo(a)anthracene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzo(a)pyrene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzo(b)fluoranthene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzo(g,h,i)perylene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzo(k)fluoranthene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzoic Acid	<	21.7	ug/L			U	GELC	[illegible]
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Benzyl Alcohol	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Bis(2-chloroethoxy)methane	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Bis(2-chloroethyl)ether	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Bis(2-ethylhexyl)phthalate	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Bromophenyl-phenylether[4-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Butylbenzylphthalate	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Chloro-3-methylphenol[4-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Chloroaniline[4-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Chloronaphthalene[2-]	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Chlorophenol[2-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Chlorophenyl-phenyl[4-] Ether	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Chrysene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dibenz(a,h)anthracene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dibenzofuran	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dichlorobenzene[1,2-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dichlorobenzene[1,3-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dichlorobenzene[1,4-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dichlorobenzidine[3,3'-]	<	10.9	ug/L			U	GELC	[illegible]
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dichlorophenol[2,4-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Diethylphthalate	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dimethyl Phthalate	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dimethylphenol[2,4-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Di-n-butylphthalate	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dinitro-2-methylphenol[4,6-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dinitrophenol[2,4-]	<	21.7	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dinitrotoluene[2,4-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Dinitrotoluene[2,6-]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Di-n-octylphthalate	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	[illegible]	<	10.9	ug/L			U	GELC	[illegible]
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	[illegible]	<	10.9	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Fluoranthene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Fluorene	<	1.09	ug/L			U	GELC	
R-28	Mortandad	[illegible]	###	[illegible]	Regional	[illegible]	[illegible]	[illegible]		UF	WG	CS	SVOA	Hexachlorobenzene	<	10.9	ug/L			U	GELC	

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Qual

Interim Measures Workplan Results 3/22/06

Location Name	Watershed	Port Depth (ft)	Port ID	Screen ID	Hydrological Zone	Request	Sample ID	Collection Date	Field QC	F/UF	Field Matrix	Lab Sample Type	Suite	Analyte	Symbol	Result	Units	Uncert	MDA	Lab Qual	Lab	2nd Val Qual
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Endosulfan II	<	0.0412	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Endosulfan Sulfate	<	0.0412	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Endrin	<	0.0412	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Endrin Aldehyde	<	0.0412	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Endrin Ketone	<	0.0412	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Heptachlor	<	0.0206	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Heptachlor Epoxide	<	0.0206	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Methoxychlor[4,4'-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	PEST/PCB	Toxaphene (Technical Grade)	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Americium-241		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Cesium-137		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Cobalt-60		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Gross alpha		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Gross beta		[illegible]	pCi/L	[illegible]	[illegible]		DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Gross gamma		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	DUP	RAD	Iodine-129		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Iodine-129		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Neptunium-237		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Plutonium-238		0	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Plutonium-239/240		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Potassium-40		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Sodium-22		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Strontium-90		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Technetium-99		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Uranium-234		[illegible]	pCi/L	[illegible]	[illegible]		DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Uranium-235/236		[illegible]	pCi/L	[illegible]	[illegible]	U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	RAD	Uranium-238		[illegible]	pCi/L	[illegible]	[illegible]		DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Acenaphthene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Acenaphthylene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Aniline	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Anthracene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Atrazine	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Azobenzene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzidine	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzo(a)anthracene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzo(a)pyrene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzo(b)fluoranthene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzo(g,h,i)perylene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzo(k)fluoranthene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzoic Acid	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Benzyl Alcohol	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Bis(2-chloroethoxy)methane	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Bis(2-chloroethyl)ether	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Bis(2-ethylhexyl)phthalate	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Bromophenyl-phenylether[4-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Butylbenzylphthalate	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Chloro-3-methylphenol[4-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Chloroaniline[4-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Chloronaphthalene[2-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Chlorophenol[2-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Chlorophenyl-phenyl[4-] Ether	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Chrysene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Dibenz(a,h)anthracene	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Dibenzofuran	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Dichlorobenzene[1,2-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Dichlorobenzene[1,3-]	<	[illegible]	ug/L			U	DBLC	
R-31	Mortandad	[illegible]	###	001	Regional	[illegible]	[illegible]	1/31/2006		UF	WG	CS	SVOA	Dichlorobenzene[1,4-]	<	[illegible]	ug/L			U	DBLC	

Interim Measures Workplan
Analytical Results not Received from University of Miami as of 3/22/06

COC_ID	SAMPLE_ID	START_DATE_TIME	OSI	ORDER_SUITE_DESC	RELINQUISHED_DATE
WG-03608-UM	UU06010G01R01	1/25/2006	18202	WG: LOW LEVEL H-3 ENRICHED	1/26/2006
WG-03622-UM	UU0601G14R201	1/25/2006	18202	WG: LOW LEVEL H-3 ENRICHED	1/26/2006
WG-03610-UM	UU06010G28R01	1/26/2006	18202	WG: LOW LEVEL H-3 ENRICHED	1/26/2006
WG-03611-UM	UU06010G15R01	1/30/2006	18202	WG: LOW LEVEL H-3 ENRICHED	1/30/2006
WG-03628-UM	UU0601G12R301	1/31/2006	18202	WG: LOW LEVEL H-3 ENRICHED	1/31/2006
WG-03613-UM	UU06010G34R01	1/31/2006	18202	WG: LOW LEVEL H-3 ENRICHED	1/31/2006
WG-03626-UM	UU0601G12R201	2/1/2006	18202	WG: LOW LEVEL H-3 ENRICHED	2/1/2006
WG-03633-UM	UU0601GR10A01	2/1/2006	18202	WG: LOW LEVEL H-3 ENRICHED	2/1/2006
WG-03625-UM	UU0601G12R101	2/2/2006	18202	WG: LOW LEVEL H-3 ENRICHED	2/2/2006
WG-03612-UM	UU06010G13R01	2/2/2006	18202	WG: LOW LEVEL H-3 ENRICHED	2/2/2006
WG-03614-UM	UU06010G11R01	2/3/2006	18202	WG: LOW LEVEL H-3 ENRICHED	2/3/2006
WG-03637-UM	UU0602G33R201	2/14/2006	18202	WG: LOW LEVEL H-3 ENRICHED	2/14/2006
WG-03636-UM	UU0602G33R101	2/16/2006	18202	WG: LOW LEVEL H-3 ENRICHED	2/17/2006

Figure 2-1. Locations of Sandia, Los Alamos, and Mortandad canyons showing major chromium release sites, stream-flow gages, and existing and planned boreholes, wells, and surface-water sampling stations